Customers' requirements of multimodal travel information systems
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Erratum

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Page 38, top row of table, ‘AA Roadwatch’, corrected to show a tick in the ‘Web cams’ and ‘Planned Roadworks’ columns

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Abbreviations and acronyms

FHWA	Federal Highway Administration (US)
GPS	Global Positioning System
Opus	Opus International Consultants Limited
PT	public transport
REST	web technique for transmitting dynamic and on-demand data to mobile clients
SQL	database look-up technique for transmitting dynamic and on-demand data to mobile clients
TCRP	Transit Cooperative Research Program
TfL	Transport for London
WiFi	Wireless Internet
XML	(Extensible Markup Language) – a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Definition

In this report, the term 'customer' refers to all people, as everyone travels from one place to another at various times. This includes urban commuters, long-distance commuters, freight drivers, rural travellers and tourists/international travellers.

'Customer requirement' refers to the non-technical requirements of the user, which define the expectations of the system in terms of objectives, constraints, effectiveness, suitability, etc.

Contents

Executive summary

The New Zealand Transport Agency (the Transport Agency) is seeking to improve the travel experiences of its customers. The provision of enhanced pre- and in-journey information has been identified as aiding this goal by allowing travellers to make smarter travel choices (which may include using a different travel mode or travelling at a different time of day) to get to their destination faster, with less frustration, and at a lower cost. This research was carried out in New Zealand between November 2012 and June 2013.

The two overarching goals of this research were to:

- provide evidence-based recommendations that identify the Transport Agency's customers' key information needs to support the use/move to multimodal travel
- provide best-practice guidance on the best ways to offer and 'push' the delivery of multimodal travel information that is tailored to individuals.

This report provides a summary of the three stages of work undertaken:

- Stage 1: Literature and best-practice review of current travel information provision, both in New Zealand and internationally
- Stage 2: Focus groups/structured interviews to examine key traveller information needs and to conduct a practical assessment of the usefulness for the New Zealand context of the various delivery systems
- Stage 3: Online interactive survey to provide a quantitative assessment and priority ranking of travellers' information needs.

This research confirmed that the provision of additional information to Transport Agency customers would allow travellers to make choices (around mode choice and travel time) that would enhance their travel experiences.

Specific findings

1 The best format for delivering traveller information depends on the level of expertise and/or preference of the person for whom it is provided. Information should be targeted at two levels: novice (ie new to a city or a mode, eg haven't used the bus system before) and experienced. Information should also be delivered in both digital and traditional formats as people have strong preferences depending on the comfort/ability with technology.

2 The best mode of delivering traveller information depends on whether the information is to be provided pre-trip or in-trip. Pre-trip information could be provided via the internet, smartphone and/or radio. For in-trip information, safety concerns were raised over drivers using mobile phones and smartphones, whilst radio and variable message signs were well accepted. Freight operators may also receive information via their dispatchers. Information delivered over mobile phones/smartphones would be appropriate for public transport (PT) applications.

3 New Zealanders have realistic expectations regarding information provision. They are aware of the importance of population density to the success of initiatives such as real-time travel time indicators, and only want them introduced where they would be affordable, reliable and useful.

4 The customer ratings of quality of traveller information services currently provided in New Zealand were varied. Participants agreed they were easy to use and understand, provided helpful information, generally came from trustworthy sources, and provided route-specific, reliable and accurate information. However, participants were neutral about whether information was updated regularly, was comprehensive, or was multimodal. This suggests that customers have a preference for information that is real-time, more comprehensive and more multimodal than what is currently available.

5 Customers' were generally positive regarding data sharing, with 77% indicating they would be willing to share travel data in some form and 70% stating they would like to see such information available in New Zealand. However, over 40% of participants also felt there were possible barriers to the introduction of crowdsourced traveller data in New Zealand, particularly the small population base and low access to, and high cost of, internet data.

Recommendations

Based on the findings of this research, the following work priorities are recommended:

- High-quality real-time information that offers multimodal information for travellers when faced with unexpected impediments to travel, such as traffic accidents, PT service delays and poor weather, could be investigated for larger centres. This work would include consideration of the wording for information around travel-time reliability. (Current US research is investigating how to describe delays, and uncertainty around the reliability and currency of the information – these aspects affect the public's perception of the reliability of an information system.)

- Investigate the provision of information for freight operators that includes road-closure information, locations with weight/height restrictions, and incident information. This information would facilitate route choice decisions. In addition, information about rest areas and toilets and other amenities would be useful, including suitability for freight vehicles (or campervans). This could be done in conjunction with the item above.

- Develop high-quality, route-specific, customisable information including alternative routes, comparative trip times for different travel times/days, directions, and pictures/names of key route landmarks. This could be integrated with information for transport mode comparison – including PT timetables, travel times and costs by different modes, and facilities (eg route maps, the location of parking, points of interest, public toilets and rest areas, walking routes/facilities/journey times, location of park-and-ride facilities, presence of steep hills/slopes, cycling routes/facilities/journey times, location of unlit roads and disability information).

- Investigate and develop a strategy for rural areas that encounter issues with data/GPS/mobile phone reception and mapping, as there is a possibility of receiving misleading or no information in these areas.

- Investigate whether a strategy is needed for rural congestion related to intense/irregular freight movements (eg logging or on-road stock movements and tractor movements). At these times, rural roads can quickly become filled with vehicles, posing safety and congestion issues, which can be a particular hazard around rural schools.

There is also a need for some overarching strategies to clarify the roles of government agencies (such as the Transport Agency) and the private sector, and which groups will provide specific types of information. The strategies could also define how traffic operation centres and information provision would interact –

for example, where there is a delay in the network, how will an alternative route be selected and communicated without moving congestion from one route to another? A related issue is the degree to which the Transport Agency provides information to third-party developers. In their 2013 report *Impacts of technology advancements on transportation management center operations,* Mizuta, Swindler, Jacobson and Kuciemba made the following recommendations regarding the involvement of third-party developers:[1]

- Develop prequalifications or standards regarding data accuracy and validation (potentially both for data received and data provided).
- Develop protocols for data privacy and confidentiality, including for media and other agencies.
- Consider the use of applicable standards to simplify data exchange, such as XML.[2]

In addition to the above, the Transport Agency could explore ways to use crowdsourcing,[3] which has been trialled in rural areas overseas to provide low-cost real-time PT information.

Abstract

The purpose of this research was two-fold: 1) to provide evidence-based recommendations that identify the Transport Agency's customers' key information needs, and 2) to provide best-practice guidance on ways the Transport Agency can best offer and 'push' the delivery of multimodal travel information that is tailored to individuals.

This research was carried out in three stages, between November 2012 and June 2013:

- Literature and best-practice review of current travel information provision, both in New Zealand and internationally
- Focus groups/structured interviews to examine key traveller information needs and to conduct a practical assessment of the usefulness for the New Zealand context of the various delivery systems
- Online interactive survey to provide a quantitative assessment and priority ranking of travellers' information needs.

This report describes the above work and provides recommendations for potential future actions.

1 Note these are the strategies considered relevant to New Zealand, and not the full list of strategies.

2 Other ways to transfer files via mobile platforms that may be worth exploration include those that rely on database look-ups (eg SQL) and/or web techniques (eg REST).

3 Crowdsourcing refers to the process of harnessing the skills of on-line communities or organisations that are prepared to volunteer their time contributing content or skills and/or solving problems, and is a rapidly growing area.

1 General introduction

The NZ Transport Agency is seeking to improve the travel experiences of its customers (road users/travellers). The provision of enhanced pre- and in-journey information has been identified as aiding this goal by allowing travellers to make smarter travel choices, which may include using a different travel mode, or travelling at a different time of day, to better meet their needs.

The Transport Agency therefore undertook this research to:

- provide evidence-based recommendations that identify customers' key information needs to support the use of/move to multimodal travel
- provide best-practice guidance on the best ways to offer and 'push' the delivery of multimodal travel information that is tailored to individuals.

The main objectives of this research were to:

- accurately define what information the user (or customer) needs when looking for travel information across a range of modes in New Zealand
- identify options and provide recommendations on how best data could be gathered and transformed into the required travel information, including identifying the most appropriate channels based on derived benefits
- identify how the Transport Agency could best offer and 'push' the delivery of multimodal travel information that is tailored to individuals' needs
- develop criteria for assessing the benefits from different levels of service for data availability, data sharing and data quality
- inform the development of future multimodal travel information systems and enhance their user focus.

The research was undertaken in several stages, from November 2012 to June 2013:

- Stage 1: Literature and best-practice review of current travel information provision, both in New Zealand and internationally
- Stage 2: Focus groups/structured interviews to understand travellers' key information needs and motivations for seeking information, and to conduct a practical assessment of the usefulness for the New Zealand context of the various delivery systems
- Stage 3: Online interactive survey to provide a quantitative assessment and priority ranking of travellers' information needs.

1.1 Report structure

This report describes the research process and the findings of each stage, and concludes with a concise summary of the research results, key overall findings, and recommendations regarding the provision of multimodal travel information.

The appendices provide detailed information on the following:

- Appendix A - Focus group script
- Appendix B - Focus group comments on the demonstration websites and applications
- Appendix C - Websites and applications shown to the focus groups
- Appendix D - Information provided to participants in the online survey
- Appendix E - Online survey weighting information.

Stage 1 Literature and best-practice review

2 Literature and best-practice review introduction

The key themes for the project's literature review, which was undertaken in December 2012 and January 2013, were to find information on:

- what multimodal travel information was currently available both within New Zealand and internationally
- travellers' information requirements
- behavioural change post implementation of improved information provision
- travel information system format specifications/issues/opportunities.

The project Steering Group emphasised that the main focus of this work was to investigate customer/user information requirements, rather than solutions.

A document search and review of international research on the key themes was performed using the terms 'multimodal information provision', 'public transport information provision', 'transit information provision' and 'traveller information'.

The best-practice review involved a web search of current information providers in New Zealand and phone interviews with three providers (the NZ Transport Agency, Wellington Regional Council and Environment Canterbury) to gain an understanding of what has been learned so far and what is being proposed for the future.

2.1 Defining 'travel information provision'

For the purposes of this research, travel information provision included any type of information that could be collected and displayed/sent to travellers, which allowed travellers to make informed decisions regarding whether to change their route, mode, departure time and/or destination. Information could include (but was not limited to):

- traffic delays (eg congestion)
- travel-planning tools
- ridesharing
- information on the cost/sustainability of different modes
- incidents
- weather conditions
- parking availability
- real-time bus/next-bus information
- travel times

- emergency alerts
- alternative routes
- walking routes/facilities/travel times
- cycling routes/facilities/travel times.

Provision of travel information could take a number of forms, including websites, real-time information at stops, variable-message signs (VMS), mobile phone applications, in-vehicle information and the use of social media. Global awareness of the value of accurate, publicly available data and its use and reuse is in its infancy, but maturing very quickly with each new system-solution development. Emerging platforms for data presentation are constantly challenging traditional information-sharing thinking, principles and media, and the nature and characteristics of underlying data sources. Please note that this report deals only with user information needs, and not technology solutions.

Globally, information provision is seen as an important area of research. A number of local authorities and countries have published best-practice guidelines for information provision, though these have largely been either display method (eg website, printed materials, VMS) or travel-mode specific (eg passenger transport, cycling). Because there was less information on integrated information provision, we included information from research into travel planning for PT that we assessed as being relevant to an integrated information provision system.

An additional component of this work was to gain an understanding of users' information needs and the terminology they use when requesting information.

3 Results of the literature and best-practice review

3.1 The demand for travel information

The international research indicated a strong demand for information (Ferris et al 2010), with the level of demand affected by a number of factors – eg travellers had a higher need for travel information for journeys that were unfamiliar and/or unpredictable and/or time critical (Lyons et al 2007; Marks 2008). Travellers were also more likely to acquire travel information for longer trips and leisure trips (Farag and Lyons 2008). In general, the internet was the most popular mode of travel information provision (Marks 2008). Research by Cluett et al (2003) revealed that, in general, travellers preferred information via paper or the internet (particularly for unfamiliar trips), followed by telephone enquiry line. As mentioned earlier, real-time information was preferred at the station or stop over any other form of information – eg actual arrival times, delays and/or location of the vehicle that is being waited on (Cluett et al 2003). Travellers' characteristics affected the modes by which they preferred to access information, and this is discussed in detail in the demographics section following.

The usability of websites and other sources of information had important implications in terms of travellers actually accessing available information (Marks 2008; Cain and Lavelle 2010). Website information needed to be quick, easy to access, reliable, and have extensive coverage of major roads and modes (Marks 2008). Providing real-time information at stops could also have psychological benefits. For example, it could improve the image of PT and reduce the perceived travel and wait time (Dziekan and Kottenhoff 2007, cited in Marks 2008), and could also result in an increased perception of personal safety (Watkins et al 2011). In fact, the provision of real-time information could have a higher value for travellers than improving the frequency of a service (Dziekan and Kottenhoff 2007, cited in Marks 2008).

Thus, the review showed that adequate provision of travel information could have a multitude of benefits. The following sections summarise the literature to date regarding customer preferences regarding information provision, demographic factors influencing this, consideration of the needs of those with different abilities and from different minority groups, the provision of multimodal information to encourage modal shift, challenges regarding data quality, and willingness to pay for such services.

3.2 Benefits of providing multimodal travel information

The review found that the provision of multimodal information had the ability to influence travellers' mode choices as it provided an opportunity to compare modes and identify the advantages of using alternatives (Marks 2008). Pathan et al (2011) found that multimodal travel information sites were also generally considered more credible than other sites, and so could have wider reach than other travel information provision services. A number of articles detailed the use and development of multimodal travel information systems (eg Li et al 2012; Minea et al 2011; Zhang et al 2010; Zhang et al 2011; Zografos et al 2010). This section reviews the evidence to date of mode shifts resulting from such systems.

The TravelSmart project, introduced between 2005 and 2006 in Adelaide, South Australia, aimed to provide information to the local population that would facilitate a change in travel behaviour (Zhang et al 2011). After distribution of the materials, an extensive perception study (N>1000) was conducted to

measure the effect of the various information types on travel behaviour change. The tools provided included information on ways to cut down car driving in general and information relating to alternative, more environmentally friendly modes of transport. The following tools were evaluated:

- *Journey plan:* Participants were provided with an individually tailored journey plan for a PT, cycling or walking trip that could replace a current car journey.
- *Walking and cycling map:* Participants were provided with a map displaying walking and cycling opportunities in Adelaide.
- *Affirmation letter:* Participants were sent a letter of praise for past reduction of kilometres driven and also reminded them of the benefits they had received from this.
- *Local access guide:* Participants were provided with a guide on local activities (eg shops, services, clubs) that highlighted whether these could be reached by walking or cycling.

Zhang et al's review showed that the walking and cycling map was the most effective tool and did encourage people to walk more frequently. Participants also reported they found receiving information about driving alternatives and the location of nearby facilities most useful

In similar work, Khattak et al (2008) completed an analysis that aimed to explore the following key questions:

- Is accessing additional data sources associated with a higher likelihood of travel decision adjustments?
- Which technologies are more likely to elicit substantive adjustment to routine travel patterns?

A secondary analysis based on Household Travel data collected in North Carolina was performed to explore behavioural responses (in relation to these two research questions) to various modes of information dissemination. Key findings from this analysis included the following (Khattak et al 2008):

- Accessing an increasing number of information sources was positively and significantly associated with a higher likelihood of travel decision adjustments (eg change in route, time or mode, or cancellation of the trip).
- Travel decision changes were significantly associated with the frequency of information use.
- Use of the internet to obtain information was associated with the highest propensity to change travel decisions, followed by radio and then television.

Work by Pathan et al (2011) further explained the reasons behind a shift in mode choice that resulted from the provision of multimodal travel information; specific modes were found to be more attractive when information sources showed decreased travel time and costs. Maximum results were achieved when different information sources gave the same information to travellers.

The US Department of Transportation web report *Managing demand through travel information services* (undated) reported the results from the Seattle Travel Survey, where travellers responded to information in the following ways:

- 13% changed the time they left
- 11% took a planned route but with small changes to avoid a congested area
- 9% took a completely different route from their planned one

- 2% added, delayed or cancelled a trip
- 1% changed the means of transport
- 64% made no change.

These findings collectively supported the assertion that being provided with multimodal information allowed for the comparison of the advantages of different modes and therefore were related to increased mode-shifting behaviour. Therefore, where possible, travel information systems should be multimodal (and provided via the internet) to promote a shift to alternative modes (eg Khattak et al 2008; Cats et al 2011; Marks 2008).

There was also evidence that providing information on a single mode could increase use of other associated modes (Ferris et al 2010). Their research investigating the effect of providing real-time information for bus users in Seattle (US) found that people reported catching buses further from their planned departure point, as they had more certainty that they could have a walk and get to their destination on time.

3.3 Long-term changes to travel behaviour

There was only one investigation into the long-term effects of different types of travel information on travellers' behaviour and habits. Poon and Stopher (2011) conducted a series of computer-based experiments to investigate this issue, tracking the day-to-day evolution (over 20 days) of travellers' behaviour with the provision of varying types of information.

The preliminary findings showed that travellers did not behave differently when given static (eg printed timetable) information from when they received no information at all. In both of these situations, the travellers engaged in an initial exploratory process to locate the perceived best time to arrive at the bus stop. During the first few days, as the travellers learned about the variability of the service time, they chose to arrive progressively later each day. However, the magnitude and frequency of changes to travel behaviour stabilised after this period. On the other hand, travellers given dynamic information such as real-time arrivals and departures achieved higher utility in their transport decision making, with a shorter mean wait time.

3.4 Understanding user requirements

The literature review found that defining user requirements of a system prior to its development was a widely used method within usability engineering of computer interface and hardware design. This approach had multiple benefits, as products were designed to meet user requirements and were therefore more usable and appealing, and required fewer changes after they had been released (Crosby et al 1993). Designing useful, easy-to-use and appealing systems encourages greater user uptake, which is a goal of information provision for multimodal transport. Knowing the users' needs also helps to future-proof designs, as each new technology can be assessed against how it would meet the users' information needs prior to it being adopted.

As mentioned earlier, the provision of relevant information was considered key to influencing the choice of transport mode used by travellers – if accessible information was provided to both car drivers and PT users, there was an opportunity to compare modes and the advantages of PT usage could become

apparent, hence affecting mode choice (Marks 2008). A significant body of research has been conducted exploring travellers' preferences and requirements for travel information provision (eg Amey et al 2011; Marks 2008; Lyons et al 2007; Zografos et al 2010; Veneziano et al 2010).

User requirements for travel information systems vary, and the findings of previous research that were relevant to the current project on this topic are summarised below.

3.4.1 New versus experienced users

People who are new to an area (including tourists and people making trips to a new location) require information to help them orient themselves within the area. Thorndyke (1980) characterised this stage of learning about an environment as 'landmark knowledge', whereby travellers seek out salient objects such as statues, building or landmarks to navigate by. Information could be provided to support this stage of learning – eg by providing landmark information on maps, such as hills, buildings and major intersections. The KMB bus operator in Hong Kong provides a photo of each bus stop on their website (UITP 2003). The need to seek landmark knowledge prior to visiting an area can be evidenced in the number of people who use Google Street View in conjunction with bus information. Crowdsource/PT information system expert, Dr Aaron Steinfeld, also noted that people with disabilities use Street View to check whether there are accessible paths (pers comm, 2012).

Additionally, research suggests that people who are new to an area will require more information that:

- supports decision making on what type of mode to choose – eg the cost and time of alternative modes
- shows how to link up different segments of the trip – eg where they can park and ride, where to catch PT, PT timetables, where to transfer, where it is safe to walk, and where there are cycle routes.

The Transit Cooperative Research Program (TCRP) report *Passenger information services: a guidebook for transit systems* (Higgins et al 1999, p3) provided the following example of the information needs of new bus users, broken down into the two stages of pre- and in-trip information needs:

> *Pre-trip information needs consist of the following:*
>
> - *Location of the nearest bus stop,*
> - *Routes that travel to the desired destination and transfer locations,*
> - *Fare; and,*
> - *Time of departure and approximate duration of the trip.*
>
> *In-transit [in-trip] information needs consist of the following:*
>
> - *At the departure point – identification of the correct bus to board;*
> - *On the bus – identification of bus stops for transfers or disembarking;*
> - *At transfer points – how to transfer to another route, cost, time limits, and restrictions; and,*
> - *At the destination – area geography (i.e., location of the final destination in relation to the bus stop) and return trip information (e.g., departure times and changes in route numbers).*

In contrast, people who have a good knowledge of the geographical area and the 'how' of using various modes (other than single-occupant cars) are characterised as needing information that is more related to notifications when something has changed (eg if there is a traffic delay ahead, a road is closed, the bus is running late, or there is a broken lift/escalator/detour, etc).

3.4.2 Urban commuters

Marks (2008) completed an Australian-based review of travel information research, focusing on the types of information that could be provided, how to transform that information into content, and how to deliver this in an accessible manner to a maximised number of car drivers and PT users. That report focused mainly on commuter trips and found that the key information types were:

- all available modes for a journey
- various options to complete a journey (eg different mixes of modes)
- alternative routes
- park-and-ride facilities
- timetables and fares for PT
- comparative trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles)
- detours/delays
- trip time
- weather
- parking availability and costs.

Marks (2008) highlighted that information needs varied depending on the trip purpose and mode choice (eg PT users could want timetable information whereas drivers could want alternative route information) and travellers' characteristics (see the demographics section of this report for further information).

Travellers could also want to obtain information at different segments along a journey and there could be different information needs at each of these – for example:

- *Pre-trip:* Drivers could need information to plan their routes and determine an appropriate departure time. Early access to this information made it more likely that drivers could choose to take an alternative route or change transport modes (Su and Jones 2006). For public transport (PT) users, information prior to a trip would assist with planning future trips.
- *En-route:* Substantial work has been carried out internationally exploring the effect of VMS on travel behaviour (see Ton 2005 or Su and Jones 2006 for examples of good practice). For PT users, information arrival times whilst waiting at a station or stop could be desired.
- *In-vehicle:* Information provided to drivers whilst travelling (eg via smartphone) could influence their choice of route. For PT users, information on the next stop to be reached and the expected time of arrival was important.

Such travel information could be provided via a range of methods. The review showed it was important to ensure a range of information provision modes was utilised to suit the needs of all travellers and all journey types. The most common modes of travel information provision cited in international research[4] included the following (from Marks 2008):

- printed on paper (eg timetables, maps)
- printed on a sign (eg at a stop)
- voice announcements (eg at a station)
- telephone (voice interaction or a live person)
- talking to a public transport staff member
- variable message signs (VMS)
- internet, website or smart phone application
- wireless handheld device (eg mobile phone, PDA or laptop)
- in-vehicle via radio, satellite navigation system or SMS.

Further information regarding which information provision mode types were preferred by different travellers, and the modes that achieved the greatest penetration into the community, are provided in the respective sections below.

3.4.3 Freight drivers

Veneziano et al (2010, p11) characterised freight operations as being driven by 'efficient routing of goods in transit, ensuring timely delivery'. The authors suggested that for the freight industry, users' requirements of travel information include:

- pre-trip information to assist in route choice that may be affected by factors such as roadworks, location of rest areas and inspection facilities
- in-trip information for updates on local road conditions that might cause delays.

The US Department of Transportation (Booz Allen Hamilton 2010) 'White paper' suggested that knowledge of severe weather or areas that were heavily congested could help commercial drivers decide when to take their breaks, so as to efficiently use the hours they were allowed to drive. For this type of information to be useful there would need to be some form of prediction of traffic flows and weather patterns.

The 'Transport for Christchurch' website that was set up after the Christchurch earthquakes provides information on weight-restricted areas.

4 Research in the New Zealand environment is required to understand if there are any location-specific differences that might alter the preferred mode of information. For example, the high costs of mobile phone calls in New Zealand means that people text more in this country than in the US.

3.4.4 Long-distance commuters

A recent newspaper item (Pearson 2012) suggested that large numbers of people in New Zealand may be regularly commuting long distances by air from regional areas to Wellington. Given that there is a shortage of work in regional areas and high housing prices in the main centres, it is likely that people are also driving long commuter distances. Whilst no research was found on the needs of this group, it is likely that they would benefit from information on ridesharing, and road conditions over greater distances.

3.4.5 Local rural travellers

Veneziano et al (2010) characterised local rural travellers as motorists whose trip was over small distances in rural areas. They suggested that these users could require information such as planned road closures and incidents, weather, and requirements for the use of chains. The authors suggested that these users would be less interested in route planning, as they were more likely to be aware of different route/mode options.

3.4.6 International travellers/tourists

Zografos et al (2010) surveyed 25 existing internet-based journey planners from several European countries, Japan and China, to ascertain the major features and capabilities of these existing services. Travellers' information needs were separated out based on the segment of a journey. The authors focused on international travellers, whose information needs were slightly different to those covered by Marks (2008). For example:

- *Pre-trip:* International travellers needed detailed information and comprehensive planning information to help them self-navigate, especially during transfers. Of the services currently available, the inability to book online constituted a major limitation. Information on multiday passes for PT, where to buy tickets and what kinds of payments are accepted would also be useful.
- *During trip:* International travellers required an appropriate level of information to manage any transport disruption. At the time of their research there was a lack of information available for real-time replanning, and this was a source of uncertainty for travellers. Wherever there was a transfer between modes, there were also increased navigation information needs. Crowdsource/PT information system expert, Dr Aaron Steinfeld, noted that this could be negatively impacted by a lack of data or the cost of the mobile phone plan in the visited country (pers comm, 2012).
- *Post-trip:* Ideally, personalised information regarding, for example car services and local taxi information, should be available once an international traveller's destination was reached.

Zografos et al (2010) also surveyed 50 travellers from Europe and China, as well as experts in journey-planning systems, to explore which features were valued in these systems and how satisfied participants were with the current level of information provision.

They found that the following information types rated as highly preferred but with low satisfaction (and were therefore identified as areas of priority for future information provision):

- customised detailed description of the parts of the itinerary covering foreign countries
- online journey booking
- timely notification for managing any disruption of the selected itinerary, before beginning the journey.

The use of travel information at seasonal tourist destinations to manage transport demand has received attention. The US Federal Highway Administration (FHWA) web report *Managing demand through travel information services* (undated) provided the example of Acadia National Park in Maine. Real-time bus departure signs, on-board bus announcements and real-time parking information message boards had been implemented and a 2002 survey found that two-thirds of people said the information provision helped them decide to catch the bus. Furthermore, the real-time parking information allowed one-third of visitors to change the time of their trip, and a further third to change their destination, reducing excess parking problems at two of the Park's most popular destinations.

3.4.7 Civil Defence emergencies/planned evacuations

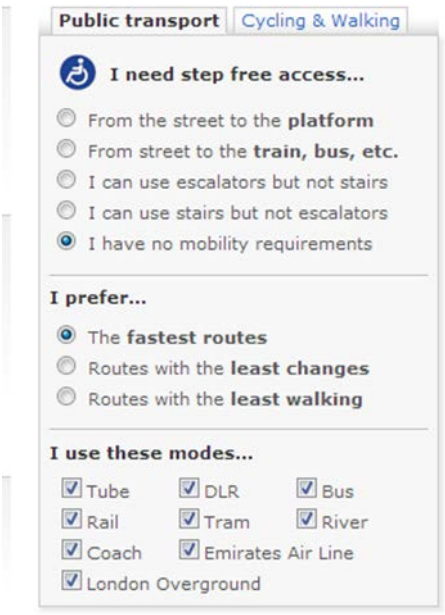
The US FHWA web report *Managing demand through travel information services* (undated) noted that travel information systems that provided pre- and in-trip information could also assist during developing emergency events, such as hurricanes and other planned evacuations. Information that had been provided in the US included shelter locations, alternative evacuation routes, congestion reports, incident information, petrol stations and accommodation. Their use during unforeseen catastrophic events, such as during the September 11 terrorist attacks in New York, was also documented – alternative routes, transit service disruptions, disaster recovery information, and safety information. For lessons learned in New Zealand on unforeseen events, see section 2.11.5 on the Canterbury earthquakes.

3.4.8 People with different abilities and minority groups

The review found that is important to ensure the travel information provided via information services meets the needs of both those with different abilities (eg physical disability) and minority groups (Marks 2008; Steinfeld et al 2011; Lyons et al 2007). Marks (2008) recommended integrating disability information (eg services for passengers with disabilities, such as wheelchair-accessible buses and facilities) into the types of travel information provided to PT users.

An example of this is the Transport for London (TfL) journey planner, which allows users to select mobility information (see figure 3.1 following).

Figure 3.1 Transport for London journey planner (Source: http://journeyplanner.tfl.gov.uk/user/XSLT_TRIP_REQUEST2?language=en)



Steinfeld et al (2011) reported how this had been achieved in the development and deployment of 'Tiramisu', a system that predicts the arrival time of buses in Pittsburgh, Pennsylvania (the deployment now also includes Syracuse and Brooklyn in New York) via the acquisition of crowdsourced information.

Tiramisu was designed with the aim of fostering a greater sense of community between PT users and bus service providers, while fulfilling the top information priority identified by PT users in the area: knowing the actual arrival time of buses. The system had the secondary benefit of providing a convenient platform to report problems and/or positive experiences, as well as other critical data such as the fullness of buses. With regard to the fullness of the buses, Tiramisu was specifically designed to support the provision of information needs for passengers with disabilities, to allow these customers greater independent mobility around the community (ibid). The Tiramisu system reported on four levels of vehicle fullness: empty; seats available; standing room only; or full. The date, time and user location were recorded automatically when the post was made, and additional text description or a picture could be added to provide evidence. A field trial prior to its implementation showed that this system was both feasible and viable (ibid).

Lyons et al's 2007 research found that a key issue in the literature on the topic of travel information provision to date was 'meeting significant minority information needs' (piii). They found that although there was a tendency to distinguish between information that was 'nice to have' and 'essential', this separation was not straightforward, as information needs varied between travellers. For example, they found that providing information on PT end-legs and interchanges had previously been found to be 'nice to have', but not 'essential' for the majority. Therefore, if information needs were prioritised at the aggregate population level, significant minorities of travellers could be disadvantaged. The cost–benefit–risk–reward of providing additional information, whilst considering the needs of minority travellers, would need to be considered when making decisions regarding the level and types of information that would be shared via available services.

All of the above information is summarised in table 3.1, along with an example website (note that the example website might not have all of the featured information needs).

Table 3.1 Summary of potential information needs, by user type

User	Potential information wanted	Example website
Urban commuters	• Ability to compare different modes/option to mix modes • Availability of alternative routes • Where park-and-ride facilities are and how they can link with other modes • Parking availability and cost • Timetables and fares for PT • Trip time • Comparative trip times for different times and days (with km travelled and fuel consumption data for private vehicles) • Detours/delays • Weather	www.transportdirect.info/Web2/JourneyPlanning/JourneyPlannerInput.aspx?cacheparam=0)
Long-distance commuters	• Ridesharing options • PT alternatives • Parking availability and cost	www.transportdirect.info/Web2/JourneyPlanning/FindTrunkInput.aspx

User	Potential information wanted	Example website
Local rural travellers	• Planned road closures • Incidents • Weather • Requirements for chains	Googlemaps.co.nz with transport layer
Tourists/ international travellers	• Visual information to help orient them within the environment • Directions to, and how to use, alternative transport modes • Directions to parking places • Knowledge of what to visit and what is the easiest way to get there • Other needs as for new users (below)	www.transportdirect.info/Web2/JourneyPlanning/FindFlightInput.aspx
New users versus experienced users	*New users* • What type of mode options there are, including cost and time for alternative modes and advice on how to use each mode – eg where to catch a bus and when the destination is reached) • How to link up different segments of the trip – eg where they can park and ride, where to catch PT, PT timetables and maps, where to transfer, where it is safe to walk, and where there are cycle routes *Experienced users* • Notifications when something has changed – eg a traffic delay ahead, a road is closed, the bus is running late, or there is a broken lift or detour.	www.tfl.gov.uk/gettingaround/default.aspx www.tfl.gov.uk/tickets/default.aspx www.tfl.gov.uk/
People with different abilities	Whilst this group varies greatly in their information needs, some identified needs are as follows: • Information relating to mobility – eg broken lifts/escalators, walking information • Assistance to identify the correct bus and exit stop NB: All NZ government websites must adhere to NZ Government Web Standards 2.0 Web Content Accessibility Guidelines 2.0 (level AA), which provide guidance to help remove many accessibility barriers from websites for people with different impairments	Googlemaps.co.nz http://journeyplanner.tfl.gov.uk/user/XSLT_TRIP_REQUEST2?language=en http://webtoolkit.govt.nz/standards/nzgws-2
Freight	*Pre-trip* • Route-planning information • Roadworks • Location of rest areas and inspection facilities • Locations that have height or weight restrictions *In-trip* • Updates on conditions that might cause delays and re-routing information re weather/incidents/congestion • Accurate projected travel time information	http://freightplanner.tfl.gov.uk/user/freightJourneyPlanner.php Also see the section of this report on Civil Defence emergencies

User	Potential information wanted	Example website
Civil Defence emergencies/ planned evacuations	• Location of shelters • Evacuation routes, and alternative routes • Congestion • Incident information • Petrol stations and lodging • Road closures	www.transportforchristchurch.govt.nz/ Developed after the Christchurch earthquakes – provides real-time information re road closures & restrictions, has a zoomable map & can show commercial vehicle information eg weight restrictions.

3.5 Demographics and travel information usage

Research by Farag and Lyons (2008) provided insights into the relationship between demographics and use of travel information. The individuals who participated in their research all had a default source of travel information that they used for most trips:

- the internet was the source most regularly used (except for people who were over 60 years of age)
- phone inquiry lines were unpopular across all age groups
- older travellers preferred face-to-face interactions with staff
- younger travellers preferred to look up the information online.

Evidence for demographics affecting transport mode choice was also apparent, with younger participants preferring PT and older participants preferring alternatives such as private transport.

Cluett et al (2003) conducted a series of 12 workshops in the US with the aim of exploring customer preferences for transit Advanced Traveller Information Systems (ATIS). Screening criteria for participants were developed to ensure a balance of participant characteristics (including age, gender, PT dependency and frequency of PT use). This allowed the researchers to explore the effects of participant characteristics and a number of contextual factors (eg exposure to a particular PT environment) on information preferences. The researchers developed a number of hypotheses related to this, based on previous research findings, including the following:

- Younger people and those with higher incomes will be more comfortable with new technologies such as computers, mobile phones, wireless communication devices and the internet. Younger workshop participants will express a greater preference for these high-tech approaches to travel information provision than older participants.
- Frequent users of PT may want less information, particularly for familiar trips, than infrequent users of PT.
- Participants who have and use communication devices (eg smartphones) will be most likely to want to receive travel information via them.
- Comfort with technology is expected to relate to a preference for the provision of high-tech information services.

- Attitudes towards PT use and the availability of good information is expected to relate to the amount and frequency of the desired information.
- Attitudes towards preferred modes of receiving information (eg via the internet versus paper-based) should relate to preferences for modes of receiving travel information.

The following demographic effects were found (Cluett et al 2003):

- Males were generally more comfortable using high-tech devices, were more easily annoyed if travel was delayed, and were less likely to report relying on published timetables. Males also indicated a higher interest in more types of real-time information than females.
- The age of the passenger had an effect on what was preferred. Older passengers relied more on printed material and static signs. Middle-aged participants preferred the internet and valued real-time information whilst en route. Younger people were more likely to use and value information provided via mobile devices at all stages of the trip.
- Participants with a higher education expressed a preference for accessing travel information via the internet and by video or kiosks. Those who had completed high school or a trade school preferred using trip-planning services, and required information on alternative routes and the locations of the closest stops/stations on their routes.
- Frequency of PT use effects were explored in relation to the types of pre-trip, station/stop and on-board information that was preferred:
  - *Pre-trip information:* The information needs of mid- and high-frequency PT users were lower than for non- and infrequent users. All user groups were interested in all types of real-time pre-trip information: non- and mid-frequent users wanted to access this information via a computer or the telephone; infrequent users wanted it via a computer; and high-frequency users were less specific (eg expressed interest in receiving information via telephone, face-to-face, computer and wireless device).
  - *Station/stop information:* Both non- and high-frequency users generally preferred information via message signs and announcements, rather than video terminals.
  - *On-board information:* Non- and infrequent users reported more dependence on timetables, route maps and other static, paper-based or signage information. Non- and high frequency users had the greatest desire for real-time information whilst on board.
- Vehicle availability was related to preferred information delivery method: participants with more access to a vehicle preferred information via a computer, wireless device, VMS and video; those without access to a vehicle preferred traditional information delivery modes (eg telephone, face-to-face, announcements, printed information).

Thus the research showed it was important to ensure information was provided via a range of modes to ensure the preferences of all travellers were met (Lyons et al 2007; Marks 2008).

3.6 Barriers to the use of transport information systems

New forms of PT information services based on the widespread use of the internet and mobile phones (particularly smartphones) have been designed to enable travellers to make better-informed travel choices.

However, the research to date has shown that a number of factors have affected the use and uptake of these modes.[5]

Assuming that there was a potential acceptable alternative way to make a trip, lack of awareness of available services was a commonly cited barrier to the use of travel information (eg Farag and Lyons 2008; Lyons et al 2007; Marks 2008; Zhang et al 2010; Pathan et al 2011). Awareness of services, particularly newer, real-time services, was influenced by individual characteristics. For example, Farag and Lyons (2008) cited evidence that those in Britain who were from a younger age group, with a professional occupation, who had internet access and currently used PT were more likely to be aware of the availability of such services than others. Access to information could also be affected by issues such as lack of access and/or knowledge of use of technologies and being in 'black spots'. The FHWA web report *Managing demand through travel information services* (undated) emphasised the need to provide a marketing campaign to increase public awareness of travel information provision.

To further explore barriers to usage, Farag and Lyons (2008) conducted a study investigating influencing factors for pre-trip use of PT information services (via the internet, phone, paper timetables and asking staff members). This research adopted a social–psychological model that took into account habit, attitudes, anticipated emotions and perceived behavioural control, and involved face-to-face in-depth interviews with 12 participants and six focus groups. Participants in the research included car drivers and PT users.

The Extended Model of Goal-directed Behaviour (EMGB) was adopted by Farag and Lyons (2008). This model has its roots in the Theory of Planned Behaviour and assumes that behaviours are selected because of their usefulness in achieving a goal, therefore providing new insights that can contribute to a better understanding of the barriers to information use. In line with this theory, they found that attitudes toward, and false perceptions of, PT did have an effect on the use of PT information. A person's goals when travelling (eg minimising travel time versus minimising the expense) also had an effect on whether or not travel information was accessed.

A review of over 100 articles of international literature on travel information research conducted by Lyons et al (2007) revealed further barriers to the uptake of travel information services. For example, they found that the 'cost' of becoming better informed was significant, and improving the amount of information available increased this cost (eg the time required to consider available information and make an informed decision). Therefore, it was important to be tactical in the types and amount of information provided, rather than simply increase the amount of information available.

They also found that where information provided differed from personal experience, travellers could rely on personal experience over the conflicting official information and therefore habitual behaviour could inhibit the seeking of new information. However, Guo (2011) found the opposite effect, where travellers in London trusted the Tube map more than their own personal experience.

Xu et al (2010) conducted research that aimed to understand why travellers would either accept or refuse information, and to explain, predict and increase travellers' acceptance of information.

5 This was the best available information available at the time of this research. More up-to-date research on these technologies is required to understand whether the identified barriers are still relevant today.

The research framework was based on the Technology Acceptance Model (TAM), which is an adaptation of the Theory of Reasoned Action and was developed to establish the relationship between the:

- intention to accept travel information
- trust in travel information
- perceived usefulness of travel information
- perceived ease of its use
- other related variables.

Structural Equation Modelling (SEM) was used to examine and analyse the relationships among these variables (based on a survey of 247 people at petrol stations in China). The TAM method was also used in the Tiramisu pilot mentioned earlier.

Xu et al's results showed that the following factors significantly determined travellers' intention to accept travel information, in order of level of effect:

- the perceived ease of use of the information and information attributes
- trust in the information
- its perceived usefulness.

Lastly, Kandarpa et al (2010) noted that in the US, the National Transportation Safety Board (NTSB) had discouraged the use of phone systems (such as 511.org) for provision of information in trucks due to concerns about driver distraction.

3.7 Ridesharing

Information needs were also found to vary depending on the goal of the service being developed or provided. For example, Amey et al (2011) conducted a review that aimed to identify, highlight and discuss potential benefits and obstacles to real-time ridesharing and to identify steps to improve understanding and advance this form of travel in the future. They found that very nature of real-time ridesharing created a number of barriers to its widespread use, and adequate information provision of the types of information travellers wanted to know was key to overcoming these.

They defined real-time ridesharing as follows:

> *... a single, or recurring rideshare trip with no fixed schedule, organised on a one-time basis, with matching of participants occurring as little as a few minutes before departure, or as far in advance as the evening before a trip is scheduled to take place* (Amey et al 2011, p104).

The underlying technological requirements for such ridesharing usually included smartphones, constant network connectivity, Global Positioning System (GPS) functionality, a ride-matching algorithm and a data repository, and could also incorporate features such as stored user profiles, social network integration, participant evaluation and incentives or loyalty rewards (Amey et al 2011).

They identified the following barriers to the facilitation of such ridesharing:

- difficulties in identifying the rideshare partner
- high transaction costs in terms of time required to organise the arrangement, and picking up/dropping off passengers
- 'stranger danger', or concerns over sharing rides with strangers
- reliability of service
- flexibility in schedule
- consistency in expectations concerning vehicle type and behaviour.

These barriers indicated the types of information required or desired by participants in order to facilitate such ridesharing. At a basic level, enough information on both parties was required for ease of identification. However, both parties would ideally need access to additional information about each other to reduce concerns such as 'stranger danger' (eg driving and criminal history). This desired level of information could be provided and achieved through integration with user profiles, where participants could rate each other and provide such background information. This type of improved information provision could increase the attractiveness of this form of travel and therefore its uptake (Amey et al 2011).

Burris and Winn (2006) noted a phenomenon called 'slugging' (or impromptu carpooling among strangers) that was occurring in some cities. This was a method of travel that allowed the use of carpooling lanes, but without forming traditional carpools – the would-be 'slugger' would stand next to a carpooling lane, sometimes indicating where they wanted to travel to. While slugging had some of the same barriers as ridesharing, the benefit was that it required less organisation time. Burris and Winn revealed that sluggers in Houston, Texas were more likely to be on a commute trip, be making more trips per week, be aged between 25 and 34, and have professional/managerial or administrative/clerical occupations. However, having an annual household income of US$25,000–$35,000 significantly reduced the likelihood of engaging in this activity.

3.8 Data quality/opportunities

The research showed that to maximise usage of travel information systems, it was important that the information provided was of high quality. Zhang et al (2010) noted that some reviews of integrated travel information systems had not shown the expected benefits after their development and implementation, and suggested this may have been due to a lack of information quality (in terms of availability, level of detail and accuracy/timeliness). To ensure credibility, information had to be accurate, reliable and dynamic (eg updated in real time) (Marks 2008).

Pathan et al (2011) found that once a decision had been made to acquire travel information, the choice of source depended on both its accessibility and its credibility, the individuals' awareness of the source, and its characteristics. They found that government-owned sources and multimodal sites generally had the highest level of perceived credibility. Where an information source was not regarded as credible, travellers would try to gather information from additional sources. Factors affecting perceived credibility included past experience with the source, ownership of the source, and the presence of advertising and/or irrelevant information.

Information could either be crowdsourced or obtained through official means. Where information was crowdsourced (as was the case with Tiramisu), there were different data-quality issues than when information was from official sources. Steinfeld et al (2011) noted that when crowdsourced data was used in transport information services there was a risk of both information abuse and/or a low motivation to participate. One strategy to overcome information abuse would be to filter out data that conflicted with information from other users or fare counts – for example, this could prevent people over-reporting on the fullness of buses in order to avoid crowding (ibid). To increase the motivation to participate, contributions from PT users could be encouraged by using social media techniques from other contexts (eg points, rankings).

However, Steinfeld et al 2011 found that simply encouraging increased participation was not adequate for routes with low ridership (eg rural routes), and additional technology would be required to provide the same level of service to passengers using routes with varying levels of popularity. One low-cost alternative they suggested was the use of a mobile phone mounted on the dashboard of PT vehicles. The mobile phone could use a simple tracker application to report the location of the vehicle to a central server, and this information could be fed back to PT users.

Barbeau et al (2011) found that providing information to specific users was a growing area, and documented a demonstration project that was designed to provide personalised alerts to individuals' mobile phones, based on their real-time location and past travel history. The authors recommended that people should be able to customise the number and type of alerts they received, to ensure they only got information that was relevant to them – an important feature in busy areas. A number of places (eg Wellington Metlink) now provide this service.

3.9 Willingness to pay for transport information systems

People's willingness to pay for travel information had received limited attention. Where research had been conducted, it had generally been found that willingness to pay was low, which could have been due to the free nature of the internet creating expectations that information received via this medium will not come at a personal financial cost (Lyons et al 2007). For example, Khattak et al (2003) found that callers would be willing to pay only 25 cents per call for a customised telephone service. Zhang and Levinson (2006) found that car drivers would be willing to pay up to only $1 per trip for pre-trip travel-time information. A Swedish study (Dziekan and Kottenhoff 2007) found that travellers were willing to pay between 5% and 20% of a journey ticket price for at-stop real-time information displays for PT. However, the TCRP 91 paper (Schweiger 2011) also suggested that if people did pay for information, they would expect the data quality to be higher.

3.10 Travel information that is available in New Zealand

As in other countries, a significant amount of data is collected in New Zealand for purposes such as monitoring traffic flows or identifying services that are running late, and this could be used to help commuters make informed decisions. The Transport Agency allows developers and companies verified access to highway data via InfoConnect, which they can repackage into appropriate information channels for the travelling public. Road travel information in New Zealand is currently provided by:

- NZ Transport Agency Highway Information

- AA Roadwatch
- New Zealand Travel Planner
- local authorities (eg Auckland Transport, Wellington City Council and CityLink).

The following information that is currently provided in New Zealand includes:

- webcams showing real-time traffic flows.
- VMS and travel-time displays indicating driving information and time to destination from selected locations
- online incident maps
- online traffic-flow maps
- carparking maps
- journey planners showing different routes and estimated travel times for buses
- planned roadworks
- rideshare websites (a Google search returned 15 different websites)
- alerts
- ferry and airport schedules.

Passenger transport information is provided by regional councils, with many councils having websites and some providing Facebook and Twitter feeds for information. The range of information provided includes:

- a journey planner (with many including walking maps linking the rider's start address and the closest bus stop, and the closest bus stop to their end destination
- timetables and maps
- ticket and fare information
- live service updates/real-time information.

3.10.1 User feedback on information provision in New Zealand

A quick survey of the ratings of these New Zealand applications showed some preferences regarding application features. Positive ratings included the following:

- *WelliBus:* "Makes catching the bus a breeze, I like the map function" (5 stars).
- *Auckland Transit:* "I tend to travel a lot of the same routes in and around Auckland so it's a helluvalot easier and quicker to get to the timetables and info I need using this app rather than having to constantly load up information on a webpage. Simple enough for even techno idiots like me to use" (5 stars).

- *MetroInfo:* "Thanks dude. This latest update has fixed the timetable, new routes and balance $ problems from before. I totally rely on this app, specifically the GPS, to navigate chch pathetic PT system. Well done" (4 stars).

However, lack of real-time information, or claims of providing real-time information that were not substantiated, were identified as issues for users:

- *WelliBus:* "This app works really well for bus schedules but the real-time features bear no relation to reality" (3 stars).
- *Multicam Wellington:* "Very disappointed I purchased this app. If it was a free app wouldn't have mattered, but it's absolutely no good for what I bought it for. Checking Wellington cameras at 7am shows them either pointing at the ground, images from 11pm last night, 2am in the morning or not working at all and just a black screen. Not entirely the developers' fault and the concept is good, but should be free because it is useless. Don't waste your money" (1 star).

In addition, some users found that applications were not updated regularly enough, didn't have the level of information they wanted, or had glitches that weren't addressed in updates, as highlighted in the examples below:

- *MetroInfo:* "The worst app I have ever bought!!! Timetables are available and it still shows old routes that are no longer running (18 has now been replaced by 17 but no 17 in the list of routes). Do not buy this" (1 star).
- *Auckland Transit:* "Why can't this app do what the maxx website does. If I want to get from point a to point b it gives me a blow-by-blow rundown of how far I have to walk, to which stop, which buses I need to take and the cost of the bus as well as the expected eta. It seems all this information is available, it just not being utilised effectively" (1 star).
- *Auckland Transit:* "From the get-go this app doesn't work. So try and find your nearest stop. Little blue icon. No data. No number. No link to move the process on. This app fails from the start" (1 star).

Only a small number of application ratings were reviewed, so conclusions based on this data should be taken with care. However, they do provide some context regarding what New Zealand is currently doing well and where there may be room for improvement.

The following tables provide a summary of current information provision, broken down by location of the main centres.

Table 3.2 PT providers

Organisation & city	Services provided	Journey planner	Timetables & maps	Ticket & fare information	Live service updates/real-time information	Twitter (as at 4 Feb 2013)	Mobile site/app	Alert subscriptions
Metlink Wellington (www.metlink.org.nz)	Buses, trains & ferries	✓	✓	✓	✓	@metlinkwgtn • 2652 followers • 4670 tweets • Daily updates on services • Replies to passenger complaints • Comments • Retweets • TranzMetro service updates	m.metlink.org.nz All features of the website + 'take me home' – select your home stop and it uses your current location to list the next services to your house	
TranzMetro Wellington (www.tranzmetro.co.nz)	Trains	✓	✓	✓	✓	@TranzMetro • 1325 followers • 4417 tweets • Daily updates on services	Uses m.metlink.org.nz	Free SMS & email alerts if services >15min late
Auckland Transport PT (www.maxx.co.nz)	Buses, trains & ferries	✓	✓	✓	✓	@AklTransport • 2524 followers • 2443 tweets • Doesn't appear to do regular service updates	• AT PT app • Free • Plan journeys, maps, live departure info for buses	

Organisation & city	Services provided	Journey planner	Timetables & maps	Ticket & fare information	Live service updates/real-time information	Twitter (as at 4 Feb 2013)	Mobile site/app	Alert subscriptions
Waikato Regional Council (www.busit.co.nz/)	Buses	✓	✓	✓	Service updates but no real-time information	@ourwaikato • 399 followers • 512 tweets • Covers all Council activities, but buses mentioned quite a bit	Busit.co.nz/mobile	Website provides service updates
Otago Regional Council (www.orc.govt.nz/Information-and-Services/Buses/Bus-Information/)	Buses		✓	✓			Can download bus timetables onto mobile	
Environment Canterbury (www.metroinfo.co.nz)	Buses in Christchurch and Timaru	✓	✓	✓	✓	@metrochch • 152 followers • 155 tweets	m.metroinfo.co.nz	Text alert for detours

Table 3.3 Road travel

Organisation	Coverage	Web cams	Incident maps	Traffic flow maps	Car parking maps	Journey planner	Planned roadworks	Alerts	Other
AA Roadwatch (www.maps.aa.co.nz/traffic/roadwatch)	Nationwide	✓	✓	✓		✓	✓	Via text or in-car GPS	• Also has airport & ferry schedules • Can dial *222 to report incidents
NZ Transport Agency Highway Information (www.nzta.govt.nz/traffic/current-conditions/highway-info/index.html)	Nationwide	✓	✓	✓					
New Zealand Travel Planner (www.travelplanner.co.nz/)									
Auckland Transport (www.aucklandtransport.govt.nz)	Auckland	✓	✓	✓	✓	✓ (PT only)	✓		
CityLink (www.citylink.co.nz/citylink-experience/webcams)	Wellington	✓							
Wellington City Council (www.wellington.govt.nz)	Wellington						✓		
MET Service	Auckland, Hamilton, Wellington, Christchurch, Dunedin	✓							✓weather
Transport for Christchurch www.transportforchristchurch.govt.nz/	Christchurch	✓	✓	✓	✓		✓		
www.nztraffic.com/index.html	Auckland, Tauranga, Central North Island, Wellington, Christchurch, Dunedin	✓							

Table 3.4 Smartphone applications

Area	Name	Mode	Developer	Cost	Features	Rating	iPhone (i), Android (A)
Wellington	WelliBus	Bus	Tmro Limited	Free	Find stops nearby or search for stops/routes	11 ratings, 3☆ average	i
Wellington	MultiCam Wellington	Traffic webcams	Denis Stanton	$1.99	Traffic webcams for road commuters	13 ratings, 1.5☆ average	i
Wellington	Wellington Airport Flight Info	Air	Inov8	Free	Real-time flight information	No ratings	i, A
Auckland	Auckland Transit	Bus, train & ferry	Tmro Limited	$0.99	Real-time departure info, traffic cameras, powered by Google Transit	5 ratings, 3☆ average	i
Auckland	MultiCam Plus Auckland	Traffic webcams	Denis Stanton	$2.99	Traffic webcams for road commuters & traffic flow maps	No ratings	i
Auckland	AT PT		Auckland Transport	Free	Journey planner, real-time information for buses, maps	No ratings	i, A
Christchurch	MetroInfo	Bus	Orsome Travel	$1.29	Real-time bus information. Find closest stops/browse all stops and save favourites	75 ratings, 4☆ average	i, A
Dunedin	Dunedin Bus Timetable	Bus	IFAILK Programming	Free	Timetable including next five buses departing at selected stop	No ratings	A

Note: There are a number of apps for Auckland and Wellington that show traffic cameras and bus/train timetables:

- no ratings suggesting they aren't very good or popular
- cost $0.99–$2.99
- almost identical apps available on Google Play for Android phones.

3.10.2 Wellington – lessons learned and future plans

Alice Wills Johnson (team leader of Marketing and Information for Metlink, Wellington's PT provider) was interviewed by phone in December 2012 regarding Metlink's lessons learned and future plans. The key points from that interview were as follows:

- Metlink had recently upgraded their mobile website to provide tailored real-time information for commuters, and intended to disestablish their text message service as demand for this had subsequently decreased.
- After research into the pros and cons of different types of social media, they had started using Twitter to provide service updates. This was updated by call centre staff and required a commitment of staff time.
- They had started rolling out QR[6] codes to provide real-time information at bus stops throughout the inner city. A PT promotion had been planned for March 2013 and they were investigating ways to use YouTube, and also to promote the use of their Twitter account for service updates.

3.10.3 Christchurch – lessons learned and future plans

Darryl Gay and Clair Nicholls from Environment Canterbury were interviewed by phone in December 2012 regarding Environment Canterbury's PT information provision lessons. The key points from that interview were as follows:

- The most-used information source was the Metro Info website. Users' priorities were real-time information; information on timetables and journey planning; and top-ups to their metro cards.
- Information needed to be provided in a variety of formats, as there was a generational split in preferred medium: 12–35-year-olds wanted information from websites and social media, whereas older users would only use the call centre. The call centre proved to be a vital information channel during the Christchurch earthquake sequence, as it continued to work when the website could not be updated. (However, it was down during a snow event, as the operators could not get in to work.)
- Environment Canterbury had introduced Quick Response (QR bar) codes at 2000 bus stops. These could be scanned with smartphones to find the next bus that would stop at that bus stop.
- A mobile website that could be accessed by a user's smartphone had been introduced, for checking real-time information and their metro-card balance.
- Facebook and Twitter were being used to communicate about changes in the bus system, particularly the detours needed because of the current rebuilding efforts throughout the city. Facebook was being used for two-way communication, whereas Twitter was being used purely to supply information. Because Facebook is open to more public criticism, there was a need to monitor the site and remove posts that breached the rules of engagement, and to respond to criticism/answer questions. At the time of this interview they had 2284 users and the posts were being checked 3–5 times per night, as well as regularly during the day, as it was important to address criticism quickly.

6 QR (Quick Response) codes can be scanned by smartphones, which then direct the user to a webpage with information specific to that code. Users need to download a free application to their smartphones.

- Environment Canterbury was working closely with the Foundation for the Blind on a number of projects, including:
  - a smartphone application called 'on the bus', which would allow the user to select information tailored towards their specific needs (eg impaired mobility, vision, hearing) – initially being developed for Android phones, though could be rolled out to iPhones at a later date.
  - large-format timetables
  - timetables that could be accessed by computer readers.
- The initiative to provide a 'one-stop-shop' information source had been delayed by the Christchurch earthquakes and was still not being progressed.

3.10.4 Christchurch earthquakes and snow events – lessons learnt[7]

Following the 22 February 2011 Christchurch earthquake, the Environment Canterbury internal servers went down and could not be accessed. This meant the Metro Info website was accessible to users, but no information on the website could be changed. Environment Canterbury had to quickly make changes to allow their website to be remotely updated. Improvements included upgrading their journey planner and moving to a 'cloud' virtual server, which would provide further robustness to the website during emergency/unplanned events. Other lessons learned included the following:

- When routes were changing daily for a number of months after the February 2011 earthquakes, Environment Canterbury provided people to communicate the changes and direct people to the right bus at two roadside areas that acted as temporary bus interchanges for all routes.
- When the central bus exchange was no longer accessible after the earthquakes, the PA system that announced bus arrivals was also lost. The current temporary outdoor bus exchange could not support a PA system to make announcements and some passengers with limited sight had reported difficulty in locating their buses. This issue had been difficult to address, but had been helped in part by the provision of people to help passengers at main interchanges.
- When using social media to alert users of changes (eg if buses would be operating), it was important to let users know if a decision had not yet been made, and to indicate a time when a decision would be made. The Environment Canterbury staff recommended that once a time for a decision had been announced, it was important to follow through with a decision by that time (or preferably 10 minutes prior to that time) – they recommended providing information before people asked for it. They had built in the ability to access the Metro Info website remotely so that routes could be updated, as well as a critical alert that would freeze a user's screen so that the user must read update information prior to accessing the site.

7 D Gay and C Nicholls (Environment Canterbury), pers comm, December 2012.

3.11 International examples of travel information provision

3.11.1 Journey planners

There was a wealth of research available on this topic.

Zografos et al (2010) conducted a survey of 25 internet-based journey planners from eight European countries, plus China and Japan, investigating their main features and capabilities. They found that half of these planners provided information on only one mode of transport. They split the multimodal planners into two categories:

- those that provided PT solutions by a variety of modes
- those that provided private-car information in addition to PT options, to enable car owners to make informed decisions about whether to drive or not.

The key features of the journey planners were as follows:

- They included information on fares.
- The information was provided in different languages.
- They enabled an accurate calculation of trip time by using the en-route time and by minimising the number of transfers or walk time.
- They included real-time information such as traffic condition updates and forecasts for urban buses, and in the case of the Japanese Yahoo Route Selection, the operational status of bus, rail and air transport.
- The journey planners in the UK, Finland, Germany, Denmark, Greece and the Netherlands often allowed two-way communication via text messaging. Italy, Spain, China and Japan did not have any form of text messaging.
- Information kiosks/terminals were less used in countries with comprehensive mobile communications and more used in China, though the authors reported that this was changing rapidly with expanding access to mobile communications.
- Telephone call centres were available in over half the systems and were seen as essential for people who did not have access (or did not use) the internet and/or mobile technologies.

Schweiger (2011) conducted a synthesis of best practice for the use of mobile device technology for real-time transit information and found that users wanted a single application to compare modes – they did not want an application for each piece of information (eg car parking, bus, train, subway, walking and wayfinding.)

In 2001, the US Department of Transportation Federal Communications Commission designated 511 as the single traffic information telephone number, to be made available to states and local jurisdictions across the country. Since then a number of 511 sites had been set up across the country to provide travel information.

The site 511.org in the Bay Area in California provided comprehensive one-stop phone and web information on traffic, ridesharing and cycling. The I-95 Corridor project in the US provided 511 information using the following media:

- *Pre-trip:* Phone and web services
- *In-trip:* Travel times on VMS in Maine, Vermont, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida.

Kandarpa et al (2010) identified the lack of national standards for provision of real-time information in the US as an issue that had led to each 511 implementation being different, which required users to adjust as they moved from one jurisdiction to another.

In a web-based search of other international information providers, we found that social media, especially Twitter, was being widely used overseas to provide timely information to commuters. Transport for London (TfL), Washington DC's Metropolitan Transit Authority (WMATA), New York City's Metropolitan Transportation Authority (MTA), and Sydney Buses in Australia all had Twitter accounts where regular service updates were posted and commuters could ask questions or post feedback and/or complaints. TfL had separate accounts for each underground line so that commuters could subscribe to or follow the feed for the line(s) they wanted to catch, rather than scroll through every update. These accounts were used extensively during the 2012 London Olympics to update commuters about delays and disruptions on different lines. Twitter was also used heavily in the US by WMATA and MTA during Hurricane Sandy in late October 2012, to provide information on line and station closures and disruptions. Updates were also provided in Spanish for Hispanic commuters.

The websites of the organisations above largely provided the same information as PT providers in New Zealand – ie journey planners, timetables and maps, ticket and fare information, and service information. Mobile websites and smartphone applications (developed by transport providers and 'unofficial' developers) were also widely available to provide the same information to commuters.

In order to access service updates whilst commuting, passengers need access to the internet. WiFi (Wireless Internet) was increasingly being installed by international PT operators. Hong Kong's MTR has had WiFi since 2004 and at the time of this research it was available at 42 stations;[8] TfL had WiFi at 70 stations, although it was still not available in underground tunnels.[9] In Sydney, mobile phone reception coverage had been extended to cover rail tunnels in the city centre.[10]

3.11.2 Developer and crowdsourcing applications

There were many developer and crowdsourcing applications available internationally. For example, the navigation system TomTom could provide information that evaluated routes based on actual traffic speeds as opposed to speed limits, and provided information on route time based on the time of day of the travel.[11] Japan had an in-vehicle communication system (VICS) that could provide information on

8 www.mtr.com.hk/eng/getting_around/wifi.html

9 www.tfl.gov.uk/corporate/projectsandschemes/23939.aspx

10 www.transport.nsw.gov.au/media-releases/new-mobile-phone-coverage-sydney-rail-tunnels

11 http://iphone.appstorm.net/roundups/lifestyle-roundups/80-terrific-travel-apps-for-summer-vacation/

congestion, road restrictions, incidents and parking, and also provided toll collection.[12] The rapid development of apps and their uptake by smartphone users suggests that not all information provision need be done via a public agency. It may be possible to further encourage the development of applications that an agency would like.

To give an understanding of the wide range of third-party applications for providing transport information that are becoming available, the 31 third-party applications that are described on the 511.org SF Bay website (www.511.org/apps-3rd-party-apps.asp) are given in the following table.

Table 3.5 Developer and crowdsourcing applications described on the 511.org SF Bay website (www.511.org/apps-3rd-party-apps.asp)

Name	Developer	Main use/feature
Transit applications		
BayTripper	Civil Systems @ UC Berkeley	Real-time and scheduled transit trip planning for variety of San Francisco-based transit options including MUNI, BART, Caltrain and ferries. Also includes bike routing and taxi information.
Droid Muni	Jeffrey Yasskin	Provides real-time Muni travel information. Gives closest-stop information by default.
iCommute SF	AppTight, Inc.	Provides real-time arrival information for nearest PT stations.
iNap	Moop.Me	Provides alerts when nearing a preselected station or stop.
LateBARTalert	Andrew Hyder	Provides alerts via text message when a pre-selected BART train is running behind schedule.
Muni Alerts	Ross McFarland	Provides San Fransisco Muni bus and train schedules, allowing the user to bookmark routes and stops. Also provides arrival predictions and alerts.
Path2Go	Civil Systems @ UC Berkeley	Provides free real-time travel information to either a mobile phone or web browser.
RailBandit	RAILBANDIT LLC	Provides train schedules and service alerts.
Routesy Bay Area	Super Slim	Provides real-time transit information for MUNI, BART, Caltrain and AC Transit.
StopAlertPro	Patel I & R Services	Provides audio-visual alerts when nearing a preselected destination.
TransiCast	Sunset App Studio	Provides real-time PT information, including stops, routes and next-bus or train times.
Transitly	Liquid Mongoose	Provides personalised real-time PT departure times. Automatically saves the most used routes and displays them on the front page of the application.
Transporter	Transporter	A real-time transit trip planner than allows users to view upcoming stops and arrival times.
Traffic applications		
Beat the Traffic	Unknown	Provides information about incidents, traffic speeds, cameras and traffic forecasts.

12 www.itsinternational.com/categories/travel-information-weather/features/uk-government-to-investigate-best-practice-for-travel-information/

Name	Developer	Main use/feature
Best Parking	BestParking.com	Locates and directs drivers towards the cheapest and most convenient parking garages and lots in 42 cities and 79 airports.
California Traffic Report	Calit2	Provides commute times based on current traffic conditions, traffic speeds and congestions. Also provides traffic maps.
Gas Buddy	GasBuddy.com	Helps users find the best fuel prices closest to their location, including directions from their current location.
Inrix	Inrix, Inc.	Provides real-time alerts, traffic forecasting and incident information along a preselected route.
Park Circa	Park Circa, Inc.	Assists neighbours with coordinating and sharing parking. Users list their own parking space while it is not in use.
SFPark	SFMTA	Provides parking availability and pricing information in San Francisco, for a preselected neighbourhood or area.
SigAlert	Sigalert.com	Provides real-time road speeds, traffic reports and roadside traffic camera data.
Take me to my Car	Anres group	Allows users to mark their parking spot on arrival and then provides directions back to this preselected spot from any later location.
Rideshare applications		
Avego	Avego Inc.	Provides real-time carpool matches for departures within as little as 10 minutes.
Carticipate	Carticipate, Inc.	Provides real-time carpool matches for departures within as little as 10 minutes.
RiderBee	RiderBee, Inc.	Facilitates one-time carpooling trips and includes safety and reliability features.
Bicycling applications		
CycleTracks	San Francisco County Transportation Authority	Provides bicycle trip tracking.
iBikeChallenge	Mopimp Productions	Records the user's bike trips, tracking miles and calories burned. Also tracks petrol money saved and pollution prevented.
Go Green applications		
CommuteGreener	Volvo	Tracks the user's trips and carbon footprint. Users can challenge each other.
iSmog	511 Contra Costa	Provides air quality forecasts based on a preselected air basin.
Spare the Air	Bay Area Air Quality Management District	Provides alerts, air quality forecasts, tools and podcasts.
Miscellaneous applications		
Bay Bridge Explorer	PB Project Viz	Allows the user to experience the New Bay Bridge at first hand, showing future changes.

Crowdsourcing refers to the process of harnessing the skills of on-line communities or organisations that are prepared to volunteer their time contributing content or skills and/or solving problems – it is a rapidly

growing area. The company Waze provides a free smartphone application that utilises real-time road information derived from other drivers' information. Velaga et al (2012) used crowdsourcing to demonstrate a rural PT phone application that can give real-time bus arrival information for people living in rural areas without the use of an expensive bus-tracking system. See also section 3.4.8 of this report for information on the development of the Tiramisu crowdsourcing application for PT.

Given the wide range of information that is provided both nationally and internationally, for the next stages of this project it was important to determine which of the following information the Transport Agency's users would use/like:

- all available modes for a journey/options to complete a journey (eg different mix of modes)
- alternative routes
- park-and-ride facilities
- timetables and fares for PT
- how to use PT
- comparison of trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles)
- detours/delays
- trip time
- weather
- parking availability
- rest area locations.

4 Summary of literature and best-practice review findings

The research revealed that whilst there had been a great deal of international research on single-mode travel information provision, there was less guidance on multimodal information provision. The following table is summary of the findings of best practice for how to offer and promote the delivery of multimodal travel information.

Table 4.1 Summary of best-practice information provision documents

Best-practice recommendation	Evidence	Reference
System must be robust in an emergency – this includes allowing changes/updates to be made remotely.	Lessons learned from the Christchurch earthquakes and snow events.	See section 2.11.5 of this report
Information must be accurate, timely, quick *and* easy to access.	Real-time information must be reliable for users to trust (and use) the system.	Kandarpa et al 2010
	If information is not accurate and timely, users will lose confidence in the system and stop using it.	FHWA 2004
	Passenger information websites should be user-friendly, accessible, consistent and current.[a]	Currie & Gook 2009
	Website information must be quick, easy to access, reliable and have extensive coverage of major roads and modes.	Marks 2008
	Consistency in message across multiple sources is important to maximise the probability of mode shift.	Pathan et al 2011
	Road closure information is the key information sought by inter-urban travellers around state highways (80% of information requests).	D Hills, NZ Transport Agency, pers comm, 2012
	Ensuring printed materials such as maps and timetables are user-friendly can have an impact on customer satisfaction and influence ridership levels even more than personal experience.	Cain & Lavelle 2010; Guo 2011
	Lack of awareness is a major reason that travellers do not access available travel information.	Farag & Lyons 2008; Marks 2008; Pathan et al 2011

Best-practice recommendation	Evidence	Reference
Real-time, location-specific information should be implemented where affordable. This is the most valuable information to users, as shown by its influence on travellers' behaviour.	In the US trucking industry, dynamic routing around traffic incidents reduces the amount of time lost from non-recurring congestion, which is estimated to cause 40–60% of lost productivity.	Kandarpa 2010
	When people in Birmingham were asked about what measures would get people to take PT instead of a private car, at-stop real-time information was the most important measure mentioned, as it had the benefit of a perceived reduction of waiting time.	Dziekan & Kottenhoff 2007
	Whilst waiting at a station or stop, real-time information (eg actual arrival times, delays, and/or location of the vehicle that is being waited on) is generally preferred over any other form of information.	Cluett et al 2003
Integrated planners are more valued than single-mode journey planners.	The Washington, DC travel planner RideGuide found that 70% of respondents said the website helped them make a PT trip they would have otherwise made by car.	FHWA web report (undated) *Managing demand through travel information services*
	36% of those who responded to a 2004 survey of people who had used the Bay Area (California) 511 travel information service said they had changed their travel plans as a result of the information (traffic 59%, PT 39%, carpool or vanpool 2%, and bicycling <1%). 92% were satisfied with the service.	FHWA web report (undated) *Managing demand through travel information services*
	Users need to be able to compare alternative routes/modes without having to use different applications or areas within one application – eg they don't want to go into one part of a website and look up bus information and to another part for car travel; if they enter 'car journey' they want to find out about parking information from the same page.	Schweiger 2011
	Multimodal planners generally have higher credibility among the public than single-mode planners.	Pathan et al 2011
All information should be easy to understand and 'speak the user's language', using common terms for locations, directions and landmarks. Users should not have to guess what terms mean.	Developed from Jakob Nielsen's *Ten usability heuristics for interface design*.	Nielsen 1995
	42% of people who frequently use PT do not know the exact name of the origin and destination of their frequently used stops – recommends use of 'points of interest' fields and clear visibility of PT lines, straight route layouts and good labelling to help people remember information.	Dziekan 2008
Information should be targeted at two different levels – novices and the experienced	Most behavioural change will result in a minor alteration to a trip, such as route or time change, rather than a modal shift.	US DOT; Cats et al 2011
	A lack of 'landmark knowledge' can be supplemented with landmark information eg users in Hong Kong use visual aids, in the forms of photos of bus stops; others use specific links to existing visual resources, such as Google Street View.	UITP 2003

Best-practice recommendation	Evidence	Reference
	'Notification information' is critical to all users, including experienced users – events that warrant notification can also create the most frustration in existing members, because of their expectations.	Higgins et al 1999
Information should be provided in at least two different formats – tech savvy and non-tech savvy	Non-tech savvy will still require a telephone call centre capability.	Zografos et al 2010; Marks 2008
	Complementary visual resources, beyond tailored journey alternatives information, can increase opportunities to travel by other modes.	Zhang & Stopher 2011
	Internet-based information provision services are generally preferred, and enhancing these should receive top priority.	Khattak et al 2008; Cluett et al 2003
Having people sign up for updates for specific routes provides a powerful way to communicate with users directly when there is a change needed at short notice	Bus agencies in the US were very positive about the ability to push out dynamic schedule changes at short notice; they noted increases in the number of people joining the Twitter feed when two large-scale disruptive events affected transport in Pittsburgh – the 2009 G20 meeting and a week of major snowstorms in February 2010.	Steinfeld et al 2011

a) For further information on aesthetic qualities for design of information (such as fonts, colour etc, see Currie and Gook 2010; Schaller 2002, and for static maps and paper information see TCRP report 45 (Higgins et al 1999). In addition, all government websites must adhere to New Zealand Government Web Standards 2.0 Web Content Accessibility Guidelines 2.0 (level AA). These provide guidance to help remove many accessibility barriers from websites for people with different abilities.

4.1 Conclusions of literature and best-practice review

This review confirmed that the provision of multimodal information could result in some behavioural change. It also identified the following factors that have an influence on the success of information provision in changing/modifying behaviour:

- There is a need for a clear understanding of the user's requirements, which will vary by person, number of mode options available to make a trip, trip purpose, and experience in making the particular trip. For this project, we investigated novice versus experts in making a trip, urban commuters, freight transporters, rural commuters, Civil Defence emergency situations, tourists and minority groups.
- Information must be accurate, timely, quick and easy to access, and use terminology that users understand.
- Real-time information can provide the user with benefits in terms of reducing lost productivity from waiting in congestion and reducing perceived wait times for PT.
- Group demographics affect the likely uptake of information. Experience both nationally and internationally suggests there is a need for information to be provided in a number of formats to make it accessible to the wider population, with older people preferring more traditional information sources (eg in person, on paper and by telephone) and younger people preferring information in digital formats. However, it should be noted that as knowledge of and access to technologies is rapidly evolving, the focus of this report was restricted to users' information needs rather than technological solutions.
- Barriers to mode shift include lack of competitive service alternative; lack of awareness of services; negative attitudes towards PT; concerns over ridesharing, cycling and walking; and differing levels of access to technologies.
- Previous research has highlighted the importance of information being of high quality in terms of availability, level of detail and accuracy. Experience after the Canterbury earthquakes and snow events reinforced the importance of being able to remotely access/change information on websites as events unfold.
- Research suggests that there is a low willingness to pay for travel information.
- In New Zealand, travel information is generally separated by roading network information and PT information. This means that users have to access a number of sites to, for example, find information that provides a comparison between PT options and private car travel. The exception relates to comparing information regarding various PT modes (eg bus versus train versus ferry) – this information is available where multiple PT modes are available in a city or region. Information provision that allows comparison between private car journeys and multimodal PT journeys should be an area of priority in developing information provision services in New Zealand in the future.

Stage 2 Focus groups

5 Focus groups introduction

The aims of this stage of this research project were to establish:

- a baseline measure of existing knowledge and satisfaction with the information provision currently on offer, the importance of different data qualities (eg data accuracy, timeliness and ease of use), and initial user perceptions of different information media and the likelihood of using them in the future (eg social media, telephone, in-person information)
- a preliminary set of information requirements, broken down by potential user groups – including the different information needs in an emergency situation (earthquake, tsunami, snow event) and the protocols/procedures that need to be agreed ahead of time so that the required information from the appropriate agencies can be provided swiftly
- the ability to shortlist and identify key elements for a quantitative survey in stage 3 of this research project.

This stage utilised focus groups and structured interviews (both from New Zealand and internationally) to examine key travel information needs and to conduct a practical assessment of the usefulness for the New Zealand context of the various delivery systems.

Four focus groups were convened in Auckland, Wellington, Christchurch and Masterton. Auckland, Wellington and Christchurch were selected as these were areas likely to gain the most benefit from improved travel information, being the three largest cities in New Zealand. In addition, these cities were seen as having the most options for multimodal travel: Auckland and Wellington have rail, ferry and bus services; Christchurch has a bus and a ferry service; and all three cities have some cycle infrastructure.[13] Masterton was selected in order to provide a comparison with a rural area that has some ability for route change/mode shift. A summary of the four locations is provided in the table following.

13 It is important to note that transport and life in Christchurch has been severely impacted by a series of earthquakes, the first of which was in September 2010. The disruption includes impacts on the roading network and the bus system, which has had to continually adjust during repairs to the city's infrastructure, building construction and deconstruction, as well as changes in where the population lives and works.

Table 5.1 Focus group locations

Location	Estimated population (region)	Notes	PT options
Christchurch	558,800[a]	Affected by earthquakes in 2010 and 2011	Bus and one ferry
Auckland	1,507,700[b]	New Zealand's largest metropolitan centre	Rail, bus and ferries
Wellington	490,100[b]	Capital of New Zealand	Rail, bus and ferries
Masterton	Urban population of 19,900[d] District population of 23,100	100km north-east of Wellington, largest town in the Wairarapa, a geographical region that is separated from metropolitan Wellington by the Rimutaka ranges.	Rail – 3 peak-time services and 2 off-peak services to/from Wellington on weekdays, a late-night service on a Friday night, and 2 off-peak services at weekends Bus – Limited bus services. Off-peak only within Masterton and peak between Masterton and Featherston

a) Region population estimate of 2012 from http://monitorauckland.arc.govt.nz/our-community/population/estimated-population-counts.cfm (as on 7 January 2013)

b) Region population estimate of 2012 from http://monitorauckland.arc.govt.nz/our-community/population/estimated-population-counts.cfm

c) Region population estimate of 2012 from http://monitorauckland.arc.govt.nz/our-community/population/estimated-population-counts.cfm

d) Population estimate from June 2008 http://www.cityofmasterton.co.nz/

Participants were recruited via notices at the following places: the Ministry of Social Development's online notice board; bus depots; driver licence testing stations; Masterton Community Centre; Masterton District Council notice board; Masterton Road Safety Council; community boards in supermarkets, libraries and museums; and emailed to the Road Transport Forum and National Road Carriers, Opus employees and other organisations. Participants were screened to ensure a mix of mode use and trip type, and to get a mixture of age groups, occupations and genders.

Table 5.2 Summary of focus groups

Location	Date of focus group	Number of participants	Age range of participants
Christchurch	7 February, 2013	5 males 4 females	18–49
Auckland	13 February, 2013	5 males 5 females	19–52
Wellington	14 February, 2013	4 males 4 females	18–66
Masterton	18 February, 2013	6 males 3 females	32–66
Total		**26**	

The groups were held in the evening and lasted approximately two hours. Participants were given a gift voucher for attending and refreshments were provided. Facilitators followed a script (see appendix A for the full script) and encouraged open discussion throughout each meeting. The questions were generally

formulated to be broad, inviting participants to respond according to however they understood the question and trying not to presuppose any prior knowledge of the subject. Each group was limited to between 8 and 10 participants, to optimise interactions within the group.

The focus groups were run in two parts. The first part sought to identify the information that participants currently used when making trips and the sources of this information, along with information needs that were not currently being met.

In the second part, participants used/viewed a number of websites and applications to facilitate brainstorming of what types of information they would find useful. The websites detailed in table 3.3 were selected to cover the potential information needs that were identified in the literature and best-practice review.[14]

Table 5.3 Summary of the websites chosen

Organisation name	Purpose
Auckland Transport (www.maxx.co.nz)	• The local passenger transport website/smartphone app for Auckland
Metlink (www.metlink.org.nz)	• The local passenger transport/smartphone app for Wellington. Also covers the Wairarapa region (eg Masterton)
Metroinfo (www.metroinfo.co.nz)	• The local passenger transport website for Christchurch
Transport Direct (www.transportdirect.info/web2/staticnoprint.aspx?abandon=true&id=_web2_about_aboutus)	• Provides door-to-door information that allows the user to compare car journeys with PT in Britain, including predicted traffic levels at different times of the day; estimated cost of a car journey; CO_2 emissions for a car/PT for a journey • Allows for selection of options (eg for cycling, the user can select routes that have only lit roads, cycle lanes and avoid steep hills). • Allows use of PDAs and mobile phones to find out departure and arrival times for railway stations throughout Britain and for some bus or coach stops • Calculate CO2 emissions for a car or PT for a specified journey
Transport for London – Freight Planner (http://freightplanner.tfl.gov.uk/user/login.php)	• Allows detailed planning of freight trips
511.org (http://tripplanner.transit.511.org)	• San Francisco/Bay Area travel planner that allows for comparisons of different trip options and for seeing what difference altering the start of the journey would make to the overall journey • Shows real-time congestion
Congestion over Thanksgiving (http://people.virginia.edu/~seb4v/TG/Thanksgiving.html)	• Static maps show historical congestion trends for the state highways for a holiday weekend over half-hourly increments
Tiramisu (https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8)	• Crowdsourcing phone application for use on PT • Has real-time arrival information and voice-over capabilities • Can let other users know when a bus is not stopping/is full
London Bus Mapper (www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu)	• Short video clip from 'Frackalicious' showing the London Bus Mapper phone app • Facilitates finding buses and routes in London • Can provide multiple options from A to B, and estimated travel times

14 See appendix C for more detail on the demonstration features.

Organisation name	Purpose
Waze (http://www.waze.com/)	• Short video clip of a crowdsourcing phone app that is targeted at car users – a community-based traffic and navigation app with community-edited maps • Allows sharing of real-time traffic and road info (eg alerts re police, accidents, road hazards, traffic jams) • Allows user to see where friends are travelling, or to navigate to the cheapest petrol station on the route

The information was shown to the focus group participants via two laptop computers. Tiramisu was also demonstrated, using a tablet. Participants were asked to perform a task on the site and to identify information that they thought would be useful to them and that they might use, as well as information that they would not find useful or that they perceived as being unnecessary.

Finally, participants were asked to rate the likelihood of them using the different types of information for each of the potential information needs identified in the literature/best-practice review. They were also asked to add information that they would like to use to this list.

6 Results from the focus groups

6.1 Christchurch focus group

6.1.1 Participant demographics

Nine participants (5 males, 4 females), ranging in age from 18 to 49 years, took part in this focus group. They reported their main mode of transport as follows:

- motorcycle (2) – both reported using a car in poor weather or at the weekend for family trips
- motor scooter (1)
- modified car (1) for a person in a wheelchair
- work car (2) – both drove as part of their jobs, one within Christchurch, the other to various places around the country (one also cycled regularly)
- car (1) – but also cycled sometimes
- car mostly, but sometimes bus (2) – one used a car when in Christchurch but used PT when travelling outside Christchurch; the other regularly caught the bus up until the Christchurch earthquakes, but couldn't currently use it for most trips because of post-earthquake bus route changes.

All participants had Facebook accounts. They reported that their use of social media had increased since the Christchurch earthquakes. Approximately half the participants had a smartphone.

6.1.2 Where do you currently get information from?

The participants had a low level of knowledge of existing travel information services. Many of them expressed frustration at not being able to find the information they needed. In particular, many thought the existing provision of information was not updated regularly enough, particularly regarding temporary road closures and roadworks. Only one participant had heard of the Transport for Christchurch website (www.transportforchristchurch.govt.nz/) but had not visited it.

The participants used a limited range of sources to get travel information. Google Maps was used by the majority. One participant used the Google search engine to find the information they wanted. One said it depended on the trip they were taking, but if it involved going over to the West Coast they would check the Transport Agency website to see if Arthur's Pass was open. On other trips they would check the weather forecast. The motorcyclists and cyclists also reported checking the weather each day before deciding whether to travel by motorcycle, bicycle or car. Sources of information included the AA website, GPS navigation units, radio traffic reports, the Transport Agency website, the Transport Agency call centre, and roadside signs (both static and variable). When prompted, the group added friends/family/workmates to this list, both in person and through social media (eg Facebook).

One participant who had previously lived in the UK and France was frustrated at the lack of travel information available in New Zealand, particularly regarding temporary roadworks and bottlenecks. This had worsened with the increase in roadworks since the earthquakes, but it was emphasised that there had

already been problems prior to this. One participant commented that Google Maps was useful when travelling in Australia because he already knew how to use it, whereas a local website might have required time to learn how to use it.

Several participants commented that when the travel information they found was incorrect, they stopped using it:

> *"It needs to be updated, 'cos like I used to use the AA website quite regularly, but I don't bother now because I found it so far out of date. We used to travel to the West Coast just about every weekend and so we used to use it to check the road conditions and things. In the end we gave up because, you know, it would say the road had snow, and you'd ring up Springfield and they'd go 'it hasn't even snowed here', sort of thing."*

Participants' current sources of information are summarised in the table below.

Table 6.1 Summary of Christchurch participants' current sources of travel information

Source	Comment
Google Maps	The first source for several participants. Useful functions were 'Find directions', and Streetview to find out what the destination looked like. Google Maps was used on mobile phones, and also to compare trips by different modes (car versus PT) when they were outside of Christchurch.
Google search engine	Used to find weather-related road closures.
Signs	The 'big signs' (VMS) were popular, but a lot of the current road closure signs could not be read when driving (eg they displayed too much information).
Transport Agency website	Used to find state highway road closures.
Call centres	An 0800 number was used to find out about a state highway closure, but it was not useful as the operator had little local knowledge (eg did not know where State Highway 1 went, nor whether it was open or closed). The City Council was regularly used for information on when roads would be scheduled to be opened and closed for earthquake repairs.
AA website	Was not updated regularly enough so the participant had stopped using it.
GPS Navigation Units	Generally helpful, but would be better if they provided current information on real-time congestion or delays, as overseas. A US radar system that warns if there are roadworks with in the next 3–4km would be useful.
Radio traffic report	Not used much as congestion was not such a problem in Christchurch.
Family/friends/workmates	Immediately following the earthquakes, word-of-mouth and Facebook was very important for obtaining knowledge about which roads were open or closed.
Metro bus website	Having to download a PDF file to see the timetables was inconvenient. Used to find out how often buses were running or when the next bus left.

6.1.3 Examples of seeking transport information

Participants were asked to provide an example of a recent trip where they had sought transport-related information and it had made some difference to their trip. These are summarised below:

- During a Melbourne holiday with four people (two adults and two children), one participant used Google Maps to compare cost/travel time/convenience of taking a rental car with using PT for

different trips. The result was that for some trips they rented a car, while for other trips they used PT. The main deciding factor was the cost and availability of parking and the cost of the PT fares.[15]

- One participant reported travelling to Auckland for work and choosing accommodation based on transport routes. This participant used Google Maps to investigate the cost of accommodation at different locations if they used PT, compared with if they rented a car.
- During a holiday in the North Island, one participant used Google Maps images that they had printed, but these didn't have all the smaller streets, which made the map difficult to use, so they went to the AA for further information. They found this experience helpful as there was a friendly and competent employee who provided them with a free table of travel times and a map showing places that would be good to stop at (eg with toilets and interesting sights). Other participants said the usefulness of these places depended on the staff, and some had interacted with people who either were not interested or didn't seem to know very much.
- One participant reported using maps and GPS while travelling in Canada and the US. While the GPS allowed for easy navigation, the participant found that when they used only maps, their route changed because studying the maps allowed them to see attractions/areas of interest and re-route their trip to see them.

Participants were asked if their mode choice for their daily commute was predetermined, or if they chose it on a day-to-day basis based on circumstances. Most people had a default mode choice, although reported that this might change according to the following factors:

- *Weather:* One participant took a motorbike most days, but if it was wet (or forecast to rain) would use private vehicle instead, or the bus.
- *Schedule for day:* The participant who generally used a motorcycle for commuter trips would use a private vehicle if he had items to carry or people to pick up. Another said that if she knew she'd be working late, she would take the car as she did not want to walk home late at night, for safety reasons.
- *Wake-up time:* One participant said that if they woke up early they'd cycle, but if they slept in late they'd be in a hurry, so would then catch the bus.

6.1.4 Types of information that participants would be interested in receiving

Participants gave the following types of information they would be interested in receiving:

- *Temporary roadworks and closures:* Not having up-to-date information about roadworks was frustrating. Several had used either Google Maps or a GPS unit to map a route, only to find that they couldn't drive it due to road closures. One participant said a sign was erected on the street advising that the road would be closed for a certain period while work was undertaken, but the dates proved incorrect and several weeks later, the work had still not been done. One participant who travelled around the country for work said knowing where roadworks were in other regions would be useful to adjust travel-time estimates. The Transport Agency website was reported to list the location of some

15 Note: In some cities (eg Melbourne), Google only gives rail information and not bus information. It is therefore important to check the accuracy of the information provided on the site.

roadworks, but was not comprehensive. Locations of footpath and cycle path/lane closures was also suggested as being useful.

- *Road closures due to weather:* Accurate information on road closures on at-risk road (eg Lewis Pass) would be useful.
- *Real-time travel time information:* Travel-time information (eg as found on Google Maps) would be useful, but must be adjusted to reflect current traffic conditions and the presence of roadworks. The Auckland and Melbourne motorway travel-time VMS were useful, and would be useful in Christchurch. One participant liked the colour-coded Melbourne times, with the usual green numbers changing to red when there were delays:

  > *"We know that you can't go across the city in 15mins, like you could before – so what we need to know is the delay ... How long extra will it take to get there?"*

- *Identifying correct bus stops:* For PT it would be beneficial to know the side streets prior to your stop, to assist in identifying the correct stop.
- *Dynamically updated GPS units:* Some GPS units used overseas were constantly updated with the locations of incidents, roadworks or road closures – this would be useful in Christchurch.
- *Drop-off areas:* Information on where drivers could drop off passengers would be useful – particularly for mobility-impaired passengers who couldn't walk long distances, and especially around areas such as the hospital. Maps showing wheelchair/pram-friendly walking tracks would be helpful.
- *Parking availability:* Real-time parking information could be provided online. Although Christchurch had VMS around the CBD showing parking availability in the major parking buildings, these had not been in use since the earthquakes and a similar system for the suburban shopping areas/malls would be useful. While one participant wanted to know how many car parks were available before they left home, a majority of the participants preferred to know how many car parks there were in total and where they were located (they thought this option was more realistic).
- *Tourist options:* Google Maps could show a tourist route based on visiting attractions or experiencing the best scenery.
- *Radar detector signals:* Roadworks crews could broadcast signals that made radar detectors within 4–5km buzz, to notify drivers that they were approaching roadworks.
- *Free travel information sources:* Several sources of information are not available to people on a lower income, as they require an internet connection and computer, smartphone or GPS unit with subscription. The focus group participants stressed that it was important to provide information that is accessible for everyone, and an 0800 number for information was suggested.
- *Special event travel information*: One single site providing information for special event transport would be useful – special events often have extra bus services but it could be difficult to access information on the details.
- *Car parking information:* The location of car parks and their cost was very important.

Following the demonstrations of various travel information websites, the following issues were added:

- It would be useful to have a door-to-door journey planner that goes from one city to another, linking up each leg of the trip and allowing comparisons of different transport modes.
- Opinion was split on whether a CO_2/cost analysis would be useful/used.
- Information on the location of unlit roads would be especially useful for cyclists and for parking areas.
- Information regarding route types – eg there are two possible routes between Christchurch and Nelson, and tourists could benefit by knowing that one is used more for freight and one is more scenic.
- PT 'Take me home' facilities would be useful (eg directions to the nearest bus stop and the bus timetable there).
- Information regarding evacuation plans showing more than one way out of the city were very important and needed to be real-time. Businesses should have this information as part of their business compliance requirements.

6.1.5 Recommendations on the critical factors in the display of information

The participants identified the following factors as being critical:

- Information must be accurate. Participants said "*If you can't do it properly, don't do it.*"
- Services must be affordable.
- Real-time information is the most useful information.
- It is important to consider the size of data files that might be downloaded, as there is a cost implication – eg people do not want to download big files/apps onto their phones.
- A non-tech option is important, especially when it is necessary to look at multiple places for information – participants preferred information they could print out and carry with them.
- Information needs to be easy to use and should follow usual web conventions – eg Google Maps uses green and yellow, which people with poor vision and some forms of colour-blindness find hard to distinguish between; the colours used on the London A to Z website are easier for colour-blind people.

6.1.6 Barriers to the use of travel information

- Cost was mentioned as being a factor. One participant asked the group to vote on whether they would accept advertising on a website if it reduced the cost to the user, and all but one agreed. The participants thought a site like 511.org would be too expensive for Christchurch, particularly with respect to being able to calculate travel times for different time periods.
- In-trip information was not likely to be accessed by motorcyclists if accessing it meant they had to stop and take off their gloves and helmet. The issue of mobile phone use whilst driving was also raised.
- Lack of availability of an alternative route/time meant information was not useful for some trips – eg picking up children from school.

- Participants didn't want to have to look up lots of sites/different places to get different pieces of information.

6.2 Auckland focus group

6.2.1 Participant demographics

Ten participants (5 males, 5 females), ranging in age from 19 to 52 years, took part in this focus group. They reported their main mode of transport as follows:

- car (6) – five also used PT, four also cycled, and one also motorcycled regularly
- motorcycle (2) – one also sometimes travelled by car, and cycled recreationally
- work truck (1) (semi-trailer delivering bulk goods) – also motorcycled and drove a car at times (another participant had worked as a truck driver delivering quarry concrete/block work, but was currently between jobs)
- PT, often using park-and-ride facilities (1) – also used a car at times.

Participants reported using Facebook/social media, but not for travel information at the time of the focus groups. There was also a high level of smartphone use in this group.

6.2.2 Where do you currently get information from?

Participants named several sources they currently used for travel-related information. One participant noted radio stations as an information source, saying he listened in the morning and could find out if he would be late to work, which was beneficial as he could then let his workplace know ahead of time. However, he said this information had little influence on his travel behaviour, as he often only heard it while in the car, already on a chosen route. Another participant reported that if it was broadcast that traffic was bad, they would consider catching the bus rather than driving. One participant obtained information from the motorway travel time indicators – he also reported that while this information did not affect his travel behaviour, it was good to know:

> *"The one I've noticed recently is motorway travel time indicators, but there has never been anything drastic on them so I've never gone and changed my route or anything."*

A number of participants commented that these VMS signs were in places that left little option to change route (eg they were at locations where the driver was unable to exit the lane, or the next motorway exit was after the reported delay).

One participant reported that their workplace promoted the use of online real-time traffic cameras and had a link to these on their home page – all the staff used this and found it helpful for the journey after work.

> *"If you've got something specific that you have to get to you might look at that, or if you look out the window and you see [the road] getting a bit blocked (you can see from our work) or you hear on the radio, or on The Herald or breaking news and Stuff, straight away everyone gets online to see whether to travel or stay at work longer."*

The freight drivers also reported using these cameras and said this could result in re-routing their trucks:

> *"I know for our trucking firm and for the previous company I worked for that if one of us sees something happening on the motorway where something is blocking or traffic is backing up, we will call in the dispatcher and they will look on the cameras to see if they can see anything happening. If we see something we will call it in and get our rigs off that part of the motorway. Sometimes you will find us going through residential areas because we are on a timeline. I know quite a few of the drivers are like me. We all listen to the radio – if there is an accident we all start to divert our trucks out of the way to the point where on several occasions we have diverted them out west. All our rigs are based on the North Shore – if we're coming from Manukau, we might take the scenic route to get home."*

Participants did not generally use social media such as Facebook as a source of information relating to travel.

The different sources of information currently used by participants are summarised in the following table.

Table 6.2 Summary of Auckland participants' current sources of travel information

Source	Comment
Motorway travel-time indicators	These were informative but did not affect route choice, as placement was often after the point where a choice could be made
Online traffic cameras	Used by both commuters and freight operators (via their dispatcher)
Radio stations	Used by both commuters and freight operators. Participants found this information source very useful
Trucking firm – dispatch officer	The freight drivers generally have a set route, but sometimes they will re-route around a major incident
Family members	Family members advised on the best route to take
Automobile Association	Mentioned, but not used by the participants
NZ Transport Agency website	Consulted for long-distance and/or weekend trips, especially for information on the location of roadworks
MAXX (Auckland Transport PT website)	The journey planner and the ability to save favourite trips was useful, as well as the map-based interface to visualise the route spatially The real-time arrival information and information on the connections and interchanges were particularly helpful
Bus stops	Bus stops need to have essential information such as timetables. Real-time bus arrival time information was popular. Some stops provided a phone number to call for real-time bus information, but this service was too expensive

6.2.3 Examples of seeking transport information

Participants were asked to provide an example of a recent trip where they had sought transport-related information and it had made some difference to their trip. These are listed below:

- One participant successfully used the MAXX website, inputting a destination and time to get a full journey plan.

- One participant used the MAXX website to come into town on a Friday or Saturday night but the journey planner sometimes did not show all available bus services. They felt it was unhelpful to have to access individual bus company timetables for that information.
- Three participants who travelled by motorbike said they did not need congestion information because they could drive through to the front of the queue and therefore not get stuck in traffic.

6.2.4 Types of information that participants would be interested in receiving

Participants gave the following types of information or information sources they would be interested in:

- *A dedicated transport website:* This would be more useful than needing to use several different websites for each different aspect of travel. Should include travel times, roadworks, cancelled/delayed services.
- *Information on parking at train/bus stations*.
- *Real-time information on bus arrivals on infrequent local routes:* This was not important on the major routes because wait times were never more than 10–15 minutes, but on a smaller local route, buses might be an hour apart.
- *Ability to save a daily route and compare different travel options quickly:* People often don't have time to input the information each time as, in general, websites are usually consulted just before a journey.
- *A text service:* This would allow the user to send their destination and receive a reply text that provided road conditions and other information (similar to the Coast Guard text service).
- *A 'Get me home' service (like the one provided on the London bus mapper):* At the end of a night out, a person can use their mobile phone to obtain information on PT options from their current location to their home.
- *Price of different travel alternatives, including parking information.*
- *Location of cycle lanes/cycle infrastructure.*
- *Notification of events that might disrupt traffic.*

6.2.5 Recommendations on the critical factors in the display of information

The participants said the information displayed:

- must be real-time and accurate
- must not be distracting
- should include paper maps (or printable maps) for longer route planning.

6.2.6 Barriers to the use of travel information

- In-trip information could be a safety issue/distraction for car users.
- Cost was an issue if services used mobile phone data when getting in-trip information.

- The lack of an alternative route – eg over the Auckland Harbour Bridge.
- One participant noted that information provision would not solve Auckland's traffic problems and they would rather see new infrastructure than information provision (two participants wanted a rail link to the North Shore).

6.3 Wellington focus group

6.3.1 Participant demographics

Eight participants (4 males, 4 females), ranging in age from 18 to 66 years, took part in the focus group. Five of them had smartphones and six had Facebook profiles.

They reported their main mode of transport as follows:

- PT (2) – also used active modes of transport (eg walking and cycling) about 30% of the time; occasionally used private vehicles
- private motor vehicle (3) – also used PT regularly, or had recently changed from having PT as their main mode
- cycling (1) – around 70% of trips; also walked and occasionally used a private vehicle
- walking (2) – lived in the CBD; also used PT or private vehicle for occasional trips out of the city centre.

6.3.2 Where do you currently get information from?

In general, participants had quite a good knowledge of existing information sources, possibly because of their overall high use of PT. Participants stressed that factors such as the weather affected whether or not they accessed information – eg if it was raining they might seek information about PT availability instead of using an active transport mode.

All the participants had heard of Metlink and used the site regularly. The Journey Planner was particularly favoured, as well as the fare and ticket information. Participants also mentioned the Metlink text service and said that the texts were helpful and timely. They particularly liked the real-time displays at bus stops that provided information about how far away the next bus was.

One participant said they were generally in a hurry when they accessed information, so didn't look beyond that specific topic to the other types of information available from that source:

> *"I think from my perspective, 'cos I only really use the Journey Planner [on the Metlink website] … 'cos I'm going somewhere specific and I'm like, oh I've got to be there in 15 minutes, and that's it, that's all I want to know. I don't want to know the tweets, I don't want to know the news, I don't want Metlink to contact me – that's just me, that's my viewpoint. They provide a bus, I just want to know what bus to get. And I'm happy with that, I don't really want to engage more than that with Metlink. So while this [other information available] is good, I would never look at it to be honest. I'm never going to go past the Journey Planner."*

Participants said they used the information office at the railway station, and the timetable displays had improved greatly and were now a major information source.

A few participants reported using call centres to gather travel information. One participant said he had used the MAXX service when living in Auckland and found this to be an easy and helpful source of information. Two participants had used the Metlink call centre, usually when they were already out and no longer had access to the internet.

One participant regularly used Wise maps for directions; others used Google Maps, which they found very helpful. They particularly liked the 'Street View' option, which allowed them to view the actual building or area that they would be travelling to. One participant said this made finding unfamiliar places a lot easier, as they could immediately recognise the destination. They also used this site to obtain distance and travel-time information. One participant reported regularly using a navigation app on their mobile phone, which they found particularly helpful for finding places and buildings they had never been to before, including the venue for the focus group.

One participant said they had looked at NZ Transport Agency webcams to gather information about traffic congestion prior to leaving their home for a trip. One car driver regularly listened to the 'Breeze' radio station during commuter trips and altered the route when traffic reports indicated traffic congestion. Another participant said they only turned to the radio 'when things go wrong' (eg there was an accident or unexpected congestion and they wanted to know the source and expected delay).

One participant worked at a large government organisation and had access to email updates (through their security team) regarding major incidents such as road closures due to snow or flooding. These emails provided employees with information about optimal travel times for avoiding the issues, and then the information would be further spread through the workplace via word of mouth.

Participants used friends and family as a source of information only when they were holiday. One participant said they might ask a friend for directions to their house, but the general consensus was that people now expect you to be able to find your own way, and it's easier just to look on the internet yourself than try to follow someone else's directions. They said they would sometimes ask for information from strangers – eg asking people waiting at a bus stop whether their bus had already departed.

The Air New Zealand website was a good source of information about domestic travel.

One participant had visited the 'Let's carpool' website but was unwilling to sign up to it before being able to access further information about how it worked. Participants also mentioned the general barriers to carpooling, such as the lack of flexibility and the variability between people's preferred travel times. On the other hand, one participant had a friend who liked car pooling because it meant they did not end up staying late at work.

The sources of information used by participants are summarised in the table below.

Table 6.3 Summary of Wellington participants' current sources of travel information

Source	Comments
Metlink	Used regularly, especially the Journey Planner and fare and ticket information. The text service was useful
Information office at railway station	A useful source, especially the improved timetable displays
Wises maps	Used regularly by one participant
Google Maps	Favoured by most participants, especially the 'Street View' option, and for distance and travel-time information

Source	Comments
Navigation application on mobile phone	Particularly helpful for finding places and buildings they had never been to before
Webcams	NZTA webcams used to gather information about traffic congestion prior to leaving their home
Radio	Useful for avoiding traffic congestion and decreasing travel times
Workplace	One government organisation emailed employees regarding major incidents (eg road closures due to snow or flooding) and included information about optimal travel times
Friends/family	Used only when on holiday, or possibly for directions to a friend's house
Air New Zealand website	Useful for information about domestic travel
Signs	Favoured real-time displays at bus stops with information about the next bus, and the improved signage at the railway station
Call centres	Found to be an easy and helpful source of information, especially when already out and with no access to internet
Strangers	Occasionally used – eg asking people waiting at a bus stop whether their bus had already departed
'Let's carpool' website	Unpopular because users are required to sign up before they can access further information about how it works. General barriers to carpooling eg lack of flexibility, variability between peoples' preferred travel times – though a positive aspect in being unable to stay late at work

6.3.3 Examples of seeking transport information

Participants were asked to provide examples of a trip where they had changed their travel behaviour based on obtained information, or would have if they had obtained information.

They were generally most likely to change their travel decisions in holiday periods (eg delay leaving by a day to avoid congested traffic) or where they received information that a road was closed (eg cancel the trip or take an alternative route). One participant talked about a time when she was delayed by roadworks, but because it was a recreational trip at the weekend she wasn't too bothered by it:

> *"A few weeks ago I decided to go to Paraparaumu for the day and I hit these roadworks and the traffic was backed up, so I might have reconsidered going if I'd known that it was that backed up … [but] I was having quite a leisurely day so it didn't end up bothering me that much and once I got through that block it was fine."*

In general, participants had reservations about the use of crowdsourced information. They thought users would probably neglect to update information via applications that gathered information this way because they would believe someone else would do it.

> *"I think user-generated information … would be like really limited 'cos like we say we have good intentions and that we'd report an accident if we drove past one or whatever, but 9 times out of 10 we probably wouldn't. Because we're busy, or in a hurry, or I'm the only person in the car, or somebody else has probably done it, or … you know … we like to say that we have that community spirit but we don't …"*

"I mean, I don't want to be addicted to my phone. I don't want to sit [there] all day updating it."

They agreed that updating should be automatic, where an application would request permission to pull information at the time of being installed. Participants also stressed that any GPS functionality that shared their current location with other users should be a separate option, so users did not have to share this information if they didn't want to.

"I would want an option whether to share [GPS data] or not."

"I would just be very reluctant …"

"I don't like the logging GPS thing … I think it's going to eat up all my memory on my phone."

Some participants said they would be happy to share GPS information via applications, but raised several concerns such as battery power on phones; internet usage caps; how the data was stored; what kind of security system would be used to protect the data; and whether or not the police could access the data.

"You'd want to know … how that information was being stored, who was protecting that information and making sure that it wasn't trackable."

"I mean, there could be criminal issues in that. You know, the police would love that information!"

"I'm comfortable with information sharing as long as I know it's just statistics."

Another theme of concern for participants was the accuracy of data. One participant recounted issues he'd observed with VMS signs around the city providing inaccurate information, and said he would be sceptical that information provided would be any more responsive and accurate with the use of social media technologies.

"How often do we find that, you know, about 6 o'clock at night or something when coming up to Ngauranga Gorge and there's one of those big boards that says 'such and such a thing's happening, delays of up to an hour' and you don't even stop! … [but] if everybody knew exactly what was happening on the Ngauranga Gorge and told the people [in charge of the signs] it wouldn't make any difference. It's like teletext, it runs about three days behind."

6.3.4 Types of information that participants would be interested in receiving

The types of information that participants had accessed in the past were travel times; distance; amount of traffic on the road (ie congestion); cost; roadworks, PT availability and travel times, and provision for young children (for a plane trip).

The following types of information would be beneficial to them in the future:

- *Real-time congestion information due to roadworks and incidents:* Congestion information/mapping based on historical data, particularly around holiday periods, would be useful, and a recommended alternative route if possible.

- *Bus information:* Before travelling to the bus stop, it would be useful to be able to find out whether a particular bus was full. On the bus, a display showing the number of bus stops before the required stop, or a loudspeaker announcement of the name of each stop would be useful.
- *General information:* For example, 'unsafe' streets for people who are unfamiliar with an area; whether there are bike lanes (and the quality of these facilities); the presence of steep hills (for cyclists and walkers); and areas that are safe and easy to access in a tsunami.
- *Car parking information:* An application that provided optimum parking options based on a person's plans for the day would be very helpful, particularly for people visiting the city from out of town – should include the location, cost, availability and rules of use (eg coupon parking and early-bird parking). Participants said obtaining this information from the Council was difficult.
- *'Get me home' information:* At the end of a night out, a person can use their phone to obtain information on PT options from their current location to their home.

6.3.5 Recommendations on the critical factors in the display of information

Participants stressed that any information provided must be credible, accurate, reliable and free.

6.3.6 Barriers to the use of information

- While focus group participants believed that people have choice in what transport mode they use, they thought providing feedback on CO_2 emissions was unlikely to result in people changing mode. The risk–reward–benefit–cost in implementing any such information service should be considered.
- They said there was a general perception that park-and-ride facilities are dangerous and unsafe (ie there is a high possibility of one's car being broken into or stolen from car parks at bus or train stations). This would need to be addressed to improve park-and-ride uptake.

6.4 Masterton focus group

6.4.1 Participant demographics

Nine participants (3 females, 6 males), ranging in age from 32 to 66 years, took part in the focus group. Four participants had smartphones (although one never used theirs with an internet connection) and three had Facebook profiles.

They reported their main mode of transport as follows:

- walking to work (3) – one also cycled to work occasionally (all three also owned private vehicles that they used for transport at other times)
- cycling (1) – also walked for trips within town and used a car for holidays and longer trips
- truck drivers (2) – one drove trucks across the whole of New Zealand and the other covered the lower North Island (they biked or drove to work)
- car (3) – two also walked frequently and cycled occasionally, or occasionally used informal ridesharing arrangements for longer trips.

6.4.2 Knowledge of existing information provision

In general, participants did not have a detailed knowledge of existing sources of travel information. At the beginning of the focus group, the only type of information they said they would like to obtain was information on the location of roadworks. Freight drivers also reported obtaining information about congestion from the Transport Agency when travelling to major centres (eg Wellington or Auckland).

6.4.3 Where do you currently get information from?

In general, participants reported accessing only limited amounts of travel information, with the exception of during long-distance trips.

The VMS sign in Featherston, which noted whether the Rimutaka road was open, was very useful, and one of the freight drivers said he found these signs very useful when travelling in and around Auckland. Parking information signs in Wellington, which indicated whether there were spaces free in a particular parking building, were found to be very useful.

One freight driver used a GPS navigation system within their vehicle to plan routes, especially to avoid congestion in major centres (eg Auckland). One other participant used a GPS system for longer trips to unfamiliar locations.

The internet and the radio were both used to obtain information on weather conditions and the locations of road closures, especially during extreme weather events. The freight drivers in particular found this information useful for planning routes to reduce travel times – they also listened to the radio during trips for information on weather conditions. They could contact their dispatcher for travel information, but said they more often obtained information themselves via the above means. Information about major accidents came from the dispatcher and was then shared with other drivers. The freight drivers also used the dispatcher when they were lost, as the dispatcher had access to online maps and could redirect them back to a main route.

One participant reported using the Wairarapa bus system and using a printed timetable to plan departure and arrival times.

The Metlink website was used when planning trips to Wellington via the train and/or the Airport Flyer bus, and the use of the train in conjunction with the Airport Flyer service was preferred when travelling to Wellington airport.

Participants used the AA website at times, but more frequently visited an AA centre to obtain paper maps of unfamiliar towns/cities/areas. One participant also reported using printed maps in conjunction with cycle maps to explore new areas without getting lost.

The different sources of travel information they used are summarised in the table below.

Table 6.4 Summary of Masteron participants' current sources of travel information

Source	Comments
VMS signs	The Featherston sign reporting on whether the Rimutaka road was open was useful; also similar signs in and around Auckland, and parking information signs in Wellington
GPS (in car)	Used to plan routes, especially to avoid congestion in major centres (eg Auckland) or for longer trips to unfamiliar locations

Source	Comments
Radio	Generally used for information on road closures during extreme weather events, and for freight drivers, information about weather conditions
Internet	Used for information on weather conditions and the locations of road closures – especially useful for freight drivers to plan routes ahead of time, to reduce travel times
Dispatcher	Mainly used for information about major accidents; also when freight drivers were lost, as the dispatcher had access to online maps and could redirect them back to a main route
Printed timetables	The Wairarapa bus printed timetable was used to plan departure and arrival times
Metlink website	Used when planning trips to Wellington via the train or the Airport Flyer
Maps (printed)	Used when travelling to unfamiliar places
AA	Visited AA centre to obtain paper maps of unfamiliar towns/cities/areas, and the website for travel information

6.4.4 Information for freight drivers

The facilitator held a separate discussion with the two freight drivers, to obtain some more in-depth information. The following provides a summary of this discussion:

Q: Thinking of a typical trip you make … what do you deliver and where?

A: One of the drivers only covered the lower North Island; the other covered the whole of New Zealand. Cargo delivered was predominantly general goods, and some livestock (bees).

Q: How is your route planned?

A: The drivers were told the destination and they planned their own route to this destination. Trucks were GPS-tracked by the company. One of the trucks had a device installed that forced the driver to take their 10-hour break (ie the engine would not switch on during the required break time). Routes were planned around required breaks and other factors such as road closures; poor weather; and the cargo carried (eg when transporting bees it was not possible to take breaks in towns, so alternative places to stop, such as rest areas outside townships, had to be used).

Q: How much flexibility do you have in your route?

A: Drivers had complete flexibility in selection of their route, and would chose optimum routes to minimise travel times and avoid impediments such as road closures.

Q: What are your main information needs prior to and during a trip?

A: The main information required was the location of roadworks or road closures, and road conditions (eg snow, ice and high winds). This information was critical to accurately planning travel times and routes, and to manage client expectations. It was particularly important prior to a trip, as in parts of New Zealand the RT radio could lose reception. They obtained this information from radio stations; other drivers; the dispatcher; GPS (one driver); and the internet (mostly before the trip, or on arrival if necessary).

Q: How do information needs differ among the different freight types?

A: The only time their information needs varied was when transporting bees – then it was more important to access information about the weather, as ideally bees are only transported on overcast and colder days, to avoid them becoming agitated. Information about the location of rest areas outside towns was also important.

Q: What would make your trips easier?

A: A GPS system that had a truck setting would be extremely helpful when travelling to large cities and unfamiliar areas – it could be tailored to the specifications of the truck (eg width and height) and would provide travel routes based on these important characteristics. Drivers currently learn which roads they can and can't take from experience or through word of mouth, and it was reported that this could sometimes lead to an 'incident' (eg one driver had had to turn around after realising an overpass was too low to travel under, and there were stories of trucks getting stuck and/or livestock killed by low overpasses). Both freight drivers liked the VMS sign in Featherston (with information about road closures on the Rimutaka Hill) and thought that having a few more such signs in the area, or having moveable signs, could help them reduce travel times. Suggestions were made with regard to snow at Mount Bruce; flooding in Martinborough; the Rimutaka Hill being closed; and high winds at Mount Bruce/on the Rimutaka Hill.

6.4.5 Types of information that participants would be interested in receiving

Participants said they would find it beneficial in the future to access information on the following:

- *Real-time information on impediments*: Including the location of roadworks, accidents, delays, livestock and tractors
- *Tailored travel information:* To be based on truck specifications
- *Increased use of VMS signs:* Particularly providing information about road closures and high winds
- *Areas of road congestion:* Knowing the types of traffic on congested roads – eg logging activity could start with no warning and lead to rural roads congested with trucks – especially a safety issue for school buses.

6.4.6 Recommendations on the critical factors in the display of information

Participants agreed that information needs to be:

- accurate
- timely
- relevant to the user's journey (ie anything that could slow the traveller down, including mode of transport and location)
- customisable (eg people should be able to switch off information they are not interested in)
- displayed simply (ie only the essential information should be displayed).

One participant summed up the importance of information being easy to interpret as follows:

> *"If it takes more than five seconds to figure out, I'll just go somewhere else."*

6.4.7 Barriers to the use of information

The following barriers were identified:

- poor GPS accuracy (eg poor mapping/tracking accuracy and signal strength in rural areas)
- patchy mobile phone coverage in rural areas (eg Vodafone coverage could drop out in the Greytown area)
- lack of options and knowledge of options
- inability to tailor information to only include what you personally want (ie a person could get overwhelmed and give up).

Participants preferred the following information delivery modes:

- radio (for changing information or real-time information)
- text/application alert system (further information about this suggestion is provided below)
- paper-based information such as maps and timetables
- social media integration for younger users (eg use Twitter to send notifications to users automatically when an event happens that may be of interest to them)
- communications/dispatch systems for freight drivers and other professionals.

Participants agreed that some type of text system would be ideal in their area, as it wouldn't require a smartphone or an internet connection. Ideally, this system would allow the user to specify exactly what route and/or event they were interested in receiving alerts about – it was important that the system did not do anything unless the specified event(s) occurred. Such a system could work in conjunction with a radio in a private vehicle, with the mobile phone sending an automatic voice announcement to the radio via Bluetooth, so drivers did not have to look at their mobile phones.

> *"The way I sort of see all of this is that it's about having specific information delivered to specific users … about how to best deliver the most accurate information to people that actually need it … so if you have a route that you take to work each day, you could add [it] as a favourite route and then you could get an update on your phone if something's happening on that route … and you never hear anything until something happens … so you can forget about it 'til you … get an alert."*

> *"… yeah, so you can add favourites and only see something when something's happening. And you can even filter what you want to be updated for: congestion, accidents, road closures, and, you know, things like that."*

> *"So you just get a text message, like the Metservice for weather updates, except in this case it tells you that trains are late."*

It was also emphasised that information would need to be provided in a variety of formats to meet all users' needs.

> *"It's about having user-specific information delivered to the user in the most relevant way for that user."*

> *"I mean we're talking about a lot of internet-based user apps, but then there's people who'd prefer, you know, paper maps, or don't have a computer and internet … so it's about how to deliver information to all potential users."*

Participants generally thought the non-commuter train timetable to and from Wellington was poor, particularly at weekends. They also thought the fares were too high for the service to be competitive with using a private vehicle for recreational trips, or for business trips were carpooling was an option. While this was not a focus of the current study, participants stressed that if the service wasn't attractive, then information about the service was not desired or helpful.

6.5 Overall ratings of 'likelihood of use'

At the conclusion of each focus group, participants were asked to rate their 'likelihood of use' of different information types for different trip purposes, from 1 (not likely to use) to 5 (likely to use). Participants were also asked to add in any other types of information that they would like to use. Their average ratings have been included in the summary table following. It should be noted that as some participants did not make trips for all purposes (particularly freight), the sample sizes could be low. Findings are therefore indicative only and conclusions should not be drawn from the data.

Table 6.5 Summary of feedback on information needs (split by trip purpose)

Area of information	Av rating – likelihood of use	Details of information needed
Urban commuters		
Detours & delays	4.4	• Where and when cycle lanes and footpaths are closed (Christchurch) • The amount of traffic on the road (ie congestion), incidents, roadworks, road closures (all sites) • Congestion information/mapping based on historical data, particularly around holiday periods (eg Christmas and New Year) (Auckland) – including a recommended alternative route if possible (Wellington). Also could be useful for places like Piha and Taylors Mistake over busy periods (Christchurch) and the Martinborough Fair – however if everyone used the same alternative route or time, this could just shift the congestion point (Masterton) • Location of livestock and tractors (real-time) – particularly regarding logging activity, which could start with no warning and result in truck congestion – a safety issue for schools (less likely to be an issue if the logging is completed by local companies) • Increased number of VMS signs providing information about road closures and high winds (Masterton) • Types of traffic on congested roads (eg truck/car/livestock) (Masterton)
Availability of alternative routes	4.3	• Where there is no alternative route, the time of travel may need to change (all sites) • Important to consider the needs of freight vehicles when notifying an alternative route (freight drivers) • Important to consider how alternative routes link with other alternative routes when there is more than one event (Auckland; freight drivers)
Trip time	3.9	• Important to know travel time and distance, as this can facilitate the decision of whether to re-route (Wellington) • Real-time travel-time information preferred (eg that provided by Google Maps), but would be more useful if it was adjusted to reflect current traffic conditions and roadworks. The Auckland and Melbourne motorway travel-time VMS were very useful and would be good in Christchurch, especially if colour-coded with the usual green numbers changing to red when there are delays (Christchurch) • Important to include cancelled and/or delayed (passenger transport) services (Auckland and Wellington) • Websites that allowed a user to save a daily route and compare the different options quickly each day would be useful when people are about to leave home/work (all sites) • A text service where you text in your destination and a reply text provides conditions and other information, similar to the Coast Guard text service, would be useful (Wellington; Masterton)

Area of information	Av rating – likelihood of use	Details of information needed
Ability to compare different transport modes/options to mix modes	3.9	• Should include parking costs and availability (all sites) • Should include cycle lanes/cycle infrastructure and locations of lit roads – also useful for drivers and parking lots, for safety reasons (all sites) – and the presence of steep hills (for cyclists and walkers) (Wellington) • Information on safe streets to walk down for people unfamiliar with an area (may need to use crime statistics) (Wellington) • Information on parking and access for mobility-impaired people, and maps showing wheelchair/pram-friendly walking tracks (Christchurch) • Special event travel Information, particularly any extra bus services (Christchurch)
Timetables & fares for PT	3.9	• For everyday use, it is important to know when the next vehicle is leaving, or if the service has been cancelled • For unfamiliar trips, information on 'how to ride' and travel times (all sites); also information on side streets prior to the desired stop (Christchurch), the number of stops before the desired stop, or have a loudspeaker announcement of the name of each stop (Wellington) • A 'get-me-home' application that could provide the user with all options to get home – especially useful when out late at night (Christchurch, Wellington and Auckland) • Real-time information on bus arrivals on infrequent local routes, where buses might be an hour apart (Auckland). • Fullness of buses (before the user travels to the bus stop), so users are aware that the bus won't pick up more passengers (Wellington)
Comparative trip times for different times and days (with km travelled & fuel consumption data for private vehicles	3.6	• Opinion was split on whether a CO_2/cost analysis would be useful/used (all sites)
Weather	3.5	• Useful in deciding which transport mode to use (all sites)
Parking availability & cost	3.4	• Location and cost of parking (all sites; Masterton visitors to Wellington) • Drop-off areas for people with limited mobility (Christchurch) • Information on the number of parking spaces available, or at least the total number of parking spaces (Christchurch) • Parking availability at railway/bus stations (Auckland) • Location, cost, availability and rules of use for different car parking options (including coupon parking and early-bird parking) – an app providing optimum parking options based on plans for the day would be useful, particularly for people visiting the city (Wellington)

Area of information	Av rating – likelihood of use	Details of information needed
Where park-and-ride facilities are & how they can link with other modes	3.1	• Useful for all sites; especially useful for someone new to the area (Masterton)
Additional suggestions		• Unusual parking issues eg resident parking rules for out-of-town commuters • Rest stops/toilets (holidays) • Road congestion • Ability to deselect info on a map
Long-distance commuters		
Parking information – availability & cost	3.3	• As per urban commuter comments above
PT alternatives	3.0	• A door-to-door journey planner that goes from one city to another (all sites) • Car parking information (Christchurch) • Costs of PT and parking locations
Ridesharing options	1.9	• Little interest (all groups)
Additional suggestions		• Ability to compare rental cars and specifications (eg hybrids) • Good rest areas and cafes • Location of clean toilets • Major delays/accidents
Local rural trips		
Planned road closures	4.4	• As per urban commuter • Also would be useful to know about unplanned closures (Masterton) eg moveable VMS signs re snow at Mount Bruce; flooding in Martinborough; Rimutaka Hill road closures and high winds at Mount Bruce/on the Rimutaka Hill
Incidents	4.2	• As per urban commuter
Weather	3.8	• As per urban commuter
Requirements for chains	3.6	• For people who make trips over mountain passes

Area of information	Av rating – likelihood of use	Details of information needed
Tourists/international travellers		
Visual information to help orient them within the environment	4.7	• Similar to that provided by Google Street View (all sites)
Knowledge of what to visit & the easiest way to get there	4.6	• A tourist option for choosing a route based on visiting attractions or experiencing the best scenery (all sites)
Directions to, and how to use, alternative transport modes/routes	4.5	• As per urban commuter needs, but also information on how to travel (all sites) • Information on route types (eg there are two routes between Christchurch and Nelson – one is used more by freight and one is more scenic (Christchurch)
Parking	4.1	• Directions to parking, and cost
Additional suggestions		• How to summon help eg dial 111 • Location of rest stops/hotels • Speed limits along the route chosen • Safe roads/black spots • Safe times to travel
Freight		
In-trip updates on conditions that might cause delays & re-routing (eg weather/incidents/ congestion)	4.2	• Important to all 4 freight driver participants
Location of roadworks	4.2	
Pre-trip route-planning information that provides accurate journey times	4.1	
Location of areas that have height or weight restrictions	4.1	

Area of information	Av rating – likelihood of use	Details of information needed
Location of rest areas & weight inspections	3.7	• Need to be specific for freight drivers, with enough room to pull a rig over and also to get up to speed before rejoining the traffic • Need to be in suitable locations (outside built-up areas) for trips that involve cartage of livestock
Additional suggestions		• Points of interest (eg rest areas and petrol stations – also distance between petrol stations) • Crowdsourcing info via dispatchers, to inform other drivers about rural hazards eg stock being moved, incidents that cause traffic delays
Civil Defence emergencies/planned evacuations		
Evacuation routes & alternative routes	4.3	• Even if specific evacuation routes are not accurate in every specific emergency situation, it is important to have such plans (all groups) • There needs to be more than one way out of an area (using non-residential streets), and information needs to be real-time, as well as a printed copy for putting in the survival pack – businesses should have this for business compliance (Christchurch; however, there is often no route out of Masterton available) • Safe and easily accessed areas for use in a tsunami (Wellington) • Dangerous/impassable areas
Road closures	4.3	As for above groups
Location of shelters	4.2	
Incident information	4.2	As for above groups – also beneficial to know the location of dangerous/impassable areas
Congestion	4.1	As for above groups
Petrol stations & lodging	3.7	

7 Summary of the focus group findings

7.1 Use of, and satisfaction with, current information provision services

The four focus groups reported differing levels of use of travel information. The Auckland and Wellington groups reported the highest use of information – possibly because Auckland has higher levels of congestion and Wellington has the most comprehensive PT systems. In the demonstration section of each of the focus groups, nearly all the participants were surprised at the amount of information that was available on the various websites that were used in the demonstration. This was most pronounced in Christchurch, where one participant who had said they would not use PT decided they would try the PT system, after seeing the Metro website. None of the Christchurch participants had been to the 'Transport for Christchurch' site prior to the focus group, but all except one said they would now use it regularly and tell their friends. Freight and commercial drivers were more likely to seek out information than any other group.

Participants commented that when they looked at a transport website to find the piece of information they needed, they generally did not look around the site to see what other information was available. They also said they did not want to spend a lot of time looking for relevant information. Participants in Auckland and Wellington reported that their employers either actively sent traffic information around (when an event had happened or road closures were likely due to bad weather) or had links on their homepages to Transport Agency camera feeds so that employees could get up-to-date information. Ensuring that people were aware of the available information appeared to be a key challenge for information providers.

Participants were generally satisfied with the information they received if it was correct, but unhappy if the information turned out to be incorrect. For example, some participants had been left standing at bus stops when buses were too full to take additional passengers (Wellington) and others recounted incidents where reported delays turned out to be completely wrong (Wellington, Masterton and Auckland). Many participants emphasised that information needed to be provided at one comprehensive source, as they did not feel motivated to obtain information from a number of sources.

7.2 Critical factors in the quality and display of information

The most important factors regarding travel information were that information must be timely, accurate, relevant to the user's journey, customisable and easy to understand. The following general conclusions were reached:

- Real-time information, presented in a timely fashion, is the most useful, but only if the data is reliable.
- Information needs to be geographically specific, appropriate to where you are and where you want to go.
- Google Maps is the most widely used travel planning tool throughout all the groups (participants particularly liked the ability to compare making trips by different modes, and the simplicity of the interface).

- User interfaces should follow typical web-conventions, with grabbable maps and colours that are distinguishable by those who are colour blind. There also need to be traditional or non-tech-savvy means of information transfer, such as the ability to phone someone, or look at paper maps. Participants noted the loss of context information when using web or smartphone maps.
- Information needs to be targeted at different levels, including new and experienced users as well as people with different abilities.
- Looking at a display of travel information when driving is a safety issue – particularly emphasised after participants watched the WAZE[16] video in which a passenger interacts with the smartphone whilst the vehicle is moving.
- Some travel-time indicator signs could be positioned better – some are placed after the point where a change of route can be initiated.

7.3 Information provision and resource implications

Focus group participants agreed on the following points:

- Information should be low cost. Where some degree of cost is required, there should be a free version available that has indirect mechanisms for payment for the service (eg advertising, or users may allow their anonymised data to be sold). WAZE currently sells data that is anonymised as congestion data. Note that whilst funding was discussed by participants it was not within the scope of this project to consider different funding models.
- Information provision should not be progressed at the expense of reduced infrastructure provision.
- Information overload, and picking the right level of information based on the user group, is important. It was felt that the information on the websites Transport Direct (Britain) and 511 (San Francisco) was more than what was required for Christchurch or Masterton – especially the 'calculate drive times' tool on the 511.org site, which allows the user to enter different times of the day to see how it changes their trip time.

7.4 Initial perceptions of different information media

The main themes from the focus group around the different information media were as follows:

- There were mixed opinions on providing information for Civil Defence emergencies/planned evacuations. There was general acknowledgement that such planning is difficult to get right, as emergencies tend to unfold in ways that cannot be predicted. In general, however, participants thought that some information should be available as part of a wider emergency preparedness strategy, and that the information provision should be done jointly by the Civil Defence, local and central government agencies.

While crowdsourcing can be a cost-effective mechanism for specific information provision, some participants did not want to share their data unless they could see a benefit to them. A freight driver from

16 A community-based traffic and navigation app.

the Masterton focus group suggested commercial dispatchers could alert other freight operators to where stock or tractors were being moved, or where logging was occurring along rural roads. Another participant thought this information should be shared with rural schools.

The following points were identified for rural locations:

- Issues regarding data/GPS/mobile phone reception, as well as map accuracy mapping, need to be considered as there is the possibility of receiving misleading or no information – eg an ambulance driver was sent 12km in the wrong direction by an in-vehicle navigation system when responding to a call-out, which could have had fatal consequences, so he now uses paper maps.
- Congestion related to intense/irregular freight movements (eg those from logging or on-road stock movements) can fill a rural road with trucks, posing safety and congestion issues – a particular hazard around rural schools.
- When a road is closed there may not be alternative routes available, so information about the expected length of the delay and the time of reopening becomes very important.

7.5 Information requirements for potential user groups

The following table summarises the different types of information needed when people use different modes of travel.

Table 7.1 Points of difference between different modes of travel

Mode	Information needed
Car	• Delay, congestion, roadworks • Car parking (eg availability, cost, and any rules that apply to on-street parking) – the cost of car parking can weight the shift to using PT instead of a private motor vehicle • Ridesharing information was not required by the majority, as they would not consider ridesharing with people they did not know
Motorbike	• Congestion information not required, as motorcyclists can move to the front of traffic queues, and accessing real-time information would require stopping and taking off gloves and helmet
Cycle	• Congestion information not required, as above • Continuity of cycle paths – although the lack of these was a big barrier to people changing to cycling as a mode of transport, and providing this information may discourage people from cycling • Up-to-date information on where cycle paths are closed and areas that are unlit (Christchurch)
Walking	• Safety information such as safe places to walk, whether the area is lit at night and, in the case of Christchurch, where footpaths are closed
PT	Needs varies according to whether the user is: • taking a regular trip (= just want to know, in real time, when the next vehicle is leaving the stop) • taking a different or out-of-the-ordinary trip (= then need to know times and connections) • new to the system (= then need 'how-to-ride' information)
Freight	• A travel-planning tool that includes freight operators' needs – could also be used when diversions are planned by local authorities to ensure that freight operators can use the routes they are diverted to • Accurate journey times and locations, and in-trip information on conditions that might cause delays, via dispatcher

Mode	Information needed
	• Locations that have height or weight restrictions • Locations of rest areas and fuel stops that have adequate space for a rig (including when the load is livestock and the truck cannot stop in a built-up area)

The focus groups confirmed and expanded on the information requirements found in the literature/best-practice review stage of this research, and also added other information that they would like. This is summarised in the table below.

Table 7.2 Summary of potential information needs

Trip purpose	Potential information needs
Urban commuters	Detours/delays
	Availability of alternative routes
	Ability to compare different modes/option to mix modes (including information for users who are new or experienced, or with different abilities – eg safe dropoff points, broken lifts/escalators, walking information and accessible websites)
	Timetables and fares for PT
	Trip time
	Comparative trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles)
	Weather
	Parking availability and cost
	Where park-and-ride facilities are and how they can link with other modes
	Also: • unusual parking issues eg resident parking rules for out-of-town commuters • rest stops/toilets (holidays) • road congestion • ability to deselect information on a map
Long-distance commuters	Parking availability and cost
	PT alternatives
	Ridesharing options (although participants did not think they were likely to use this)
	Also: • ability to compare rental cars & specs (eg hybrid) • good rest areas & cafes • clean toilets • major delays/accidents • train timetables, delays, etc
Local rural trips	Planned road closures
	Incidents
	Weather
	Requirements for chains
	Also: • information displayed as soon as event happens on state highways • unplanned road closures

Trip purpose	Potential information needs
Tourists/ international travellers	Visual information to help orient them within the environment
	Knowledge of what to visit and the easiest way to get there
	Directions to, and how to use, alternative transport modes
	Directions to parking places
	Also: • how to summon help eg 111 • rest stops/hotels • speed limits along the route • safe roads/blackspots • safe times to travel
Freighting	In-trip updates on conditions that might cause delays and re-routing – eg weather/incidents/ congestion
	Roadworks
	Pre-trip – route-planning information that provides accurate journey times
	Locations that have height or weight restrictions
	Location of rest areas and inspection facilities
	Also: • points of interest (eg rest areas, petrol stations) • information-gathering from companies to be shared
Civil Defence emergency/ planned evacuation	Road closures
	Evacuation routes and alternative routes
	Incident information
	Location of shelters
	Congestion
	Petrol stations and lodging
	Also: • tsunami evasion • a hard copy of info to put in survival pack • dangerous/impassable areas.

This information was further refined in the next stage of this research, an online interactive survey to provide a quantitative assessment of the proposed information provision.

Stage 3 Online survey

8 Online survey introduction

Based on information gathered in the first and second stages of this research, the interactive online survey aimed to gain a better understanding of what New Zealand travellers seek in terms of information provision. The goals were to:

- estimate the number of people who, if provided with the right information, might improve their travel experience by altering their travel behaviour (eg travel time, travel route or travel mode), split by trip type
- obtain information on people's current access to technology and their intention to purchase new technologies within the next five years (eg smartphones, tablets)
- obtain quantitative metrics examining the ranked importance of the type of information that users require for making different types of trips, and information based on characteristics such as usability, specificity/relevance of data, timeliness and reliability/trust.

8.1 Procedure

8.1.1 Sample make-up

Information from the literature review suggested that differences in information requirements would be expected in different geographical locations (urban versus rural) as well as by different trip purpose. The online survey therefore sampled participants from different geographical locations across New Zealand to cover a wide cross section of customers' needs.

8.1.2 Sample selection

A convenience sample[17] was used to increase the sample size of participants, using existing traveller networks in New Zealand (with some oversampling of non-car groups to ensure minimum sample sizes for less-frequent travel modes such as public and active transport). This sample was bolstered by a stratified sample selected through the Automobile Association (AA). The sample selected through the AA member list (N=1200) was stratified for relevant demographics (including age, gender, and main travel mode) using the Ministry of Transport's Household Travel Survey data to determine the selection criteria, based on hours of travel (as opposed to distance travelled or number of trips). A snowball technique was also used, with people who were sent the survey link through either the AA list or existing networks (the convenience sample) being encouraged to send it on to anyone else who they thought might like to participate.

The existing groups and networks that circulated the survey link included PT agencies, National Road Carriers, the New Zealand Road Transport Association, CCS Logistics and freight companies. These contact lists were used to correct for a potentially lower response rate for primarily PT users and freight drivers.[18] In addition, the Christchurch branch of the Transport Agency and members of the project's Steering Group

17 A convenience sample is one that is made up of volunteers; ie respondents choose whether or not they want to participate.

18 As detailed in section 9.2, this technique did result in an oversampling of PT users and cyclists.

sent the link to people working for: The Stronger Christchurch Infrastructure Rebuild Team (SCIRT), the Christchurch City Council and the Ministry of Transport.

Because the snowball technique was used and it is not known how many people were sent the survey link, a response rate cannot be calculated. It should also be noted that because of the way the survey participants were selected (ie via the snowball technique), it is not a representative sample of New Zealand travellers. However, the data was post-weighted based on Household Travel Survey data with the aim of correcting for (but not completely removing) sample bias for the main output of the report (the future information provision priorities). More information regarding this is provided in section 9.11.1 and appendix E.

8.1.3 Sample size

A power analysis that was run using GPower software showed that a minimum of approximately 255 survey participants was required to allow for regional comparison. In total, 1319 respondents completed the survey (66 of whom were freight drivers or employed in the freighting industry). Therefore, the sample was more than sufficient to run the required analyses. A prize draw was run to encourage participation in the survey (offering a one-off prize of $1000 of vouchers of the winner's choosing).

8.1.4 Survey measures

The online interactive survey was designed using Survey Crafter 4.0 software.

The survey initially collected baseline data on respondents' current behaviours and access to/experience with the various travel information services already available in New Zealand. Participants were then primed, through viewing high-quality options for information transfer (eg national and international service examples) on best-practice travel information provision. The following five examples were provided to the participants:

- *Transport Direct's 'Door-to-door journey planner':* A multimodal planner that allows the user to completely customise journey plans, including setting parameters (eg walking speed, travel via a specified station) and compare using a private car with PT options. The information that was provided to participants is presented in appendix D1.
- *Drive-time calculator:* A website that allows the user to compare travel times on different days and at different times for specific trips, including times calculated based on historical traffic trends and real-time data. The information that was provided to participants is presented in appendix D2.
- *'Next Bus' application:* An application that allows the user to obtain real-time information about the next bus arriving at a specified stop, based on the actual location of the bus. The information that was provided to participants is presented in appendix D3.
- *Cycling and walking journey planner:* A Wellington region active transport website that allows the user to plan either a walking or cycling trip by specifying the desired start and end points. The output provides turn-by-turn directions for the trip, as well as information on calories burned, comparative trip costs by private car, and CO_2 emissions saved. The information that was provided to participants is presented in appendix D4.

- *Tiramisu crowdsourcing application:* Participants were given an explanation of the concept of crowdsourcing and provided with an example of a travel information application that uses this technique (Tiramisu). The information that was provided to participants is presented in appendix D5.

After the examples were presented to participants (and questions asked about their appeal), items were presented that were designed to explore anticipated future behaviour and information provision preferences.

A separate battery of items, which followed the same order as the main survey but explored freight information provision only, was also developed and presented to participants who were freight drivers or working in the freight industry.

The measures used in the survey were informed by the findings of the focus groups and literature review. The following table provides a summary of measures included in the survey.

Table 8.1 Measures included in online survey

Measure	Description
Baseline use of travel information services	Included different types of information delivery (eg website, mobile phone application, VMS, paper-based, in-vehicle) and different types of information (eg multimodal information, comparison trip times, timetable and fare information, emergency alerts/incidents, walking and cycling routes, park-and-ride facilities, real-time information, weather conditions, parking availability)
Perceived barriers to use of information services	Such as lack of knowledge of what's available, perceived high expense, difficulty using, reliability issues, lack of types of information desired, irregular updating and lack of trust
Quality of information services' characteristics	Ranked importance of characteristics such as ease of use, regular updating, usefulness, reliability/accuracy, comprehensiveness, consistency between information sources, providing multimodal information
Perceived influence of information services on travel behaviour	Included changes to various trip types (eg leisure, commuter, tourist, rural, freight, long-distance commuter) and types of changes (eg to route, mode, departure time, destination)
Perceptions of best-practice examples	Included 'helpfulness' of provided information types, likelihood of using each (if available), and anticipated frequency they would use them
Future travel information priorities	Rated 'helpfulness' of each information type (if it was available in the future and was of high quality), including anticipated frequency of use. This was used to calculate the priority scores for information types, using a weighting variable (see section 9.11 and appendix E for more information)
Anticipated future behaviour and preferences	Included anticipated changes to travel behaviour that participants' would be willing to make to avoid delays, and their information provision preferences (eg regarding mode comparison abilities and information types provided)
Current and anticipated future access to technology	Such as smartphones, tablets, laptops, and WiFi/3G connections
Demographics	Such as age, gender, ethnicity, main weekly activity, household living situation, education, region lived in, travel modes and access to private vehicles
Freighting	Explored baseline use of freighting information and travel behaviour change, perceived barriers to accessing this information, perceptions on a presented international freight-drivers' planner website and future information priorities (including anticipated future behaviours and information preferences)

9 Results of the online survey

9.1 Sample

A total of 1319 respondents completed the survey, 66 of whom were currently employed as freight drivers or in the freighting industry (and therefore completed the freight survey items). The remaining 1253 respondents completed the items for the general population. This section presents findings for the general sample and findings relating to the freight items are provided in a later section.

Four hundred and ninety-eight (39.8%) of the general sample were males. Table 9.1 provides a breakdown of gender, age, ethnicity, region lived in and area type for the total sample and table 9.2 shows their main weekly activity, living situation and education level. As can be seen, a good spread of all demographics was achieved. The sample size achieved in Christchurch (N=935) was due to a particularly successful uptake of participants from PT networks in the Canterbury region.

A chi square analysis showed that survey respondents from Christchurch were not over-represented in the urban, suburban or rural groups ($\chi^2(2, N=1096) = 4.4$, p=.11). Therefore, where appropriate, the survey findings were split by both variables (as the high sample rate in Christchurch had not biased the sample in relation to this variable). Findings for the total sample are reported where there were no significant regional differences; however, where regional differences existed, findings were broken down by region lived in, to accurately represent this natural variation. Where it was appropriate that findings should match the New Zealand travelling population, the sample was weighted to match the Ministry of Transport's Household Travel Survey sample, as detailed earlier in this report.

Table 9.1 Gender, age, ethnicity, region and area for the general sample

	No. of respondents	% of sample
Gender		
Male	498	39.8
Female	752	60.2
Total	*1250*	*100.0*
Age group		
16–24 years	244	19.5
25–34 years	254	20.3
35–44 years	253	20.2
45–54 years	255	20.4
55–64 years	167	13.3
65–74 years	67	5.4
75+ years	11	0.9
Total	*1251*	*100.0*
Ethnicity		
European	958	76.9
Maori	42	3.4
Pacific Islander	14	1.1

	No. of respondents	% of sample
Asian	87	7.0
Other[a]	145	11.6
Total	*1246*	*100.0*
Region		
Auckland	134	10.7
Wellington	100	8.0
Christchurch	935	74.7
Other[b]	82	6.6
Total	*1251*	*100.0*
Area type		
Urban area	438	35.0
Suburban area	707	56.5
Rural area	107	8.5
Total	*1252*	*100.0*

a) 'Other' ethnicities specified were African, American, Australian, British, Canadian, Dutch, Filipino, French, Indian, Jamaican, Latin, Netherlands, Persian, Russian, Scottish, South African, Turkish, European/Maori, and Kiwi/New Zealander.

b) 'Other' regions specified were Ashburton, Banks Peninsula, Blenheim, Canada, Central Otago, Clarence, Dargaville, Dunedin, Dunsandel, Europe, Hamilton, Hawke's Bay, Horowhenua, Kaiapoi, Leeston, Marlborough, Napier, Nelson, New Plymouth, North Canterbury, Northland, Otautahi, Palmerston North, Paraparaumu, Queenstown, Rangiora, Renwick, Richmond, Selwyn, Southbridge, Tauranga, Timaru, Waikato, Wairarapa, Waiuku, Wellsford, Whakatane, Whangarei and Woodend.

Table 9.2 Main weekly activity, living situation and education level for the general sample

	No. of respondents	% of sample
Main weekly activity		
Full-time employed	633	50.6
Part-time employed	143	11.4
Full-time self-employed	33	2.6
Part-time self-employed	33	2.6
Caregiver to family or household	56	4.5
Tertiary student	177	14.1
High school student	42	3.4
Sickness or ACC beneficiary	18	1.4
Unemployed	28	2.2
Retired	62	5.0
Other[a]	26	2.1
Total	*1251*	*100.0*
Living situation		
Family (including extended) with children	382	30.6
Single adult living with children	57	4.6
Family with adults only	147	11.8

	No. of respondents	% of sample
Single adult with other adults only	182	11.8
Person living alone	135	10.8
Married/de facto couple	302	24.2
Other[b]	43	3.4
Total	*1248*	*3.4*
Education level		
Postgraduate qualification	283	**22.6**
Degree	318	**25.4**
Diploma	200	**16.0**
High school qualification	353	**28.2**
No recognised qualification	55	**4.4**
Other	41	**3.3**
Total	*1250*	***100.0***

a) 'Other' main weekly activities reported included volunteer work and casual/call out work.

b) 'Other' living situations reported included boarding, living in a university hall of residence, or staying with friends/family.

9.2 Current mode choice, split by trip type

Table 9.3 shows main travel mode reported by respondents, split by trip type. As can be seen, the respondents' main travel mode for all trip types was a private car as a driver, followed by high rates of people travelling as passengers in private vehicles and buses. Other modes of travel were relatively infrequent, with the exception of cycling and walking, which had relatively high rates for commuter trips.

Main travel mode for commuter trips was compared to New Zealand Travel Survey data, and significant differences between the two datasets were found ($\chi^2(2, N=1803) = 233.5$, $p<.001$).[19] This survey oversampled PT users and cyclists. Therefore as expected, the sample was not representative of the New Zealand traveller population.

19 This could not be compared for other trips types, due to differences between the two surveys in the ways trip categories were broken down.

Table 9.3 Main travel mode, split by trip type

	Car as driver		Car as passenger		Walk		Cycle		Bus		Train		Other		N/A
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Commuter trips[a]	544	43.9	58	4.7	117	9.4	145	11.7	336	27.1	31	2.5	9	0.7	12
Long-distance commuter trips[b]	426	49.6	175	20.4	1	0.1	10	1.2	222	25.8	11	1.3	14	1.6	392
Leisure/ recreation trips[c]	648	52.4	312	25.2	31	2.5	55	4.4	177	14.3	2	0.2	12	1.0	14
Tourist trips[d]	499	42.5	461	39.3	2	0.2	1	0.1	63	5.4	11	0.9	137	11.7	78

a) Defined as trips to the respondents' main weekly activity.

b) Defined as trips that took longer than one hour, on average, to main weekly activity.

c) Defined as trips to sport or to visit family/friends.

d) Defined as holiday trips, including within New Zealand.

9.3 Willingness to change mode

Two items were included in the survey to explore how willing participants would be to change mode. Firstly, this was explored indirectly via perceptions of the quality of the PT service in their area (M=3.4, SD=1.2). The other item explored whether participants believed that the level of travel information provided would have an effect on their mode choice (M=2.5, SD=1.1). Findings for these two items are displayed in table 9.4.

As can be seen, more than half (56.5%) agreed/strongly agreed that the PT in their area was of high quality. In relation to information provision, 58.3% of respondents indicated a willingness to change travel mode based on provided information. Only 19.7% of respondents indicated that their mode choice would remain uninfluenced by improved travel information provision.

Respondents' main travel modes for commuter trips were related to significant differences on ratings of this second item ($F(2, 1193) = 4.34$, $p<.05$), with those who mainly used PT having a significantly higher mean (M=2.7, SD=1.2) than those who primarily used active transport modes (M=2.4, SD=1.0). Those who travelled to work via private vehicle had a mean of 2.5 (SD=1.1). Therefore, those who already used PT to travel to work were least likely to believe that improved travel information would result in a change to their travel mode, whereas those travelling by active transport modes were most likely to be willing to change. However, all means were less than 3, indicating that all groups were, on average, likely to disagree with the item (indicating that they were open to mode shift).

Table 9.4 Quality of PT in area and willingness to change mode

Item	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Not sure
	No.	%	No.	%	No.	%	No.	%	No.	%	No.
The quality of the PT in my area is very good	97	7.9	207	16.8	231	18.8	525	42.7	170	13.8	21
No matter how much information was provided to me, I would never change my travel mode for any trip	168	13.9	537	44.4	266	22.0	160	13.2	79	6.5	39

ANOVAs (Analysis of Variance) revealed that there were significant differences on mean scores on the quality of PT item based on region lived in ($F(3, 1225) = 27.4$, $p<.001$) and area type ($F(2, 1227) = 22.9$, $p<.001$). Means for each group are displayed in table 9.5. For region lived in, all differences between groups were statistically significant, with the exception of the mean difference between those living in Auckland and those living in 'Other' areas of New Zealand. Therefore, respondents living in Wellington rated their PT system significantly higher than all other groups; those residing in Christchurch rated their PT system significantly higher than those in Auckland and 'Other' areas; and those living in Auckland rated their PT system significantly lower than those living in Wellington and Christchurch.

In relation to area type, those living in urban and suburban areas rated their PT systems as being of significantly higher quality than those living in rural areas. The only mean difference that wasn't statistically significant was that between those living in urban and suburban areas.

Table 9.5 Mean scores on PT quality, split by region lived in and area type[a]

	Mean	SD
Region lived in		
Wellington	3.8	1.0
Christchurch	3.6	1.1
Auckland	2.9	1.2
Other	2.6	1.2
Area type		
Urban	3.5	1.1
Suburban	3.4	1.1
Rural	2.7	1.3

a) Items on a five-point scale ranging from 1 = Strongly disagree to 5 = Strongly agree, midpoint (neutral) = 3. Higher means indicate a higher perceived quality of PT in the area for that group.

However, there were no significant differences between either region lived ($F(3, 1205) = 1.0$, $p=.38$) or area type ($F(2, 1207) = 2.9$, $p=0.6$) on the willingness to change mode. Therefore, where respondents lived did not influence their willingness to change mode given improved information provision, even though the perceived quality of the PT systems across areas varied significantly.

Data was also gathered on two other factors that could influence mode choice for commuter and other trips: access to a vehicle for private use (75.5% of the sample had access); and whether or not respondents' employment required them to drive (excluding commuting trips) (30.5% of the sample fell into this category). On average, these respondents were required to drive 122.0 days per year for their jobs, ranging from 1 to 313 days (SD=84.3).

9.4 Current and anticipated future access to technology

Table 9.6 displays reported frequencies of current and anticipated future access (within the next five years) to technologies that play a role in travel information provision. As can be seen, it was anticipated that the majority of respondents would have better access to all the specified technologies.

'Other' technologies that respondents said they currently had access to included mobile phones (not smartphones), desktop computers, dial-up internet and non-wireless broadband connections, GPS systems, and mp3 players. Future 'other' technologies included 4G internet, updated smartphones (eg

iPhone 6), GPS systems and smart TVs. A number of respondents also commented that they were unsure what would be available in the next five years (due to the fast rate of technology development), but would be interested in obtaining technologies that were newly developed.

Table 9.6 Current and anticipated future access to relevant technologies

Technology type	Current access		Anticipated future access[a]	
	No. of respondents	% of sample	No. of respondents	Total %
Laptop	1022	81.6	121	91.3
WiFi connection	1050	83.9	71	89.6
Smartphone	807	64.5	277	86.6
Tablet/iPad	418	33.4	412	64.6
3G data package	546	43.6	145	55.2
Other	79	6.3	49	10.2

a) Percentage = estimated total percentage of respondents that would have access to each technology within the next five years.

9.5 Baseline travel information service access

Participants were asked what travel information service types they had accessed over the past year. Table 9.7 displays the frequencies with which each type was currently being accessed by the survey participants, sorted from most commonly accessed to least. Web-based information was accessed by almost all users of information (95.3%), so this had the best market penetration or reach. The least commonly accessed type appeared to be one-on-one communications direct with staff (15.7%).

Table 9.7 Baseline access to travel information service types

Information type	No. of respondents	% of sample
Websites	1193	95.3
Real-time, information at PT stops	858	68.5
Paper-based information (eg maps, timetables)	831	66.4
Signage at PT stops	783	62.5
Variable Message Signs (VMS)	637	50.9
GPS navigation systems	513	41.0
Mobile phone applications	507	40.5
Radio	394	31.5
In person with staff member	284	22.7
Voice announcements at PT stops	220	17.6
Telephone services (eg call centres)	196	15.7
Other[a]	21	1.7

a) 'Other' travel information services specified by participants included: asking bystanders and/or family and friends; via email; the newspaper; magazines; and social media sites (eg Twitter).

9.6 Baseline travel information type access

Tables 9.8, 9.9, 9.10 and 9.11 display average 'helpfulness' ratings for travel information types that respondents had accessed over the last 12 months, sorted by those rated most helpful to least helpful. The number of people who had accessed each information type is also shown.

The travel information types were split into the following key categories (based on different user needs identified in the literature review and focus group analysis):

- information allowing the user to compare modes of travel with each other
- route-specific information
- information about facilities provision
- real-time information.

As can be seen in the tables, traditional types of information (eg step-by-step directions, PT timetables and route maps) were those most commonly accessed by the respondents over the past year (92–95%), and these were also the information types rated most helpful by respondents. Therefore there is a relationship between rate of access and perceived helpfulness of information types. Respondents also found real-time information (eg that provided in-vehicle by a GPS system and real-time bus arrival information) equally helpful, with access rates being slightly lower overall for these.

Table 9.8 Current level of access to, and mean helpfulness rating of, mode comparison travel information types[a]

Information type	Mean	SD	No. of respondents	% of sample
PT timetables	4.3	0.9	1163	93.9
Travel time by different modes	4.0	0.9	999	82.4
What modes are available for a journey	3.9	0.9	921	76.4
Travel costs by different modes	3.8	1.0	893	74.5
Other[b]	3.5	0.9	146	12.5
Ridesharing information	3.0	1.1	428	35.5

a) Items on a five-point scale ranging from 1 = Very unhelpful to 5 = Very helpful, midpoint (neutral) = score of 3.

b) 'Other' information types accessed that were rated by respondents included bus stop maps, distance of a journey, environmental impact scores and personal experience from being a bus driver.

Table 9.9 Current level of access to, and mean helpfulness rating of, route-specific travel information types[a]

Information type	Mean	SD	No. of respondents	% of sample
Directions	4.2	0.9	1129	91.7
Comparison trip times for different travel times/days	4.0	0.9	956	78.3
Alternative routes	4.0	0.9	1085	88.3
Pictures/names of key route landmarks	3.9	0.9	947	78.3
Other[b]	3.5	1.0	81	6.9

a) Items on a five-point scale ranging from 1 = Very unhelpful to 5 = Very helpful, midpoint (neutral) = score of 3.

b) 'Other' information types specified by respondents included: facilities available on specific routes; weather and traffic conditions; breakdowns and congestion; road closures; and scenic routes for long-distance trips.

Table 9.10 Current level of access to, and mean helpfulness rating of provision of facilities travel information types[a]

Information type	Mean	SD	No. of respondents	% of sample
Route maps	4.3	0.8	1172	95.1
Walking routes/facilities/journey times	4.0	0.9	921	76.0
Location of points of interest (eg petrol stations, restaurants, accommodation)	3.9	1.1	890	72.8
Cycling routes/facilities/journey times	3.8	1.0	634	52.0
Location of public toilets and rest areas	3.8	1.1	830	67.5
Location of parking	3.7	1.0	805	65.7
Location of park-and-ride facilities	3.5	1.1	584	47.7
Presence of steep hills/slopes	3.4	1.1	580	48.7
Other[b]	3.4	0.9	50	4.2
Disability information	3.3	1.0	335	27.6
Location of unlit roads	3.0	1.1	426	35.4

a) Items on a five-point scale ranging from 1 = Very unhelpful to 5 = Very helpful, midpoint (neutral) = score of 3.

b) 'Other' information types specific by respondents included: location of PT stops; facilities on PT to carry bicycles; location of specific fuel brands; and locations of shops and points of interest such as historical sites, natural wonders and famous locales.

Table 9.11 Current level of access to, and mean helpfulness rating of, real-time travel information types[a]

Information type	Mean	SD	No. of respondents	% of sample
In-vehicle navigation information (eg GPS system)	4.3	0.9	718	58.0
Next bus information	4.3	0.9	1068	85.9
Next train information	4.2	0.9	435	35.0
Next ferry information	4.1	0.9	389	31.4
Roading conditions (eg presence of ice/snow)	4.1	0.9	787	64.2
Weather conditions	4.1	0.9	926	75.5
On-board public transport (eg next stop information)	4.0	1.1	894	72.9
Anticipated travel times based on real-time updates	4.0	1.1	814	66.4
Location of road closures	3.9	1.1	933	75.7
Parking availability information	3.8	1.0	645	52.6
Location of roadworks	3.8	1.1	883	71.7
Information gathered from other travellers (eg crowdsourced information)	3.8	0.9	554	45.5
Location of traffic incidents	3.7	1.1	732	59.7
Congestion information	3.7	1.2	698	56.7
Traffic cameras (in real-time)	3.5	1.1	535	44.0
Other[b]	3.0	1.1	32	2.7

a) Items on a five-point scale ranging from 1 = Very unhelpful to 5 = Very helpful, midpoint (neutral) = score of 3.

b) 'Other' information types specified by respondents included: breakdowns and congestion; traffic updates; and security cameras.

9.7 Baseline overall helpfulness of travel information accessed

Participants were asked to rate the overall helpfulness of all travel information they had accessed over the previous year. This item had a mean of 4.1 (indicating that respondents found the travel information they had accessed helpful in general, SD=0.7). There were no significant differences on mean scores on this item by either region lived[20] ($F(2, 1233) = 0.5$, p=0.7) or area type[21] ($F(2, 1235) = 0.8$, p=0.5).

A scale was also formed using the 11 items displayed in table 9.12 below, exploring the perceived quality of travel information services that had been accessed previously. This scale had a mean score of 37.6 (SD=5.9), ranging from 16 to 55, and a Cronbach's Alpha of .84. Individual item statistics are reported in the table below, arranged from highest mean (highest level of agreement with item) to lowest.

Table 9.12 Quality of travel information services accessed – scale item statistics

Item	Mean	Std. dev.
In general, the travel information services I have used in the past 12 months …		
Are easy to use and understand	3.9	0.7
Provide very helpful information	3.8	0.7
Generally come from trustworthy sources	3.8	0.7
Provide me with route-specific information	3.7	0.8
Provide reliable and accurate information	3.6	0.8
Provide value for money	3.5	0.9
Are highly customisable	3.2	1.0
Provide consistent information between sources	3.1	0.9
Are updated regularly (and so provide up-to-date information)	3.0	1.0
Provide comprehensive information	3.0	1.0
Cover multiple modes in one tool (eg I can compare car, public transport, cycling and walking options on one site)	3.0	1.0

a) Items on a five-point scale ranging from 1 = Strongly disagree to 5 = Strongly agree, midpoint (neutral) = score of 3.

ANOVAs revealed that there were also no significant differences between either region lived ($F(3, 769) = 1.01$, p=.39) or area type ($F(2, 770) = 0.02$, p=.98) on mean scores on this scale, indicating the perceived quality of information services did not differ for respondents living in different areas across New Zealand.

9.8 Perceived barriers to accessing travel information

Self-reported reasons for not accessing available travel information are displayed in table 9.13, sorted from most frequently endorsed to least. As can be seen, over half the respondents (55%) believed they did access a wide range of travel information services, indicating they saw no barriers to accessing this information. Lack of knowledge of available services was the most frequently endorsed barrier to

20 Split by Auckland, Wellington, Christchurch or Other.

21 Split by Urban, Suburban or Rural.

accessing information, with concerns over the current cost of accessing information[22] and difficulty of using services being relatively minor concerns for the respondents.

Table 9.13 Self-reported barriers to accessing available travel information services

	No. of respondents	% of sample
Please indicate below what reasons stop you from using the traveller information services currently available in New Zealand (select all that apply)		
Nothing has stopped me, I use a wide range of information services available in my area	642	54.7
I did not know any traveller information services were available in my area	228	19.4
It's too difficult to compare modes because there are no multi-modal information services available (eg services that compare car, bus, train, cycling and walking travel options)	225	19.2
They are not reliable enough	185	15.8
It takes too much time to gather enough information from them	172	14.7
They are not updated regularly enough	168	14.3
They are not comprehensive enough	131	11.2
They do not have the types of information I want to access	125	10.6
Other[a]	125	10.6
Different services provide conflicting information	84	7.2
They are too difficult to use	64	5.5
They cost too much	47	4.0

a) 'Other' barriers reported included: inability to use such services when not at home with access to home computer; lack of smartphone; lack of internet connection; poor accessibility on mobile phones and smartphones for some information services; lack of need for travel information (eg due to limited travel options/requirements, only completing common, familiar trips, or contentment with current travel mode); high use of data and high cost of data on mobile phones to access information; lack of motivation to access services; limited provision of services and internet coverage in certain areas; lack of a central site linking travel information services; and lack of publicity regarding services.

9.9 Baseline changes to travel behaviour

Participants were first asked to estimate how many days in the last 30 they had encountered situations that increased their expected journey time for any trip. Mean scores are presented in table 9.14, split by region lived in and indicating where ANOVA analyses revealed significant differences between regions. As could be expected, those residing in Christchurch were affected by roadworks, congestion and road closures at a significantly higher rate than those from other regions (due to disruption to the roading network following the earthquake sequence). Those from Christchurch also experienced PT service delays causing disruption to trips at a significantly higher rate than all other regions, with the exception of Wellington. Respondents from Auckland experienced congestion on a significantly higher number of days than those from Wellington, and 'Other incidents' at a significantly higher rate than those in Christchurch and 'Other' areas.

22 Cost was a low concern for the sample because at the time of this research, traveller information in New Zealand was generally provided free of charge.

In relation to area type, those in suburban areas encountered roadworks (*M*=8.4 days) at a significantly higher rate than those in urban areas (*M*=6.7), *F*(2, 1241) = 4.5, p<.05). Those in suburban areas also encountered road closures (*M*=4.7) at a significantly higher rate than those in either urban areas (*M*=3.9) or rural areas (*M*=2.8), *F*(2, 1241) = 4.5, p<.05). The only other significant difference between area types was in regards to weather, with those in rural areas (*M*=0.2) encountering weather conditions that increased expected journey times at a significantly lower rate than those from urban and/or rural areas (*M*=0.7), *F*(2, 1239) = 3.4, p<.05). There were no other significant differences between area types on any other measure reported in this section.

Table 9.14 Mean number of days respondents had encountered situations that increased expected journey times, split by region lived in and indicating significant differences between regions[a]

	Total sample mean (SD)	Auckland (SD)	Wellington (SD)	Christchurch (SD)	Other areas (SD)	Sig.
Roadworks	7.7 (9.1)	4.5 (6.3)	2.7 (4.5)	8.9 (9.6)	5.4 (7.0)	p<.001
Congestion	7.7 (8.6)	6.0 (6.9)	3.5 (5.6)	8.6 (9.0)	4.7 (7.3)	p<.001
Road closures	4.3 (7.3)	1.6 (4.4)	0.8 (3.1)	5.2 (8.0)	1.6 (3.3)	p<.001
PT service delay	2.9 (5.6)	1.8 (4.2)	2.3 (4.3)	3.2 (6.0)	1.7 (4.6)	p<.01
Other incidents	1.2 (3.2)	2.2 (4.3)	1.6 (4.2)	1.0 (2.9)	0.5 (0.8)	p<.001
Cancelled PT service	0.6 (3.1)	0.9 (4.1)	0.7 (2.0)	0.6 (3.2)	0.1 (0.3)	
Weather	0.6 (2.0)	0.9 (3.0)	0.7 (2.4)	0.6 (1.9)	0.3 (0.8)	

a) Minimum = 0, maximum = 30 for all variables.

The number of respondents who believed they could have avoided delays by altering their behaviour (ie if they'd had adequate travel information) was also assessed. Table 9.15 provides the same breakdown as in the table above. Changing route was expected to be the most viable option for avoiding delays for all regions except Wellington, where respondents thought delaying their departure time would be more effective. Respondents residing in Christchurch believed changing their route would have avoided delays at a significantly higher rate than those in Wellington and 'Other' areas. Those in Auckland and Christchurch believed changing their departure time would be effective at a significantly higher rate than those from 'Other' areas. Those in Christchurch believed changing their mode would be a significantly more effective strategy than any other area, with those in Auckland also scoring significantly higher on this item than those in Wellington.

Table 9.15 Mean number of days respondents could have avoided delays by changing travel behaviours, split by region lived in and indicating significant differences between regions[a]

Change	Total sample mean (SD)	Auckland (SD)	Wellington (SD)	Christchurch (SD)	Other areas (SD)	Sig.
Route	4.6 (7.1)	3.7 (5.9)	1.8 (3.2)	5.3 (7.6)	2.3 (4.5)	p<.001
Departure time	2.8 (5.8)	2.7 (4.9)	2.0 (4.2)	3.1 (6.2)	1.1 (2.9)	p<.01
Mode	2.3 (5.6)	1.7 (4.1)	1.1 (2.8)	2.7 (6.1)	0.7 (3.5)	p<.001
Destination	1.4 (4.7)	1.2 (4.1)	0.6 (2.1)	1.6 (5.1)	0.7 (3.4)	

a) Minimum = 0, maximum = 30 for all variables.

Overall, 581 (46.4%) of the respondents believed they had actually altered their behaviour due to travel information received at least once the 30 days prior to filling out the survey. There were also regional

differences on this ($\chi^2(3, N=1251) = 18.6$, $p<.001$), with those in Auckland being significantly more likely to agree and those in 'Other' areas being significantly less likely to agree.

The percentage of the time these respondents believed they altered their behaviour is displayed in table 9.16, split by trip type. As can be seen, commuter trips were altered most often of all the trip types. Only one significant difference was found between regions ($F(3, 550) = 4.2$, $p<.01$), with those from Christchurch altering their behaviour on commuter trips at a significantly higher rate than those from Wellington.

Table 9.16 Mean percentage of times they had changed travel behaviour, split by trip type and region lived in, indicating significant differences between regions[a]

	Total sample mean (SD)	Auckland (SD)	Wellington (SD)	Christchurch (SD)	Other areas (SD)	Sig.
Commuter trips	24.7 (27.6)	21.3 (26.6)	13.1 (20.7)	26.8 (28.2)	16.7 (23.2)	p<.01
Leisure/recreation trips	14.6 (22.5)	15.7 (24.1)	13.0 (25.0)	14.6 (22.1)	13.5 (22.3)	
Long-distance commuter trips	11.3 (21.9)	13.7 (23.7)	10.1 (22.9)	10.9 (21.4)	12.3 (24.3)	
Tourist trips	8.8 (22.0)	10.0 (23.0)	10.7 (21.9)	8.4 (21.9)	7.9 (21.7)	

a) Minimum = 0, maximum = 100 for all variables.

Finally, participants were asked to indicate what types of changes they had made to their trips in the last 30 days. Table 9.17 displays the frequencies for each type of change for commuter trips, split by trip type and ordered by most common change to the least. Percentages reported in the table are the percentage of the total respondents who had made at least one change to each trip type in the 30 days prior to completing the survey.

As can be seen in the table, in line with the frequencies reported in table 9.16, the greatest number of changes were made to commuter trips. The most common changes to such trips were alterations to the route and departure time. These changes were also the most common changes made to all other trip types.

Table 9.17 Types of changes made to trips in last 30 days, split by trip type

I changed my…	Commuter trips		Long-distance commuter trips		Leisure/ recreation trips		Tourist trips	
	No.	%	No.	%	No.	%	No.	%
Route	274	56.6	99	43.6	201	51.7	81	41.8
Departure time	241	49.8	125	55.1	165	42.4	85	43.8
Travel mode (entire journey)	72	14.9	32	14.1	51	13.1	15	7.7
Travel mode (part of journey)	61	12.6	29	12.8	43	11.1	21	10.8
Destination	13	2.7	9	4.0	36	9.3	27	13.9
Cancelled my trip	13	2.7	8	3.5	20	5.1	7	3.6
Other	[a]4	0.8	[b]6	2.6	[c]4	1.0	[d]3	1.5
Not applicable	97		354		192		387	
Total[e]	*484*		*227*		*389*		*194*	

a) Changing bus routes was specified as the 'Other' change made to commuter trips.

b) Changing bus routes, altering driving style to compensate for weather conditions, and 'making provisions' for longer journey times were the 'Other' changes made to long-distance commuter trips.

c) Finding other activities to do (eg running errands) rather than waiting for delayed PT services was reported as 'Other' change to leisure/recreation trips.

d) Changing the arrival time was reported as the 'Other' change to tourist trips.

e) Total number of respondents who had made at least one change to each trip type.

These findings suggested that travellers in New Zealand were already making changes to their trips based on travel information received.

9.10 Example travel information services presented

9.10.1 Transport Direct 'Door-to-door journey planner' (see appendix D1)

Fifty percent (N=589) of the survey respondents reported having seen a site similar to the Transport Direct door-to-door journey planner that was presented. Table 9.18 displays mean helpfulness ratings of the features of the site, arranged from highest mean (rated most helpful) to lowest.

Table 9.18 Mean helpfulness ratings of features of the door-to-door journey planner site[a]

	Mean rating	Std. dev.
Ability to view travel routes via a map	4.4	0.8
Ability to set start and end points using a map	4.3	0.8
Ability to plan journeys in advance	4.3	0.8
Ability to view ticket and trip costs	4.3	0.8
Ability to compare trip length/time and route for all available PT modes	4.2	0.9
Ability to set certain parameters for your journey (eg alter walking speed, travel via a specified station)	4.1	0.9
Ability to view travel routes via step-by-step instructions	4.1	0.9
Ability to compare trip length/time and route for PT versus car	4.0	0.9
Ability to obtain information on accessible transport options	3.8	1.0
Ability to compare CO_2 emissions for different trip options	3.2	1.1

a) Items on a five-point scale 1= Very helpful to 5 = Very helpful, midpoint (neutral) = 3.

Tables 9.19 and 9.20, respectively, display how likely respondents reported they would be to use such a site if it were available in their area, and how frequently they thought they would use it. As can be seen, the majority of respondents (85%) believed they would use such a site if it were available to them. Over half (51.5%) the respondents also believed they would use such a site at least once a week or more.

Table 9.19 Self-reported likelihood respondents would use a door-to-door journey planner site

Highly unlikely		Unlikely		Neutral		Likely		Highly likely		Not sure
No.	%	No.	%	No.	%	No.	%	No.	%	No.
38	3.3	49	4.3	86	7.5	412	35.8	565	49.1	18

Table 9.20 Self-reported frequency that respondents would use a door-to-door journey planner site

Never		Less than monthly		Monthly		Less than weekly		1–2 times/week		3–4 times/week		5–6 times/week		Daily	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
45	3.8	160	13.7	151	12.9	213	18.2	344	29.4	149	12.7	57	4.9	53	4.5

9.10.2 Drive-time calculator (see appendix D2)

Around 30% (N=483) of the respondents reported having seen a website similar to this one. The mean helpfulness rating of this website was 4.0 (indicating that respondents would find the website 'helpful' on average, SD=0.9). Tables 9.21 and 9.22 display the likelihood of respondents using the website, and the frequency, if it was available in their area. Again, the majority of respondents (70.3%) believed they would be likely to use such a website if it was available to them. Just under half (44.7%) anticipated they would use such a website weekly, or more frequently.

Table 9.21 Self-reported likelihood that respondents would use a drive-time calculator website

Highly unlikely		Unlikely		Neutral		Likely		Highly likely		Not sure
No.	%	No.	%	No.	%	No.	%	No.	%	No.
53	4.7	109	9.6	175	15.4	454	40.0	344	30.3	39

Table 9.22 Self-reported frequency that respondents would use a drive-time calculator website

Never		Less than monthly		Monthly		Less than weekly		1–2 times/week		3–4 times/week		5–6 times/week		Daily	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
93	7.9	226	19.3	84	7.2	245	20.9	286	24.4	140	11.9	41	3.5	57	4.9

9.10.3 Real-time bus updates application (see appendix D3)

Forty-three percent (N=660) of the respondents reported having seen an application similar to the real-time bus application presented. The application's mean helpfulness rating was 4.3 (SD=0.8), indicating that respondents felt such an application would be helpful, on average. The majority of the respondents (77.7%) believed they would be likely to use such an application if it was available to them (table 9.23), with just over half (51.5%) believing they would access such an application at least weekly (table 9.24).

Table 9.23 Self-reported likelihood that respondents would use a real-time bus updates application

Highly unlikely		Unlikely		Neutral		Likely		Highly likely		Not sure
	No.	No.	%	No.	%	No.	%	No.	%	No.
34	3.0	87	7.6	136	11.8	422	36.8	469	40.9	25

Table 9.24 Self-reported frequency that respondents would use a real-time bus updates application

Never		Less than monthly		Monthly		Less than weekly		1–2 times/week		3–4 times/week		5–6 times/week		Daily	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
75	6.4	183	15.6	93	7.9	218	18.6	254	21.7	155	13.2	79	6.7	116	9.9

9.10.4 Active transport website (see appendix D4)

Around 57% of the respondents (N=672) reported having seen a site similar to the active transport site presented. Mean helpfulness ratings of the features of the site are provided in table 9.25, arranged from highest mean (rated most helpful) to lowest. As can be seen, respondents were generally more interested in walking information than in cycling information, and had limited interest in CO_2 emissions information.

Table 9.25 Mean helpfulness ratings of features of the active transport website[a]

	Mean rating	Std. dev.
Ability to choose quickest routes for walking trips	4.1	0.9
Mapping of walking trips	4.0	0.9
Ability to choose shortest routes for walking trips	4.0	0.9
Turn-by-turn instructions for walking trips	3.8	0.9
Elevation information for walking trips (ie presence of hills)	3.8	0.9
Location of on-road cycle lanes	3.8	1.0
Calories burned	3.8	1.1
Ability to avoid unlit routes for walking trips	3.8	1.0
Mapping of cycling trips	3.8	1.0
Ability to choose shortest routes for cycling trips	3.8	1.0
Ability to choose quickest routes for cycling trips	3.8	1.0
Location of off-road cycle tracks	3.7	1.1
Elevation information for cycling trips (ie presence of hills)	3.7	1.0
Ability to select routes that avoid steep hills for walking trips	3.7	1.0
Turn-by-turn instructions for cycling trips	3.6	1.0
Ability to select routes that avoid steep hills for cycling trips	3.6	1.0
Ability to avoid unlit routes for cycling trips	3.6	1.0
Money saved (compared with car trip)	3.5	1.0
CO_2 emissions saved (compared with car trip)	3.1	1.1

a) Items on a five-point scale of 1 = Very helpful to 5 = Very helpful, neutral = 3.

Anticipated likelihood of future use and frequency of future use of the site is reported in tables 9.26 and 9.27, respectively. The majority of respondents (73.3%) believed they would be likely to use such a site in the future, with around 40% anticipating they would use it weekly or more often.

Table 9.26 Self-reported likelihood that respondents would use an active transport site

Highly unlikely		Unlikely		Neutral		Likely		Highly likely		Not sure
No.	%	No.	%	No.	%	No.	%	No.	%	No.
95	8.3	101	8.8	111	9.7	43	37.6	409	35.7	21

Table 9.27 Self-reported frequency respondents would use an active transport site

Never		Less than monthly		Monthly		Less than weekly		1–2 times/week		3–4 times/week		5–6 times/week		Daily	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
130	11.1	192	16.4	116	9.9	251	21.5	244	20.9	143	12.2	47	4.0	47	4.0

9.10.5 Crowdsourcing (see appendix D5)

Respondents' reported willingness to share data via crowdsourcing is reported in table 9.28. As can be seen, only 23% of respondents indicated they would be completely unwilling to share data via

crowdsourcing, meaning the majority of respondents (77%) would be willing to share travel data in some form.

Table 9.28 Self-reported willingness to share travel data via crowdsourcing

	No. of respondents	% of sample
Happy to share information	471	40.2
Would share information, as long as it helped own trip	217	18.5
Would share information if rewarded in some way (eg fare or fuel discount)	213	18.2
Would never share information	270	23.1

Around 70% (N=836) stated that they would like to see crowdsourced travel information available in New Zealand. These respondents specified the following types of information they would like to be available through crowdsourcing:

- number of seats available on/fullness of buses and trains, and whether or not they are stopping (eg some buses don't stop when running late)
- next-bus/train information (eg actual time until arrival, delays, cancellations, actual location of bus in real time)
- capacity for carrying bicycles and prams on buses/trains
- changes to PT timetables or routes
- feedback regarding PT drivers (eg their politeness, positive experiences when riding with them)
- accessibility information for PT options
- travel times via specified routes, including increased travel times due to incidents and expected travel times based on this information
- location and severity of accidents, congestion and roadworks/closures, information on alternative routes in advance of reaching these areas (eg optimal routes), and average travel speed there
- parking availability
- roading conditions (eg related to weather, and conditions such as major potholes for travel via car, and cycling hazards such as broken glass)
- information to help drivers navigate traffic, particularly during rush hour (ie during increased congestion)
- alternative travel options where there is an issue (eg other PT services available, alternative routes)
- local weather conditions
- affordable travel options
- crowding (eg at points of interest such as shopping malls and for safety reasons, large groups congregating in areas at night)
- carpooling/ridesharing options.

Respondents were mainly concerned about situations that could cause a delay to travel, meaning that PT fullness and delay information and congestion information were specified by the highest proportion of respondents. Some respondents also commented that they had a preference for crowdsourced data to be gathered passively (eg automatically from the user's phone), rather than the user having to manually upload information to the application or website.

Finally, participants were asked whether they believed there were any barriers to the successful introduction of crowdsourced travel information in New Zealand. Around forty-four percent (N=519) identified barriers, including:

- cost of data and lack of free WiFi in many areas across New Zealand
- 'buy-in' from the community (eg willingness and motivation to share quality data, particularly if data is shared manually by users rather than passively accessed from phones)
- lack of participation from certain demographic groups with limited interest
- lack of population density (apart from the major centres – Auckland, Wellington) leading to poor uptake/participation and therefore ineffective information provision, particularly for sharing information regarding PT[23]
- the possibility of data being inaccurate (eg the reliability and validity of shared data, and whether users might be purposefully untruthful or misleading)
- the possibility of creating a climate where travellers relied on this information, which might not be accurate or reliable enough
- concerns over protection of privacy, security and the misuse of information (eg using gathered information to send spam)
- limited 3G coverage in some areas, and concerns over the capacity and reliability of mobile phone networks
- people's access to required technologies (eg smartphones, data packages) to share and use such data (and poor uptake resulting in poor information quality/coverage)
- increased power consumption on mobile phones whilst running crowdsourcing applications
- legal requirements (eg inability to use mobile phones whilst driving, which would affect the amount of shared data that could be provided) and the danger of encouraging people to break this law
- concern over poor-quality applications being introduced, and whether the cost of developing applications would be viable for the small population/market in New Zealand
- increased confusion for travellers comparing different sources of data and choosing which information to take into account when making travel decisions.

Therefore, while respondents saw the merits and potential of crowdsourced travel information, they were also aware of the potential barriers to its effectiveness in the New Zealand context.

23 It should be noted that at the time of this research there were a range of applications in New Zealand that gathered information via users, to which people were willing subscribe.

9.11 Future travel information priorities

9.11.1 Method

To offset potential sample bias, the data was post-weighted before priority scores were calculated to create the final priority list for travel information provision in New Zealand in the future. The steps taken during this process are summarised and justified as follows:

- *Weighting:* A weighting variable was created based on the Ministry of Transport's Household Travel Survey sample. The weighting variable ensured the sample was comparable on age, gender and main mode of travel for commuter trips. Only commuter trips were included in the final list of information priorities because:
  - commuter trips made up 78.9% of the most frequent trips for the sample in this research
  - a commuter trip is a specified trip type in the Household Travel Survey data, ensuring an accurate weighting variable could be developed.

  Further information regarding how the weighting variable was calculated is provided in appendix E.
- *Priority score:* Priority scores were calculated on an unweighted sample and then the final tables were output with the weighting variable applied. Priority scores were calculated based on a multiplication of helpfulness ratings (scale of 1 = Very unhelpful to 5 = Very helpful) and anticipated frequency of use (scale of 0 = Never to 7 = Every day). To ensure neither measure was given additional weighting in the final priority score, the following formula was used: helpfulness rating*(frequency*(5/7)), which made the 7-point frequency-of-use scale match the 5-point scale for helpfulness.

9.11.2 Final weighted future information type priorities

The following tables (9.29–9.32) present the final weighted mean priority scores for each information type, sorted by highest mean (and therefore highest priority) to lowest, and arranged within the four information type categories. The tables have been arranged based on highest mean score within each category, indicating that real-time information is the overall highest priority, followed by route-specific information, mode comparison information, and finally, facilities provision information. The percentage of people who had accessed each information type at the baseline has also been reported, to give an indication of current availability of each information type (an important consideration in prioritisation decisions).

As can be seen in table 9.29, the first eight real-time information types relate to events that could cause delays in trips, followed by some ways this information could be provided to travellers in real-time to assist them in avoiding such delays. The first PT-specific information type in this grouping is 'Next-bus' information (rated 12th); however, other information types with higher priorities could also be related to travel via PT (eg congestion could delay those travelling by bus; weather conditions could affect mode choice; and PT-specific information could be gathered via crowdsourcing).

For route-specific information (table 9.30), the most-sought information was that about alternative routes, which tied back into the high interest in real-time delay information (eg if any locations need to be avoided to reduce delays; information about possible alternative routes). The second-ranked information type in this category also related to avoiding delays, but by changing departure times rather than altering routes.

Mode comparison information was the third-most important information type (table 9.31), indicating that the respondents were interested in exploring transport mode options (also evidenced in their mode comparison preferences in section 9.13). Traditional timetable information was the highest priority in this category, followed by comparative travel times by different modes; what modes were available for a specific journey; and travel costs by different modes. Ridesharing information was a low concern for New Zealand travellers.

Traditional information (eg route maps) were also at the top of the priority list for facilities provision information types (table 9.32). Below this, New Zealand travellers were particularly interested in the locations of key facilities such as parking; points of interest (eg restaurants, accommodation, petrol stations); and public toilets and rest areas. Disability information received a low priority score because of the high number of people who reported they could never use this information (N=822).

Table 9.29 Final weighted mean priority scores for real-time information types (N=843)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	Congestion information[b]	12.0	8.0	56.7%
2	Location of road closures	11.9	7.6	75.7%
3	Location of roadworks	11.8	7.6	71.7%
4	Location of traffic incidents	11.6	7.9	59.7%
5	Anticipated travel times based on real-time updates	9.9	8.0	66.4%
6	Weather conditions	8.7	6.9	75.5%
7	Crowdsourced information	8.1	7.9	45.5%
8	Roading conditions	8.0	7.0	64.2%
9	In-vehicle navigation information	7.9	7.8	58.0%
10	Traffic cameras (in real-time)	7.4	7.4	44.0%
11	Parking availability information	7.3	6.8	52.6%
12	Next bus information	6.0	6.2	85.9%
13	On-board public transport	5.5	6.0	72.9%
14	Next train information	2.7	5.0	35.0%
15	Next ferry information	2.4	4.8	31.4%
Overall mean		*8.1*		

a) Minimum = 0, maximum = 25 for all variables.

b) Refers to road congestion.

Table 9.30 Final weighted mean priority scores for route-specific information types (N=860)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	Alternative routes	9.1	6.8	88.3%
2	Comparison trip times for different travel times/days	7.5	6.6	78.3%
3	Directions	7.2	6.4	91.7%
4	Pictures/names of key route landmarks	5.5	5.7	78.3%
Overall mean		*7.3*		

a) Minimum = 0, maximum = 25 for all variables.

Table 9.31 Final weighted mean priority scores for mode comparison information types (N=856)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	PT timetables	7.1	6.1	93.9%
2	Travel time by different modes	6.9	6.2	82.4%
3	What modes are available for a journey	6.3	6.2	76.4%
4	Travel costs by different modes	6.0	5.9	74.5%
5	Ridesharing information	3.5	5.5	35.5%
Overall mean		*6.0*		

a) Minimum = 0, maximum = 25 for all variables.

Table 9.32 Final weighted mean priority scores for facilities provision information types (N=841)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	Route maps	7.1	6.1	95.1%
2	Location of parking	6.8	6.3	65.7%
3	Location of points of interest	5.9	5.8	72.8%
4	Location of public toilets and rest areas	5.7	6.0	67.5%
5	Walking routes/facilities/journey times	4.6	5.6	76.0%
6	Location of park-and-ride facilities	4.6	5.8	47.7%
7	Presence of steep hills/slopes	3.9	5.4	48.7%
8	Cycling routes/facilities/journey times	3.8	5.4	52.0%
9	Location of unlit roads	3.5	5.3	35.4%
10	Disability information	2.1	4.7	27.6%
Overall mean		*4.8*		

a) Minimum = 0, maximum = 25 for all variables.

9.12 Anticipated future changes to travel behaviour

Respondents were asked what changes they would be willing to consider making to their future trips if improvements meant high-quality real-time travel information was accessible. The following scenario was presented in the survey: 'If you were provided with real-time information that indicated a delay in your usual travel time, which of the following actions would you be willing to make to avoid this delay?'. Respondents were asked to tick all actions that applied for each trip type. The results are reported in table 9.33.

As can be seen in the table, respondents thought they would be most willing to change their departure time (61–65%) and their route (54–64%) for all trip types; 21–25% were willing to consider changing their travel mode for their entire trip; and 17–21% for part of their trip, in order to avoid delays. Only 9–12% of respondents thought they would make no changes to any trip type based on information received. Cancelling trips was more likely for non-compulsory trips (eg leisure and tourist trips – 11–15%) than for commuter trips (4–7%).

Table 9.33 Anticipated future changes to travel behaviour due to travel information received[a]

I would change my …	Commuter trips		Long-distance commuter trips		Leisure/ recreation trips		Tourist trips	
	No.	%	No.	%	No.	%	No.	%
Departure time	685	61.4	522	62.1	723	64.5	637	60.8
Route	674	60.4	456	54.3	718	64.0	636	60.7
Travel mode (entire journey)	284	25.4	178	21.2	276	24.6	237	22.6
Travel mode (part of journey)	230	20.6	140	16.7	215	19.2	207	19.8
I would make no changes	110	9.9	94	11.2	96	8.6	127	12.1
Destination	48	4.3	66	7.9	163	14.5	234	22.3
Cancel my trip	46	4.1	62	7.4	167	14.9	114	10.9
Not applicable	58		334		53		126	
Total[b]	*1116*		*840*		*1121*		*1048*	

a) Percentages reported are the proportions of the total sample who indicated they would take the specified action.

b) Total number of respondents who indicated they would be willing to consider making at least one change to each trip type.

Table 9.34 shows the absolute increase in proportions of respondents' willingness to make each change compared with actual rates of change at the baseline, split by trip type. For departure time, the absolute increase ranged from 7.0% to 22.1%, whereas for travel mode for the entire trip, it ranged from 7.1% to 14.9%.

Table 9.34 Total change between baseline and anticipated future changes to travel behaviour, split by trip type

Change	Commuter trips	Long-distance commuter trips	Leisure/ recreation trips	Tourist trips
Departure time	11.6%	7.0%	22.1%	17.0%
Route	3.8%	10.7%	12.3%	18.9%
Travel mode (entire journey)	10.5%	7.1%	11.5%	14.9%
Travel mode (part of journey)	8.0%	3.9%	8.1%	9.0%
Destination	1.6%	3.9%	5.2%	8.4%
Cancel the trip	1.4%	3.9%	9.8%	7.3%

9.13 Mode comparison preferences

Respondents were asked to indicate which travel modes they would like to be able to compare with each other on integrated information provision websites (table 9.35). As can be seen in the table, over half the respondents wanted to be able to compare private car, PT and active transport options on one service, in

some combination.[24] This implies there is a desire for quality, multimodal information provision services in New Zealand.

Table 9.35 Ideal mode-comparison options

Mode	No. of respondents	% of sample
Private car, PT, active transport[a]	545	54.3
Private car, PT[b]	243	24.2
PT, active transport[c]	122	12.2
Private car, active transport[d]	80	8.0
All available PT modes[e]	12	1.2
Active transport modes[f]	2	0.2
Total	*1004*	*100.0*

a) Most common combination was car, bus, walking and cycling (N=175).

b) Most common combination was car and bus (N=158).

c) Most common combination was bus and walking (N=50).

d) Most common combination was car, walking and cycling (N=32).

e) Most common combination was bus, train and ferry (N=6).

f) Only combination was walking and cycling (N=2).

9.14 Accessibility information preferences

Eighteen percent (N=216) of the respondents indicated they would like to access travel information relating to accessibility and facilities for those with disabilities. They thought the following types of accessibility travel information would be most helpful:

- which buses can become lower (ie 'kneeling' buses) to allow access for passengers in a wheelchair or with limited mobility, and the accessibility of other PT services (including services with ramps available and services that have access for wider wheelchairs)
- location of areas undergoing footpath maintenance, and accessible alternatives to these areas
- the presence of tactile pavers, accessible footpaths and other provisions (eg voice-activated buttons at lighted pedestrian crossings)
- location and availability of accessible parking (both park-and-ride facilities and at points of interest, such as shopping malls), restrooms and lifts
- availability of wheelchairs for use at points of interest, and crowding in those areas
- information for people with visual and hearing impairments, provided in appropriate forms (eg braille and spoken/audio information)
- information for people who do not speak English

24 Categories were broken down in the survey to car, bus, train, ferry, walking, cycling or 'other'. Participants could select any possible combination of these. 'Other' transport modes specified were plane, carpooling, motorbike/moped, running and cable car.

- capacity to carry items required by those with disabilities (eg walking frames, wheelchairs) and capacity to carry prams (optimally updated in real time)
- availability of assistance from staff
- passengers' feedback about PT drivers (including friendliness and driving style)
- maps with routes and facilities marked clearly
- distances that must be travelled on foot without assistance (for those with limited mobility and the elderly) and presence of steep hills (including gradient information), other difficult terrain, and locations of unlit areas

9.15 Freight driver subsample

9.15.1 Sample

Ninety-two percent of the freight driver sample were male (N=60). Table 9.36 provides a breakdown of this subsample's age distribution, ethnicity and region lived in. As can be seen in the table, the majority of this subsample (59%) was from Auckland; however, freight drivers living throughout New Zealand completed the survey.

Table 9.36 Breakdown of age and region lived in for the freight driver subsample

	No. of respondents	% of subsample
Age group		
16–24 years	2	3.1
25–34 years	3	4.6
35–44 years	16	24.6
45–54 years	25	38.5
55–64 years	16	24.6
65–74 years	3	4.6
75+ years	0	0.0
Total	*65*	*100.0*
Ethnicity		
European	55	84.6
Maori	5	7.7
Other[a]	5	7.7
Total	*65*	*100.0*
Region lived in		
Auckland	38	59.4
Wellington	3	4.7
Christchurch	4	6.3
Other[b]	19	29.7
Total	*64*	*100.0*

a) 'Other ethnicities = Kiwi and New Zealander.

b) 'Other' regions specified were Gisborne, Hamilton, Marton, Northland, Palmerston North, Picton, Rotorua, Taupo, Tauranga, Temuka, Thames, Turua, Waihi and Whangarei.

9.15.2 Characteristics of the freight driver subsample

The area of New Zealand primarily covered for this subsample and freight type delivered are shown in tables 9.37 and 9.38 respectively, both of them sorted by most common to least. As can be seen, a good spread of both area and freight type was achieved.

On average, respondents drove 43.5 hours per week, ranging from 2 to 70 hours (SD=22.6). Only 8% (N=5) of the subsample had no flexibility in their route when delivering goods (eg due to carrying over-dimension freight and therefore having their route set by High Productivity Motor Vehicle (HPMV) permits). Forty-nine percent of the subsample (N=32) had some flexibility in their route when unexpected events occurred, and the remaining 43% (N=29) had complete flexibility in their route and were able to plan it themselves. Therefore, 92% of the freight driver subsample had some capacity to alter their routes if necessary.

Table 9.37 Areas of New Zealand primarily covered by the freight drivers

Area	No. of respondents	% of subsample
Upper North Island	28	43.1
Whole of New Zealand	12	18.5
Whole of North Island	11	16.9
Whole of South Island	6	9.2
Other[a]	6	9.2
Lower North Island	2	3.1
Total	*65*	*100.0*

a) 'Other' areas were Auckland and Gisborne/the East Coast of the North Island.

Table 9.38 Types of freight delivered

Types of freight	No. of respondents	% of subsample
Other[b]	41	62.1
Wood products	14	21.2
Metals	14	21.2
Produce	12	18.2
Fertiliser	10	15.2
Sawn timber	7	10.6
Minerals	7	10.6
Cement	6	9.1
Logs	6	7.6
Oil products	5	7.6
Dairy	4	6.1
Livestock	3	4.5
Coal	3	4.5
Meat	1	1.5
Wool	1	1.5
Milk	1	1.5
Total	*66*	*100.0*

a) Types of freight obtained from Bolland and Weir (2005).

b) 'Other' types of freight delivered were aggregates, boats, containers, chilled goods, concrete and plastic piping, construction materials, containerised freight, courier freight, currency, fragile goods (eg electronics and whiteware), furniture, gas, glass, machinery, medical goods, vehicles, paper, structural steel, tyres and water.

9.15.3 Baseline travel information sources for freight drivers

Table 9.39 shows the technologies that freight drivers reported having access to in their vehicles that could be used to gather travel information. As can be seen, mobile phones were the most commonly available, followed by GPS systems, radios and a dispatcher.

Table 9.39 Information provision technologies available in freight vehicles

Information provision type	No. of respondents	% of subsample
Mobile phone	62	93.9
GPS navigation system	44	66.7
Radio	35	53.0
Dispatcher	31	47.0
Other[a]	5	7.6
Total	*66*	*100*

a) 'Other' technologies specified were internet/3G data connection, map books and general knowledge.

The freight drivers were asked which travel information sources/services they had accessed in the year before they completed the survey (table 9.40). Websites were accessed equally as frequently as GPS systems (67%), with dispatcher (61%), VMS signs and other drivers (56% each) being the next most commonly accessed information source.

Table 9.40 Baseline access to travel information service types/sources for freight drivers

Information provision type	No. of respondents	% of sample
Websites	44	66.7
GPS navigation system	44	66.7
Dispatcher	40	60.6
VMS signs	37	56.1
Other drivers	37	56.1
Radio	32	48.5
Paper-based information	30	45.5
Mobile phone applications	29	43.9
Other	0	0.0
Total	*66*	*100*

9.15.4 Baseline travel information types for freight drivers

Mean ratings of helpfulness of the travel information types that had been accessed by freight drivers over the past year are reported in table 9.41, sorted by those rated most helpful to least, and including the number and percentage of the subsample that had accessed the type of information specified. Mapped routes and the location of road closures that would affect such routes were rated most helpful by freight

drivers; however all means (apart from the 'other' category) were higher than 3, indicating that all information types were considered at least helpful by the subsample.

Table 9.41 Current level of access to, and mean helpfulness rating of, travel information types for freight drivers[a]

Travel information type	Mean	SD	No. of respondents	% of subsample
Mapped routes	4.3	1.0	61	92.4
Location of road closures	4.0	1.2	50	78.1
Estimated journey times	3.9	0.9	51	81.0
Locations of facilities (eg petrol stations)	3.9	1.0	56	87.5
Weather conditions	3.9	1.1	55	85.9
Location of traffic incidents	3.9	1.1		84.1
Mapped routes customised to be suitable for vehicle driven and load carried	3.8	1.1	39	60.0
Estimated journey times updated in-trip based on real-time information	3.8	1.1	49	77.8
Location of roadworks	3.8	1.0	50	78.1
Roading conditions (eg presence of snow, ice and/or high winds)	3.8	1.2	53	82.8
Locations with weight/height/width restrictions	3.7	1.2	50	78.1
Congestion	3.7	1.3	51	79.7
Carriage of dangerous goods	3.6	0.8	37	59.7
Locations of rest areas and inspection facilities	3.5	1.0	38	60.3
Other[b]	3.0	1.0	16	29.6

a) Minimum = 1, maximum = 5, neutral (midpoint) = 3 for all items.

b) 'Other' information types specified were local knowledge and traffic reports.

9.15.5 Baseline overall helpfulness of travel information accessed by freight drivers

The freight drivers were asked to rate the overall helpfulness of all travel information they had accessed over the previous year. This item had a mean of 4.1, indicating the subsample had found the travel information they had accessed helpful in general (SD=0.7.

A scale using 10 items was formed to explore the perceived quality of travel information services accessed previously. This scale had a mean score of 34.2 (SD=5.4), ranging from 21 to 47, and a Cronbach's Alpha of .87. This showed that the freight drivers were relatively consistent in their responses to this bank of items. Individual item statistics are shown in table 9.42, arranged from highest mean (highest level of agreement with item) to lowest.

As shown in the table, the freight drivers agreed most strongly that the information services they had accessed over the past year was easy to use and understand, provided helpful information, and generally came from trustworthy sources. Respondents were undecided as to whether current information services provided consistent information between sources, and did not believe that they provided comprehensive information or were updated regularly.

Table 9.42 Quality of travel information services accessed – scale item statistics[a]

Item	Mean	Std. dev.
In general, the traveller information services I used in the past 12 months …		
Were easy to use and understand	4.0	0.7
Provided very helpful information	3.8	0.7
Generally came from trustworthy sources	3.8	0.6
Provided reliable and accurate information	3.7	0.7
Provided route-specific information	3.6	0.8
Provided value for money	3.5	0.8
Were highly customisable	3.2	0.8
Provided consistent information between sources	3.0	0.9
Provided comprehensive information	2.8	1.0
Were updated regularly (ie provided up-to-date information)	2.7	0.9

a) Items on a 5-point scale ranging from 1 = Strongly disagree to 5 = Strongly agree, midpoint (neutral) = 3.

9.15.6 Freight drivers' perceived barriers to accessing travel information

The freight drivers were asked about barriers to drivers accessing the travel information that was available to them (table 9.43). As can be seen, the majority of this subsample (68%) believed nothing had stopped them from accessing a range of information services. The most common barrier mentioned was the time it took to gather information. In addition, in line with the findings from the previous section, poor updating and inconsistency between information sources were also major issues.

Table 9.43 Freight drivers' self-reported barriers to accessing available travel information services[a]

Reasons	No. of respondents	% of subsample
Reasons for not using the travel information services currently available in New Zealand (select all that apply)		
None – a wide range of information services used	45	68.2
It takes too much time to gather enough information from them	11	16.7
They are not updated regularly enough	9	13.6
Different services provide conflicting information	9	13.6
They are not reliable enough	6	9.1
Other[a]	4	6.1
Not aware of availablility	3	4.5
They cost too much	3	4.5
They do not have the types of information needed	3	4.5
They are not comprehensive enough	2	3.0
They are too difficult to use	2	3.0

a) The only 'Other' barrier identified was the lack of need for information because only a set run was being driven each day, meaning information was only needed if delivering outside of the usual delivery area.

9.15.7 Baseline changes to travel behaviour for freight drivers

Over half (55%, N=36) of the freight drivers believed they had made changes to their travel behaviour in the past year based on travel information they had received. On average, these respondents had altered their behaviour 18% of the time for their freight trips, ranging from 1% to 60% (SD=14.5). The specific types of changes these drivers reported making to their trips are detailed in table 9.44.

The majority of the subsample (92%) had changed their route in the past year based on information received, with changing the departure time for a freighting trip also being common (58%). Changing destinations or cancelling trips was much less common.

Table 9.44 Types of changes made to freighting trips in the past year

Change	No. of respondents	% of subsample
Route	33	91.7
Departure time	21	58.3
Destination	4	11.1
Cancelled trip	1	2.8
Other	0	0.0

9.15.8 Example of a freighting journey planner presented (see appendix D6)

Around 60% (N=39) of the freight drivers were not aware that journey planners for freight drivers, such as the one presented as part of this survey, existed internationally. Table 9.45 shows the mean helpfulness ratings of the features of the website.

As shown in the table, road-closure information, locations with weight/height restrictions and incident information were rated as most helpful. However, all means were over 3, indicating the freight drivers believed all the information types available would be helpful.

Table 9.45 Mean helpfulness ratings on features of the journey planner for freight drivers[a]

Features	Mean	Std dev.
Road-closure information	4.4	0.9
Locations with weight/height restrictions	4.4	0.9
Incident information	4.3	0.9
Ability to avoid specific areas, based on specified restrictions	4.2	1.0
Route planner	4.2	1.0
Congestion information	4.2	0.9
Location of roadworks	4.2	1.0
Locations of points of interest (eg rest areas, loading bays, petrol stations)	4.1	1.0
Ability to input truck specifications	4.0	1.1
Ability to set required departure time	3.9	1.0
Ability to set required stop/break durations	3.9	1.0
Ability to set required arrival time	3.8	1.0
Carriage of dangerous goods information	3.8	1.1

a) Items on a 5-point scale ranging from 1 = Very unhelpful to 5 = Very helpful, midpoint (neutral) = 3.

Tables 9.46 and 9.47 display, respectively, how likely the freight drivers would be to use such a website if it was available in New Zealand, and how frequently they would use it. As can be seen, the majority of the subsample (76%) believed they would use such a website and over 70% believed they would use it at least once a week or more.

Table 9.46 Freight drivers' self-reported likelihood of using a freighting journey planner

Highly unlikely		Unlikely		Neutral		Likely		Highly likely		Not sure
No.	%	No.	%	No.	%	No.	%	No.	%	No.
3	4.8	7	11.1	5	7.9	23	36.5	25	39.7	1

Table 9.47 Freight drivers' self-reported frequency they would be likely to use a freighting journey planner

Never		Less than monthly		Monthly		Less than weekly		1–2 times/week		3–4 times/week		5–6 times/week		Daily	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
5	7.9%	5	7.9	2	3.2	5	7.9	15	23.8	8	12.7	5	7.9	18	28.6

Finally, freight drivers were asked how such a planner could be improved before introducing it in New Zealand. The following suggestions were made:

- Ensure the site is user friendly.
- Ensure it is updated in real time or very regularly (otherwise it will have limited usefulness) – especially regarding traffic conditions and other situations/factors that could result in delays in trips. Include average traffic speeds at congestion points and historical congestion patterns where appropriate and applicable.
- Ensure information covers rural, as well as urban, areas.
- Include the ability to set up customer sites and geo fences,[25] depending on individual needs.
- Include alternative-route options to avoid congestion/incidents/accidents (real-time).
- Include information regarding effluent dump sites and saleyard information, for those transporting livestock.
- Include the ability to specify multiple drop points in a single planned route.
- Include the ability to specify load limitations.
- Include points of interest – eg location of weigh points, fuel truck stops for various suppliers, tyre shops, truck repairs, and affordable accommodation that has adequate parking for trucks.
- Include the ability to specify both shortest and quickest routes, and compare the cost/time of them.
- Include the ability to add specific detours to planned routes and to change routes as the user sees fit.
- Include the distance affected by roadworks.

25 Geo fences are virtual perimeters for real-world geographic areas.

- Include integration with satellite images and street views.
- Include ferry crossing information and contact details.
- Include an option to integrate with a driver's log book, to reduce data entry time.
- Include the ability to provide feedback on experiences at truck stops.
- Include integration with in-vehicle technologies, such as GPS systems, so real-time updates are provided to drivers in real time.
- Ensure the planner is piloted by a variety of personnel working in the freight industry prior to its launch, and make amendments as necessary.
- Ensure the final tool is a comprehensive 'one-stop shop' that integrates all relevant information.

Other respondents raised some concerns about the introduction of such a website, including information accuracy (some navigation systems that are already available send drivers down unsuitable roads) and the possibility that the provision of such information could shift points of congestion as high numbers of vehicles detour to alternative routes. Some respondents also commented that the cost to implement such a system in New Zealand may be too high, due to the small population base.

9.15.9 Anticipated future changes to freighting trips

The freight drivers were asked what changes they would be willing/able to make to their trips in the future if travel information provision was improved, and therefore real-time information that could be acted upon to avoid delays was easily accessible (table 9.48).

As can be seen, only 8% of the freight drivers reported they would not be willing/able to make any changes to their trips (the same drivers who reported having no flexibility in their route). The vast majority (92%) anticipated they would change their route in the future to avoid delays, and 57% would alter their departure times if necessary.

Table 9.48 Anticipated types of changes the drivers would make to freighting trips

Changes	No. of respondents	% of subsample
Route	60	92.3
Departure time	37	56.9
Destination	5	7.7
Cancel trip	4	6.2
No changes	5	7.7
Other changes	0	0.0

9.15.10 Future information provision for freight drivers

The freight drivers were asked how they believed information provision could be improved for them in the future. They made the following suggestions:

- Up-to-date real-time information on the location and severity of incidents that could cause delays (eg roadworks, congestion, road closures), and updated anticipated trip times, should be provided via text message or GPS device integration.

- A user-friendly, comprehensive, integrated website that provided real-time information (such as the one discussed in the previous section) should provide consistent information, be customisable, highly accurate and reliable, and free of charge to those in the freight industry.
- The development of any information provision systems should be done in conjunction with the freight industry, and driver input (eg crowdsourced information) would be beneficial.
- Increase the amount of travel information available on local radio stations (eg up-to-date traffic reports).

Some freight drivers felt they had gained sufficient knowledge from experience with routes to make additional travel information unnecessary, other than that gained through CB radio use. Some also felt that any budget allocated to assisting the freight industry should be put towards fixing/improving the roads in the first instance.

10 Discussion of results from the online survey

10.1 Travel information, mode choice and behaviour change

The online survey respondents indicated they were willing to alter their travel behaviour to improve their travel experiences, particularly if they were provided with improved travel information. This indicates that there is an information need to be filled in New Zealand.

It was found that the survey respondents were already altering their travel behaviour based on information they were currently accessing (46% had altered their travel behaviour because of travel information received in at least one instance in the 30 days prior to completing the survey). Commuter trips were altered most often (28%). Those residing in Christchurch altered their travel behaviour for work trips significantly more often than those in Wellington. This could possibly be a result of roading network disruptions after the Canterbury earthquake sequence.

The most commonly reported types of changes the respondents reported making to their trips were a change of route (42–57%) and/or departure time (42–55%) for all trip types (commuter, long-distance commuter, leisure/recreational trips and tourist trips). Transport mode had been changed for part of a trip in at least one instance in the previous 30 days for 11–13% of respondents, with 8–15% changing mode for an entire trip. This implies that New Zealand travellers may be more likely to change their travel mode than the travellers surveyed overseas. For example, the US Department of Transportation[26] found that only 1% of travellers surveyed had changed their mode for prior trips, 9% had changed their route, and 13% had changed their departure time.

When provided with examples of enhanced information provision, the most common changes the online survey respondents were willing to consider making were a change of route (54–64%) and/or departure time (61–65%) for all trip types. Some (21–25%) were also willing to consider changing their travel mode for their entire trip, in order to avoid delays, and 17–21% were willing to consider this for part of their trip. Between 9% and 12% of respondents indicated they would make no changes to any trip type to avoid delays based on information received. These anticipated rates of change increased from the baseline for all possible travel behaviour changes for all trip types. For example, there was an absolute increase of between 7% and 15% of respondents reporting a willingness to change their travel mode for their entire trip compared to actual rates of mode shift at the baseline (varying in proportion by trip type).

With regard to travel mode shift, only 20% of the respondents said they would never consider changing their travel mode based on travel information received, with 58% stating they would consider changing their travel mode.[27]

These findings together imply that New Zealand travellers are willing to make changes to avoid delays and improve their travel experiences, based on advice received from information services. However, it should

26 www.ops.fhwa.dot.gov/publications/manag_demand_tis/travelinfo.htm

27 Respondents were asked for their level of agreement with the following statement: 'No matter how much information was provided to me, I would never consider changing my travel mode for any trip' (see table 9.4 for further information).

be noted that reported willingness to change behaviour may over-represent actual changes to behaviour. For example, Bamberg (2000) cites the findings of meta-analytic reviews that found intention generally accounts for 20–30% of variance in actual future behaviour. As an example of the effects of this, applying a conservative 20% figure to the increased proportion of respondents who anticipated they would be willing to change their travel mode (for their entire trip) for commuter trips would equate to a projected actual behavioural increase of 2.1%. Therefore, it could be expected that with improved travel information provision in New Zealand, mode shift for commuter trips would increase from 14.9% at the baseline to 17.0% (remembering that some of the mode shifts would be from other modes to the car mode).

The following sections detail what information the online survey respondents were already accessing, and how information provision could be enhanced in the future.

10.2 Use of, and satisfaction with, current New Zealand travel information

The findings provided a ranked priority list to identify the respondents' most important information types based on what is currently available. Web-based information had the best market penetration or reach, with almost all (95%) of respondents currently accessing travel information via this medium. Real-time information at PT stops came in second, at 69%, with paper-based information coming in third most commonly accessed, at around 66%. This variation in means of accessing information highlighted the importance of ensuring information is available via a number of media, particularly lower-tech options for those with limited (or no) access to modern technologies (as also noted in Zografagos et al 2010 and Marks 2008). Information services that were accessed less frequently by respondents included one-on-one communications direct with staff (eg in person or via a telephone) (16–23%).

Traditional types of information (eg step-by-step directions, PT timetables and route maps) were the most common forms that had been accessed by the respondents over the past year (92–95%), and these were also rated as the most helpful forms of information. Respondents also found real-time information, such as that provided in-vehicle by a GPS system, or real-time bus arrival information, equally helpful. The importance to travellers of real-time information has also been evidenced elsewhere (eg Cluett et al 2003; Kandarpa 2010).

The perceived quality of travel information services currently available varied slightly for the respondents. It was agreed that services were easy to use and understand, provided helpful information, generally came from trustworthy sources and provided both route-specific and reliable and accurate information. However, they were undecided as to whether sources of information were updated regularly, provided comprehensive information or allowed for multimodal comparison. There was no variation in the perceived quality of available services for those living in different regions (Auckland, Wellington, Christchurch, other) or those living in urban/suburban versus rural areas, indicating that what was provided was at least perceived as comparable across the nation. This may have been related to the fact the respondents appeared to be realistic in their expectations of what was provided, which was a recurring theme in both the focus group findings and the online survey findings. For example, while a high proportion of the online survey respondents would like crowdsourced information to be available in New Zealand, many could only see it working in densely populated areas such as Auckland. In addition, rural focus group participants often stated that various information provision possibilities were excessive for what was required and/or viable in a rural area.

More than half (55%) of the online survey respondents felt there were no barriers stopping them from accessing the travel information services available. The most common barriers that were perceived were a lack of knowledge of what information services were available, and difficulty in comparing travel modes, due to a lack of such services being accessible (19% each). The cost of accessing information was a very low concern (4%), probably because what was available in New Zealand at the time of this research was generally free. This conclusion was in line with the findings of the focus groups, where participants said they were generally unwilling to pay for travel information, and earlier overseas research (eg Lyons et al 2007; Khattak et al 2003; Zhang and Levinson 2006; Dziekan and Kottenhoff 2007).

These findings suggested that while the online survey respondents were accessing a wide range of information via various delivery modes (eg internet, paper-based and VMS), there was room for improvement in what was provided. The next section describes the respondents' most desired improvements in the provision of travel information in the future.

10.3 Future travel information provision priorities in New Zealand

In order to get a representative picture of information priorities for the New Zealand travelling population, the online survey sample was weighted to match the Ministry of Transport's Household Travel Survey sample on age, gender and main travel mode. Priorities for commuter trips were identified as most important, as these trips constituted around 80% of the most frequent trips for the online survey respondents.

Accurate real-time information was the highest priority for future improvements to information provision for commuter trips, followed by information specific to a particular route, information that allowed travellers to compare travel mode options, and information regarding the provision of facilities. This prioritisation was similar to that of previous overseas research (eg Cluett et al 2003) and is also logical; poor or incomplete real-time data would lead to poor-quality information in all the other areas.

The most important real-time information was with regard to delays in trips and providing information about this to travellers making commuter trips, including (in priority order): congestion information; the location of road closures, roadworks and traffic incidents; expected travel times based on real-time updates; and weather conditions. While this type of information could be useful for PT users (eg congestion could delay trips via bus; weather conditions could affect transport mode choice), the highest-rated PT-specific information type was 'next-bus' information, which rated twelfth overall. This indicated that on the whole, New Zealand travellers were more concerned with receiving high-quality real-time information related to their car trips than for any other mode. This was in line with the current travel-mode split in New Zealand (eg private cars are used at a much higher rate than PT). However, over half the respondents (54%) said they would like to have access to a multimodal travel information service that allowed them to compare trips by private car, PT and active transport options, indicating that this type of information was a priority for travellers. Previous overseas research also found that integrated planners were highly valued among travellers (eg Schweiger 2011; Pathan et al 2011).

For route-specific information, the most sought-after information was about alternative routes for trips that would help travellers avoid any current delays. The next priority in this category was the ability to compare trip times (based on different times and days that could be travelled) in order to change the departure time to avoid delays.

Traditional timetable information was the highest priority in the mode-comparison category, followed by comparative travel times by different modes, what modes are available for a specific journey, and travel costs by different modes. Ridesharing information was a low concern for New Zealand travellers.

Traditional information (eg route maps) was the most popular type of facilities provision information, followed by the locations of key facilities such as parking, points of interest (eg restaurants, accommodation, petrol stations), public toilets and rest areas. Disability information received a low priority score because of the high number of respondents who stated they would never use this information. However, 18% of the respondents indicated they would like accessibility information to be available, particularly regarding which PT vehicles were accessible for those with disabilities; the locations of factors that could hinder or improve accessibility (eg footpath maintenance, location of tactile pavers); and the location and availability of accessible parking, restrooms, lifts and provisions such as wheelchairs at malls.

In terms of how this information could be delivered to New Zealand travellers, over 80% of the survey respondents anticipated they would have access to smartphones, laptops and WiFi connections within the next five years (65–84% already had access to one or more of these). Fifty percent of respondents anticipated they would have access to 3G data packages within the next five years. Therefore, modern forms of information delivery were an attractive and viable option for information delivery in the future, but other low-tech forms of information delivery (eg paper-based, in person, via phone) were still important to ensure accessibility for all travellers. This notion has also been supported by overseas authors such as Zografos et al (2010) and Marks (2008).

10.4 Requirements for freight drivers

10.4.1 Behaviour change in freight drivers

Nearly all (92%) freight drivers had at least some flexibility in their route, meaning improved information provision could improve travel experiences for this user group. These drivers were proactive information seekers, with over half (55%) reporting having made changes to their freighting trips in the past year based on travel information received, at an average of 18% of the time. Most of the freight drivers had changed their route (92%), and altering departure times was also common (58%).

In line with the proportion who reported they had no flexibility in their route, only 8% of this subsample stated they would not be willing/able to make any changes to their freighting trips in the future if information provision was improved. Anticipated types of changes for those who suggested they could change their route matched the pattern of the changes the subsample had already made to their trips in the past (ie 92% would be likely to change their route; 57% would be likely to change their departure time).

The following sections detail what information New Zealand freight drivers were already accessing and how information provision could be enhanced in order to improve this user groups' travel experiences.

10.4.2 Freight drivers' current use of, and satisfaction with, travel information provision

In terms of information delivery modes, nearly all (94%) freight drivers had access to a mobile phone that could be used to gather travel information. GPS navigation systems, radios, and the dispatcher, respectively, were the next most commonly available technologies.

Websites were accessed equally as frequently as GPS systems (67%) for travel information. The dispatcher (61%), VMS signs, and other drivers (56% each) were the next most commonly accessed information source.

Mapped routes and the location of road closures were rated as the most helpful types of information available to freight drivers. Mapped routes were accessed by almost all of these respondents (92%); road closure information was accessed at a lower rate (78%).

Nearly 70% of this subsample felt there were no barriers to them accessing the travel information currently available. The most common barrier they identified (17%) was the amount of time required to gather enough information from the services available.

The freight drivers felt that the travel information services they had accessed were easy to use and understand, provided helpful information, and generally came from trustworthy sources. However, they did not believe the information available at present was comprehensive or that it was updated regularly.

These findings suggest that while freight drivers were accessing a wide range of travel information via various delivery modes, improvements in what is provided would be beneficial; their preferred improvements are detailed in the next section.

10.4.3 Freight drivers' priorities regarding future travel information provision

The majority of the sample (60%) were not aware that journey planners for freight drivers, like the one presented in the survey, existed internationally (see appendix D6 for further detail). However, 76% believed they would use something similar if it was available in New Zealand, and most (over 70%) anticipated they would use such a site once a week or more. This anticipated frequency of use for the freighting information provision service was higher than for any of the information service examples presented to the general sample. This was in line with expectations, as professional drivers travel a higher number of kilometres more regularly, and with larger implications from delays, than the general population.

Road closure information, locations with weight/height restrictions and incident information were rated as most helpful. However, mean helpfulness ratings for all information types provided on the site were over 3, indicating the freight drivers believed all the information types available would be at least helpful. This finding was in agreement with previous international literature, which emphasised the importance to freight drivers of pre-trip information to assist in route choice and in-trip updates on events that may cause delays (eg Veneziano et al 2010; Booz Allen Hamilton 2010).

The majority of the freight driver subsample commented that the introduction of a user-friendly, comprehensive, integrated website that provided real-time information would be beneficial in New Zealand. The most frequently requested information was the location and severity of incidents that could cause delays, including updated expected trip times. However, some respondents believed improvements to freight information provision in New Zealand was unnecessary and that any available budget should be spent on other priorities (eg improving roads).

10.5 Limitations to this data

Due to the nature of the survey, there were three main limitations to the data gathered, as follows:

1 *Web-based survey:* Because the data was collected via a web-based survey, there was potential for some bias to the survey sample and therefore the data gathered. The fact that anyone who completed the survey had to have some level of internet access may have resulted in a higher reported reliance on the internet (95% of survey respondents) to gather travel information than exists amongst the general population. However, this was considered the appropriate method for data collection given the nature of the survey design. For example, this method allowed added flexibility for question presentation based on previous answers, and there was a need to gather respondents from regions across the whole of New Zealand.

2 *Oversampling of PT users and cyclists:* While it was an aim of the study to oversample such populations in order to be able to effectively explore transport mode shift and preferences, this oversampling is also a potential bias and means the sample is not representative of the New Zealand travelling population as a whole. For example, interest in multimodal information, and willingness to shift transport mode based on information received, may have been higher in the sample than for the general public. This limitation was reduced by weighting the sample to match the New Zealand traveller population (based on the Ministry of Transport's Household Travel Survey data) for the final information priority tables, which are the main output of the study. Further information regarding the method for weighting the sample is provided in section 9.11.1 and appendix E.

3 *Self-reporting of behaviours and intentions:* This resulted in some inherent bias in the data due to the possibility of inaccurate recall of past behaviour, and inconsistencies between intended behaviour and actual behaviour at a later date. Further biases may also be present in the data due to the nature of the survey, where respondents were making decisions based on example information provision systems they had not used in real life. While these biases were unavoidable given the topic and goals of the survey, they have resulted in an inherent bias in the data collected and presented.

10.6 Conclusions from the online survey

Overall, the online survey found that satisfaction with the existing information provided to travellers within New Zealand has been good. However, some gaps in travel information provision were identified, which could, if addressed, lead to enhanced travel experiences. This gap was evidenced by travellers' willingness to consider changing their travel behaviour if information provision was improved, and self-reported barriers to information access, including a lack of knowledge of what was available and an inability to access desired information. Improvements to information provision could improve people's travel experiences and potentially promote increased use of alternative transport modes (eg PT and active transport options).

High-quality, real-time information was the highest priority for future improvement, as it would offer solutions for travellers faced with unexpected impediments to travel, such as traffic accidents, PT service delays, or even poor weather. This would also improve the accuracy of route-specific and multimodal information (see section 9.11.2 for a summary of priorities for information provision for the future for New Zealand travellers). The findings suggested that the information delivery medium is unlikely to be an issue in the future, with most of the respondents able to access technologies to gather information (eg

smartphones, WiFi connections). However, access to lower-tech forms of delivery (eg paper-based information) is also required, so multiple media should be used in order to maximise accessibility.

An overarching theme throughout the survey findings (and also the focus group findings and previous literature search) was the importance of the specificity of travel information; travellers wanted to be able to access information that was specific and customisable to themselves and their specific trips. However, the survey respondents also had realistic expectations and were aware of the importance of population density to the success of different information provision initiatives. They therefore only wanted them introduced where they would be affordable, reliable and useful.

Summary of research results and recommendations for the provision of multimodal travel information systems

11 Summary of the results from this research project

11.1 Literature and best-practice review results

The key user groups that were identified as the Transport Agency's 'customers' were urban commuters, long-distance commuters, freight drivers, rural travellers, tourists/international travellers and people involved in Civil Defence emergencies/planned evacuations.[28] Through the literature review process, three other groups were identified: users who were new to the system; those who were experienced with a system; and those who had different abilities. A summary of the potential information needs for the different groups/trip purposes is provided below.

Table 11.1 Summary of potential information needs

Trip purpose	Potential information needs
Urban commuters	Detours/delays
	Availability of alternative routes
	Ability to compare different modes/option to mix modes (including information for users who are new or experienced, or with different abilities – eg safe dropoff points, broken lifts/escalators, walking information and accessible websites, help in identifying the correct bus and exit stop)
	Timetables and fares for PT
	Trip time
	Comparative trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles)
	Weather
	Parking availability and cost
	Where park-and-ride facilities are and how they can link with other modes
	Also: • unusual parking issues eg resident parking rules for out-of-town commuters • rest stops/ toilets (holidays) • road congestion • ability to deselect information on a map
Long-distance commuters	Parking availability and cost
	PT alternatives
	Ridesharing options (although participants did not think they were likely to use this)
	Also: • ability to compare rental cars & specs (eg hybrid) • good rest areas & cafes

28 Following the focus group stage of the project, the Civil Defence emergencies/planned evacuations group was dropped as it was felt that the needs for people involved in these events should be progressed separately in conjunction with Civil Defence and local authorities.

Trip purpose	Potential information needs
	• clean toilets • major delays/accidents • train timetables, delays, etc
Local rural trips	Planned road closures
	Incidents
	Weather
	Requirements for chains
	Also: • information displayed as soon as event happens on state highways • unplanned road closures
Tourists/ international travellers	Visual information to help orient them within the environment
	Knowledge of what to visit and the easiest way to get there
	Directions to, and how to use, alternative transport modes
	Directions to parking places
	Also: • how to summon help eg 111 • rest stops/hotels • speed limits along the route • safe roads/blackspots • safe times to travel
Freighting	In-trip updates on conditions that might cause delays and re-routing – eg weather/incidents/ congestion
	Roadworks
	Pre-trip – route-planning information that provides accurate journey times
	Locations that have height or weight restrictions
	Location of rest areas and inspection facilities
	Also: • points of interest (eg rest areas, petrol stations) • information-gathering from companies to be shared

11.2 Focus group results

Four focus groups (Auckland, Wellington, Christchurch and Masterton) were held to examine key travel information needs. The locations were chosen to give a mix of geographical layout, population size, underlying infrastructure provision, and popularity of different modes. Participants included people who utilised bicycles, cars, motorbikes and PT, as well as commercial freight drivers. A summary of the findings, by mode, is given in the next table.

Table 11.2 Points of difference between different modes of travel

Mode	Information needed
Car	• Delay, congestion, roadworks • Car parking (eg availability, cost, and any rules that apply to on-street parking) – the cost of car parking can weight the shift to using PT instead of a private motor vehicle • Ridesharing information was not required by the majority, as they would not consider ridesharing with people they did not know
Motorbike	• Congestion information not required, as motorcyclists can move to the front of traffic queues, and accessing real-time information would require stopping and taking off gloves and helmet
Cycle	• Congestion information not required, as above • Continuity of cycle paths – although the lack of these was a big barrier to people changing to cycling as a mode of transport, and providing this information may discourage people from cycling • Up-to-date information on where cycle paths are closed and areas that are unlit (Christchurch)
Walking	• Safety information such as safe places to walk, whether the area is lit at night and, in the case of Christchurch, where footpaths are closed
PT[a]	Needs vary according to whether the user is: • taking a regular trip (= just want to know, in real time, when the next vehicle is leaving the stop) • taking a different or out-of-the-ordinary trip (= then need to know times and connections) • new to the system (= then need 'how-to-ride' information)
People with different abilities[b]	• Information related to mobility eg broken lifts/escalators, uneven ground • Assistance in identifying the correct bus and exit NB: All Government websites must adhere to New Zealand Government Web Standards 2.0 Web Content Accessibility Guidelines 2.0 (level AA), which provide guidance to help remove from websites many accessibility barriers for people with impairments.
Freight	• A travel-planning tool that includes freight operators' needs – could also be used when diversions are planned by local authorities to ensure that freight operators can use the routes they are diverted to • Accurate journey times and locations, and in-trip information on conditions that might cause delays, via dispatcher • Locations that have height or weight restrictions • Locations of rest areas and fuel stops that have adequate space for a rig (including when the load is livestock and the truck cannot stop in a built-up area)

a) This category contained a relatively small sample size of daily bus riders. (The online survey specifically targeted the recruitment of regular bus users.)

b) This category was from the literature review, as the focus groups contained only a small sample size of people with different abilities.

Overall, travellers were not aware of all the information currently available to them. Users commented that they did not exhaustively examine different sites for information. This indicates a challenge for information providers to offer easily accessible information that can be tailored to the individual.

11.3 Online survey results

Based on information gathered in the literature review and focus group stages of this research, the online survey aimed to gain a better understanding of what New Zealand travellers seek in terms of information provision and to:

- estimate the number of people who, if provided with the right information, might improve their travel experience by altering their travel behaviour (eg travel time, travel route or travel mode), split by trip type
- obtain information on people's current access to technology and their intention to purchase new technologies within the next five years (eg smartphones, tablets)
- obtain quantitative metrics examining the ranked importance of the type of information that users require for making different types of trips, and information based on characteristics such as usability, specificity/relevance of data, timeliness and reliability/trust.

Overall, the online survey found that satisfaction with the existing information provided to travellers within New Zealand is good. However, some gaps in travel information provision in New Zealand were identified, which could, if addressed, lead to enhanced travel experiences. Improvements to information provision could improve people's travel experiences and promote increased use of alternative modes (eg PT and active transport options). This is not to say that people will no longer require access to a motor vehicle, but that people will have better information to substitute specific trips.

In relation to future information type priorities, the following tables (tables 11.3–11.6) present the final weighted mean priority scores[29] for each information type, sorted by highest mean (and therefore highest priority) to lowest, and arranged within the four information type categories (real-time; route-specific; comparing transport mode options; and facilities provision). The tables have been arranged based on highest mean score within each category. The percentage of people who had accessed each information type at the baseline has also been reported, to give an indication of current availability of each information type (an important consideration in prioritisation decisions).

Disability information received a low priority score because of the high number of people who reported they would never use this information; however, adequate provision of such information is critical to ensuring accessibility to, and usefulness of, information for all.

29 The way the online survey sample was selected means this was not a representative sample of New Zealand travellers. However, the data was post-weighted based on Household Travel Survey data with the aim of correcting for (but not completely removing) sample bias for the future information provision priorities. More information regarding the weighting is provided in section 9.1 and appendix E.

Table 11.3 Final weighted mean priority scores for real-time information types (N=843)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	Congestion information[b]	12.0	8.0	56.7%
2	Location of road closures	11.9	7.6	75.7%
3	Location of roadworks	11.8	7.6	71.7%
4	Location of traffic incidents	11.6	7.9	59.7%
5	Anticipated travel times based on real-time updates	9.9	8.0	66.4%
6	Weather conditions	8.7	6.9	75.5%
7	Crowdsourced information	8.1	7.9	45.5%
8	Roading conditions	8.0	7.0	64.2%
9	In-vehicle navigation information	7.9	7.8	58.0%
10	Traffic cameras (in real-time)	7.4	7.4	44.0%
11	Parking availability information	7.3	6.8	52.6%
12	Next bus information	6.0	6.2	85.9%
13	On-board public transport	5.5	6.0	72.9%
14	Next train information	2.7	5.0	35.0%
15	Next ferry information	2.4	4.8	31.4%
Overall mean		*8.1*		

a) Minimum = 0, maximum = 25 for all variables.

b) Refers to road congestion.

Table 11.4 Final weighted mean priority scores for route-specific information types (N=860)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	Alternative routes	9.1	6.8	88.3%
2	Comparative trip times for different travel times/days	7.5	6.6	78.3%
3	Directions	7.2	6.4	91.7%
4	Pictures/names of key route landmarks	5.5	5.7	78.3%
Overall mean		*7.3*		

a) Minimum = 0, maximum = 25 for all variables.

Table 11.5 Final weighted mean priority scores for mode comparison information types (N=856)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	PT timetables	7.1	6.1	93.9%
2	Travel time by different modes	6.9	6.2	82.4%
3	What modes are available for a journey	6.3	6.2	76.4%
4	Travel costs by different modes	6.0	5.9	74.5%
5	Ridesharing	3.5	5.5	35.5%
Overall mean		*6.0*		

a) Minimum = 0, maximum = 25 for all variables.

Table 11.6 Final weighted mean priority scores for facilities provision information types (N=841)[a]

Rank	Information type	Mean priority score	Std dev.	Baseline proportion accessed
1	Route maps	7.1	6.1	95.1%
2	Location of parking	6.8	6.3	65.7%
3	Location of points of interest	5.9	5.8	72.8%
4	Location of public toilets and rest areas	5.7	6.0	67.5%
5	Walking routes/facilities/journey times	4.6	5.6	76.0%
6	Location of park-and-ride facilities	4.6	5.8	47.7%
7	Presence of steep hills/slopes	3.9	5.4	48.7%
8	Cycling routes/facilities/journey times	3.8	5.4	52.0%
9	Location of unlit roads	3.5	5.3	35.4%
10	Disability information	2.1	4.7	27.6%
Overall mean		*4.8*		

a) Minimum = 0, maximum = 25 for all variables.

The above results suggest that high-quality real-time information should be the highest priority for future improvement, as this would offer solutions for travellers faced with unexpected impediments to travel, such as traffic accidents, PT service delays, or even poor weather. The survey respondents also prioritised having access to route-specific and multimodal information. However, improving real-time information provision was even more important, as poor or incomplete real-time data would lead to poor-quality route-specific and multimodal information.

For freight operators, road closure information, locations with weight/height restrictions and incident information were rated as most helpful.

The online survey found that the information delivery medium was unlikely to be an issue in the future, and most travellers believed they would be able to access technologies to gather information (eg smartphones and WiFi connections). However, access to lower-tech forms of delivery (eg paper-based information) was also recommended; therefore, multiple media should be used to maximise accessibility.

An overarching theme throughout the survey findings (and also the focus group findings and literature review) was the importance of the specificity of travel information – travellers wanted to be able to access information that was specific and customisable to themselves and their specific trips. However, the survey respondents had realistic expectations – they were aware of the importance of population density to the success of different information provision initiatives and only wanted them introduced where they would be affordable, reliable and useful.

12 Key overall findings from this research

Throughout all three stages of this project, the following aspects of information provision either emerged or were confirmed as being critical:

- Information must be of high quality in terms of being timely, accurate, relevant to the user's journey, customisable and easy to understand. It must be real-time and location-specific, and allow users to save 'favourite' routes for fast access to information about specific routes. If information fails to meet user's expectations they will quickly stop using that source – therefore it is critical that any new information provision systems are fully tested before they go live. Similarly, any limitations around timeliness or possible inaccuracy need to be transparent and well communicated to users. Information must also be quick to access, preferably from one comprehensive source – users indicated that they will not check multiple sites. Monitoring of information provision is required at regular intervals to check the accuracy and timeliness of information that is presented. Usability testing, both during development and once the system is implemented, will ensure that systems are easy to use and are providing the information that users want. Systems must be robust in an emergency, including allowing changes/updates to be made remotely.

- All information must be easy to understand and 'speak the user's language', using common terms for locations, directions and landmarks. This has implications for finding ways of, for example, noting the reliability of travel time information – currently there is no common terminology for describing how reliable this information is.[30]

- Information needs to be suitable for both novices and experienced travellers, and in both digital and traditional formats. A number of focus group participants preferred paper maps and information, as they felt that digital information (particularly maps) did not provide enough context. Contextual information was valued because it allowed the users to identify other destinations that were close to where they were going and provided a backup for choosing another route when necessary.

- Access to integrated multimodal information would allow users to compare entire trips by transport mode, as well as see what parts of their trip could be accomplished by another mode (eg in case of road congestion, users may park and take a train, or cycle for part of their journey).

- Indirect payment mechanisms for improved information (eg advertising on transport information websites and applications) are preferred over direct costs.

- A marketing strategy to ensure people are aware of what information is available is required. Focus group participants noted that some organisations in Auckland and Wellington provide a link to information (eg the Transport Agency webcam) on their company intranets, which has increased awareness of the information provided.

- Although the display method used for information provision was outside the scope of this project, comments during this research suggested the following:

  - Pre-trip information could be provided via the internet, smartphone and/or radio.

30 For further information on requirements for freight drivers see the discussion of the online survey.

  - For in-trip information, radio and variable message signs are useful but there are safety concerns regarding the use of mobile phones/smartphones for information. Freight operators could also receive information via their dispatcher.
  - For PT applications, information via mobile phone/smartphone are useful – most of the online survey respondents anticipated they would have access to smartphones, laptops and WiFi connections within the next five years, but only half thought they would have access to 3G data packages in that time frame.
  - Low-tech forms of information delivery (eg paper-based, in person, via phone) are also important to ensure all travellers can access information.
- If people sign up for updates for specific routes, organisations can communicate directly with users when there is a change needed at short notice (eg Environment Canterbury's experience after the Christchurch earthquakes).

12.1 Benefits of improved travel information provision

This research indicated that providing additional information to travellers would allow them to make travel choices (eg regarding transport mode choice and travel time) that would enhance their travel experience. Further benefits could include:

- improvements to road network performance and safety by spreading demand throughout the day and onto different routes – eg fewer cars circulating as drivers look for parking
- increased safety, as appropriate rest stops for long car journeys and freight movements could be planned
- reduced customer frustration around congestion and delays
- improved accessibility for people with different abilities.

13 Recommendations for the provision of multimodal travel information

The following future work priorities are recommended:

- The provision of high-quality real-time information that offers information for travellers when faced with unexpected impediments to travel, such as traffic accidents, PT service delays and poor weather, could be investigated for larger centres. This work would include consideration of the wording for information around travel time reliability. (A US draft report by Kuhn et al 2013 is investigating how to describe delays, and uncertainty around the reliability and currency of the information – these aspects affect the public's perception of the reliability of an information system.)
- Investigate the provision of information for freight operators that includes road-closure information, locations with weight/height restrictions, and incident information. This information would facilitate route choice decisions. In addition, information about rest areas and toilets and other amenities would be useful, including suitability for freight vehicles (or campervans). This could be done in conjunction with the item above.
- Develop high-quality, route-specific, customisable information including alternative routes, comparative trip times for different travel times/days, directions, and pictures/names of key route landmarks. This could be integrated with information for transport mode comparison – including PT timetables, travel times and costs by different modes, and facilities (eg route maps, the location of parking, points of interest, public toilets and rest areas, walking routes/facilities/journey times, location of park-and-ride facilities, presence of steep hills/slopes, cycling routes/facilities/journey times, location of unlit roads and disability information).
- Investigate and develop a strategy for rural areas that encounter issues with data/GPS/mobile phone reception and mapping, as there is a possibility of receiving misleading or no information in these areas.
- Investigate whether a strategy is needed for rural congestion related to intense/irregular freight movements (eg logging or on-road stock movements and tractor movements). At these times, rural roads can quickly become filled with vehicles, posing safety and congestion issues, which can be a particular hazard around rural schools.

Throughout this project, a number of future issues/challenges were discussed that, whilst outside the scope of this project, would be useful to consider when developing information provision. One issue was the need for overarching strategies that clarify the roles of government agencies (such as the Transport Agency) and the private sector, and which groups will provide specific types of information. The strategies could also define how traffic operation centres and information provision would interact – for example, where there is a delay in the network, how will an alternative route be selected and communicated without moving congestion from one route to another, or directing freight vehicles onto unsuitable roads?

A related issue is the degree to which the Transport Agency provides information to third-party developers. Some strategies that are relevant to the New Zealand situation regarding the involvement of third-party developers have been recommended in the report *Impacts of technology advancements on transportation management center operations* (Mizuta et al 2013), as follows:

- Develop prequalifications or standards regarding data accuracy and validation (potentially both for data received and data provided).
- Develop protocols for data privacy and confidentiality, including for media and other agencies.
- Consider the use of applicable standards to simplify data exchange, such as XML.[31]

In addition to the above, the Transport Agency could explore ways to use crowdsourcing[32], which has been trialled in rural areas overseas to provide low-cost real-time information for PT users (Edwards et al 2011).

31 XML Extensible Markup Language is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable (Wikipedia, accessed 17 May 2013). Other ways to transfer files via mobile platforms that may be worth exploration include those that rely on database look-ups (eg SQL) and/or web techniques (eg REST) (PT information system expert, Dr Aaron Steinfeld, pers comm 2013).

32 Crowdsourcing refers to the process of harnessing the skills of online communities or organisations that are prepared to volunteer their time contributing content or skills and/or solving problems, and is a rapidly growing area.

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Appendix A Focus group script

Project purpose:

The NZ Transport Agency aims to provide people (their customers) with a good travel experience. They see providing travel information as a key way to improve customers travel experience. Information may be used by customers to improve their travel experience by using a different mode or travelling at a different time of day, thus getting to their destination quicker, or with less frustration or cost. This focus group session aims to gain a better understanding of what their customers (you) seek in terms of information provision.

Focus group etiquette:

- Toilet breaks, emergency exit information and request cell phones be turned off.
- Not here to reach a consensus, but to discuss a range of views. There are no right or wrong answers.
- Cross talk among group, not to/from me – I will guide the discussion to cover the topics the Transport Agency wants to hear about and may bring the group back to a particular point if more clarification is needed.
- Give everyone an opportunity to talk.
- Session will be audio-taped to allow us to analyse information after the session.

Introduction:

- name and what type of trips/mode do you regularly take (may need to explain mode)

(moderator to begin … travel to work by bike or car, use bus to go out at night or on the weekends …)

Questions:

1 Where might you get information from? (prompts below):

  - Friends/workmates/family
  - Random people at public transport access point
  - Kiosk/information centre
  - Call center
  - Real-time signs/VMS
  - Smartphone applications
  - Social media
  - Radio/tv
  - In-vehicle information

2 What type of information might you be seeking?

- Traffic delays (eg congestion)
- Travel planning tools
- Ridesharing
- Information on the cost/sustainability of different modes
- Incidents
- Weather conditions
- Parking availability
- Real-time bus/next bus information
- Travel times

3 Imagine a recent trip where you sought out information prior to taking the trip, or during the trip – explain what information you looked for and from where.

- What information would have made the trip easier? Pre-trip/during the trip? (prompt: Where might you expect to get this information?)
- Think of a recent trip and talk us through the trip, including where you were going and what decisions you had to make along the way. (May need to give an example to prompt eg urban commute.)
- Prompt to get different trips (depending on the group members)
  - urban commute
  - rural
  - freight
  - tourist
  - civil defence/evacuations
- What information would be/was helpful? What would have been useful?

Demonstration:

For the demonstration part of the focus group the participants will be split into two groups. Each group will work through the demonstrations and provide feedback. Where the demonstration involves a website or smartphone app, participants will be asked to perform a task such as: you are at the George Street Tramlink stop and you want to go to the Cemmaes Road Inn; using this website what are your options for getting to your destination. Note that this will involve using technology and using static screen shots of the sites as a back-up to ensure that if a web-site/app is not working we can still showcase what it can do). The static screen shots will also allow participants to refer back easily to particular pages of the sites when answering questions.

The following websites/apps have been selected to show what is possible in term of the information that users might require (see the table below):

- the local New Zealand PT website and smartphone app for the region that we are conducting the focus group in
- four international sites: transportdirect.info, freightplanner.tfl.gov.uk, 511.org, people.virginia.edu/~seb4v/TG/Thanksgiving.html
- googlemaps.co.nz
- www.transportforchristchurch.govt.nz/
- www.state.nj.us/njoem/plan/evacuation-routes.html
- https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8
- www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu
- www.waze.com/

Table A.1 Summary of potential information needs

User	Summary of potential information need
Urban commuters	• Ability to compare different modes/option to mix modes • Availability of alternative routes • Where park-and-ride facilities are and how they can link with other modes • Timetables and fares for public transport • Comparison trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles) • Detours/delays • Trip time • Weather • Parking availability and cost
Long-distance commuters	• Ridesharing options • Public transport alternatives • Parking
Local rural trips	• Planned closures • Incidents • Weather • Requirements for chains
Tourists/international travellers	• Visual information to help orient them within the environment • Directions to, and how to use, alternative modes • Directions to parking • Knowledge of what to visit and what is the easiest way to get there • Other needs are the same as new users below.
New users versus experienced users	New users: • New users require information on what type of mode options there are (including

User	Summary of potential information need
	cost and time for alternative modes and advice on how to use each mode (eg where to catch a bus and when the destination is arrived at). • They also require information on how to link up different segments of the trip – eg where they can park and ride, where to catch public transport, public transport timetables and maps, where to transfer, where it is safe to walk and where there are cycle routes. Experienced users: • In contrast, people who have good knowledge of the geographical area and the 'how' of using modes (other than single-occupant cars) are characterised as needing information more related to notifications when something has changed (eg if there is a traffic delay ahead, a road closed, or the bus is running late, or there is a broken lift or detour).
People with different abilities	Whilst this group varies greatly in their information needs, some identified needs are: • Need to know information relating to mobility such as broken lifts/escalators, walking information • May need assistance to identify the correct bus and exit stop NB: All Government websites must adhere to New Zealand Government Web Standards 2.0 Web Content Accessibility Guidelines 2.0 (level AA). These provide guidance to help remove many accessibility barriers from websites for people with different impairment.
Freight	• Pre-trip – route planning information that provides accurate journey time • Roadworks • Location of rest areas and inspection facilities • Locations that have height or weight restrictions • In-trip – updates on conditions that might cause delays and re-routing information weather/incidents/congestion
Civil Defence emergencies/planned evacuations	• Shelter locations • Alternative evacuation routes • Congestion • Incident information • Petrol stations and lodging • Road closures • Alternative routes

After each walk-through/demonstration feedback on the information will be recorded. Feedback from the demonstrations to include:

- what they like/don't like why
- what they might use and how that might change their travel experience
- Ask participants to picture how/what information they would like and how this might change when making different types of trips.

Structured interview questions:

- If information was provided, what barriers do you think there are in making a change to your planned trip (either in choosing the time you make the trip, whether to go, what mode to use and route you take).
- What types of trip would you be most likely to consider alternatives for/how often do you take these trips?

Appendix B Focus group comments on the demonstration websites and applications

B.1 Christchurch group

The table below provides a summary of comments made about each website and application that was presented during the focus group.

Table B.1 Demonstrated websites and applications

Website	Prior knowledge	Participants' opinions
Google Maps www.mapsgoogle.co.nz	All participants had used this site	As this site was already well used by the participants, we did not go into this site. Participants noted that they liked being able to get directions, use Streetview so they would recognise when they had arrived, and being able to compare trips by car and public transport.
Metroinfo www.metroinfo.co.nz	Most participants knew of or had used this site.	One participant who had not previously used the bus indicated that they were going to try the bus service. One participant had a look at the Facebook page from Metroinfo and thought that the bus delays information would be useful for her in her job, which involved driving around. Criticism of the site included that in some instances it did not work like other standard maps – you couldn't drag it around.
Transport for Christchurch www.transportforchristchurch.govt.nz	Only one participant had heard of this. No participants had used it before.	All except one participant said they would now use this site. The participant who wouldn't use it didn't know Christchurch well enough to identify the roads she wanted to use. 'How do they advertise this – publicise this? I'll have to go find this and share it with all my friends.' Thought the site was really good and it was the most useful information out there. Also liked that it had an 0800 number. 'How regularly is this updated?' The first thing that participants did was look at areas that they knew to see how up-to-date the information was. If they felt it wasn't up-to-date, they said they wouldn't use the site, but if it was up-to-date, they'd be more likely to use it. 'Guess what's going on my phone now? I'll use it all the time.'

Website	Prior knowledge	Participants' opinions
Transport Direct www.transportdirect.info	British site	'Door to door journey planner could go between cities. Liked this.' 'Good that you can drive to a car park.' Cost analysis – 'This would be good. People in New Zealand would get a real shock with this if they knew the true cost (especially if added in vehicle-running costs like warrants, registration and maintenance – does this do that?' Most participants thought that this would be useful. 'Only going to use things if they are as simple to use.' 'Ah, here is a parking spot near where my uncle lives – it tells you how many parks there are and the cost. That's really good.' 'Unlit road is of interest as a driver.'
London freight planner freightplanner.tfl.gov.uk/user/freightjourneyplanner.php	British site	Did not show this website, as didn't have freight participants.
511.org www.511.org	American site	'Really cool, but this would be unrealistic for Christchurch – how many people live in this area?'
Congestion over Thanksgiving www.people.virginia.edu/~seb4v/TG/Thanksgiving	American site	Opinion split if this would be useful – perhaps for places like Piha, Taylors Mistake, etc. 'The route from Christchurch to Nelson might be good for tourists, etc - –inland route or coastal route. Good to know where all the trucks go?'
New Jersey Evacuation Plan www.state.nj.us/njoem/plan/evacuation-routes.html	American site	'Need to have more than one way out.' 'Needs to be in real time.' 'All businesses should have this for business compliance.' 'Need to be non-residential streets.'
Tiramisu https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8	American application	'It's really good – need this, should be able to report back to the bus company that their bus is late.' 'Could integrate car parking into this.' 'Really like the take-me-home app.'
London Busmapper www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu	British application	Participants thought their comments for Tiramisu above equally applied to the London Busmapper App.
Waze	American application	'In-trip information not likely to be accessed by motorcyclists if accessing it means that they have to stop, take off their gloves and helmet. Should it be used in cars, as not allowed to use cell phone?'

B.2 Auckland group

The table below provides a summary of comments made about each website and application that was presented during the focus group.

Table B.2 Demonstrated websites and applications

Website	Prior knowledge	Participants' opinions
Google Maps maps.google.co.nz	Good knowledge of the site – used by several participants	'I always look on Google Maps – it gives you three options and the times, and it will talk you there. I use that all the time when driving.' 'I've used Google Maps on the rig – you've gotta love these apps.'
Maxx Public Transport website www.maxx.co.nz	Some knowledge of the site	Liked its map-based interface – said they liked to know where the route is. Liked that the site provided journeys for driving, bussing, walking and cycling. 'Real-time arrivals is good.' Liked having connections/interchanges locally and regionally Found the name 'MAXX' confusing, didn't recognise the information shown. Can look at the physical route (this is useful) 'It's cheap. Not many options.' Journey planner (car, bike bus, tram, public, teen-friendly version) was used by several and some asked if it could save favourite trips.
Transport Direct www.transportdirect.info	British site	Thought this website was similar to the MAXX website. They liked the logos. One participant would use the CO_2 calculator, thought younger users would too. Comments about paper maps and the ability to see the whole route – however, thought maps were hard to read when zoomed out. Positive comments about paper maps for cyclists showing existing cycle ways and roads where there is good width, roads to avoid, etc. 'Is there live travel info?' There should be information on ridesharing and satellite sites. Also information around the buying of tickets. Information on car parks is good, with number of spaces, cost, times, finder.
London freight planner freightplanner.tfl.gov.uk/user/freightjourneyplanner.php	British site	Would be good if you could have preset addresses, and if it included truck park and rest areas, out-of-town service areas, events, and overweight and height restrictions. 'A bigger map would be better. Should include points of interest.'

Website	Prior knowledge	Participants' opinions
511.org www.511.org	American site	Should include the fare. The site needs to be user friendly, allowing the prefilling of addresses, zooming, ability to add layers with your information eg.Your_tab_route, tourist information and information on how travel times change throughout the day. Could also include seasonal changes in traffic and congestion eg public holidays. 'Good to see route.' 'Too many words.' 'Not everyone's on Facebook/ Twitter.' Re carpooling: 'Yes. if lanes mean it's worthwhile, but prefer to be alone.' Smart driving, tips (for fuel efficiency) are useful.
Congestion over Thanksgiving www.people.virginia.edu/~seb4v/TG/Thanksgiving	American site	Would be useful for Christmas Eve, New Year's Eve, and the beginning of school holidays when everyone leaves.
New Jersey Evacuation Plan www.state.nj.us/njoem/plan/evacuation-routes.html	American site	There is a need to have emergency advisory education. The guide times on the motorway are not accurate (45mins compared with 25mins). May be blocked by an incident. Key info has to be accurate. 'Could be able to sign up for alerts – stay clear of the Northwester [a particular route or set of roads]' Information needs to be accurate and there should be information on diversions. Needs to consider all traffic (freight vehicles' manoeuvring needs). 'Should have a bigger picture view.'
Tiramisu https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8	American application	'Really like the take-me-home – could use this when out on the weekend.'
London Busmapper www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu	British application	Participants thought their comments for Tiramisu above equally applied to the London Busmapper App.
Waze http://www.waze.com/	American application	Liked information about road closures/roadworks. Participants mentioned you get by with what you have got, but there is a need for a bigger-picture view than can be obtained on a smartphone. Participants were concerned about potential distraction. Video shows it relying on hand controls.

B.3 Wellington group

The table below provides a summary of comments made about each website and application that was presented during the focus group.

Table B.3 Demonstrated websites and applications

Website	Prior knowledge	Participants' opinions
Google Maps www.mapsgoogle.co.nz	All participants had previously used this site	All believed this site was an extremely useful source of travel information.
Metlink www.metlink.co.nz	All participants had previously used this site	Particularly liked the Journey Planner feature (which allows users to plan trips via multiple PT modes). One participant only used the timetable information, as there were only two bus options for the trips they made. Ticket and fare information was also useful. Found new information that they hadn't noticed prior to the focus group – eg not all participants knew the site included information about ferry and shuttle bus options, but felt this was good information to include. Other information types not known about included the active transport, tweeting, park-and-ride facilities and mapping features. In general, participants felt that the site was easy to use and had enough information available on it. However, one participant felt the site could be intimidating for people who weren't technologically savvy and therefore it may be beneficial to provide some tips about how to use the site. Suggested it needed better advertising of what information was available on the site. Also criticised the mobile application version of the site, where it wasn't always clear what direction 'inbound' and 'outbound' was actually referring to, making it difficult to plan trips.
Transport Direct www.transportdirect.info	British site	Thought the site looked old and out-of-date, which made them assume it wouldn't be updated regularly. Found the site difficult to use at first, with the controls not being intuitive (eg accidentally cleared fields instead of entering information). Also found that it wasn't possible to get all required fare information from the site, but required linking to other external sites. The output was liked, especially: that updates were included amongst the journey information; CO_2 emissions were provided for different travel modes for the same journey; and the information about presence of unlit roads. Overall, agreed the level of detail provided on the site was good, but was required for a city of that size. Participants were sceptical that such a level of information would be needed in a city the size of Wellington.
London freight planner freightplanner.tfl.gov.uk/user/freightjourneyplanner.php	British site	Would be good to have information about the availability and location of petrol stations across the country, including whether they had amenities such as espresso coffee –would need to be regularly updated.

Website	Prior knowledge	Participants' opinions
511.org www.511.org	American site	Liked the summary information provided at the top of the site, which made it easy to compare between different trip options. Also thought the map was very easy to comprehend and follow. The layout of this site was superior to the Metlink site because everything was displayed on one page, rather than having to navigate to multiple pages (eg to see a map). Negatives were that the site was a little complex and difficult to use – while the information available was good, that it was difficult to actually access. Also questioned whether congestion mapping was required for a city like Wellington, as the congestion was always in the same place.
Congestion over Thanksgiving www.people.virginia.edu/~seb4v/TG/Thanksgiving	American site	Would be useful in a New Zealand context if it was accurate – it could save people a lot of travel time by timing their leaving times more appropriately, based on the information provided. Basing it on historical data (rather than real-time information) was beneficial, as people could then plan ahead. However, this could shift congestion if everyone had access to the same information.
New Jersey Evacuation Plan www.state.nj.us/njoem/plan/evacuation-routes.html	American site	Would be good for businesses and workplaces to have – people unlikely to access such information at the time of an emergency event. One participant said they felt there was no escape in Wellington from an event such as a flood or tsunami, therefore limiting the usefulness of the information. Another participant thought they would be more likely to use Radio New Zealand to gather such information in an event.
Transport for Christchurch www.transportforchristchurch.govt.nz	Participants were not aware of this site	Liked that the site offered real-time congestion information but felt that it should be possible to have alternative routes suggested when congestion was an issue for a trip. The mapping was also favoured as it was easy to understand and participants felt it would be possible to make decisions quickly based on the information provided. In a Wellington context, congestion information based on roadworks and road closures would be beneficial.
Tiramisu https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8	American application	Would be more sensible to have GPS devices installed on buses rather than accessing such information from people's smartphones, because: (1) it doesn't rely on a app user to be on each bus at all times (2) discomfort with sharing such information (eg the possibility of being tracked if sharing this information with other users) (3) people keep their GPS functionality switched off to save battery life and data in their packages. There would be a benefit for parents who could check the availability of buses for their children through the application and check whether information they received from their children was actually true. Participants likened the application to VMS signs which are at some bus stops in the Wellington area, which they found helpful and useful.

Website	Prior knowledge	Participants' opinions
Waze http://www.waze.com/	American application	Liked the GPS idea but pointed out that it is illegal to use your cell phone whilst driving a car in New Zealand. One participant expressed reservations about giving people the ability to share so much information and felt this may be best left to the professionals – ie who was going to filter and interpret such vast amounts of information, and also could it create issues (eg if someone incorrectly reported an accident, or reported an incident as much worse than it was). Barriers to the uptake of such an application included lack of access to technology (eg smartphones) and lack of awareness of the existence of such services. The information provided may not actually change behaviour but may assist with mental preparation (eg it may be easier to deal with very heavy traffic if you're prewarned) – although it would also be possible to delay leaving, based on this information. Concerns over the reliability of information shared over such applications, although recognition that developers would know people would not use it if it was unreliable, and therefore would have a vested interest in this aspect.
London Busmapper www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu	British application	Participants thought their comments for Tiramisu above equally applied to the London Busmapper App.

B.4 Masterton group

The table below provides a summary of comments made about each website and application that was presented during the focus group.[33]

Table B.4 Demonstrated websites and applications

Website	Prior knowledge	Participants' opinions
Metlink www.metlink.co.nz	All participants knew of this site.	Liked this site and most used it when catching the train and/or Airport Flyer when travelling to Wellington. Thought the timetables were not ideal for the train service, particularly at weekends, and also that the fare price meant it wasn't competitive with driving if there were several people travelling.
Transport Direct www.transportdirect.info	British site	Liked the site and found the information easy to interpret. One participant liked the $C0_2$ information provided. One freight driver particularly liked how the website allowed the user to identify anything they would like to avoid on their trip.
London freight planner freightplanner.tfl.gov.uk/user/freightjourneyplanner.php	British site	The freight drivers liked this website and stated that they would find something comparable for a New Zealand context helpful, particularly for cities that are growing quickly and therefore changing constantly. Also that bridge information (heights and widths) would be useful for planning optimal routes.
511.org www.511.org	American site	Thought the information for this site was 'over the top'.
Congestion over Thanksgiving www.people.virginia.edu/~seb4v/TG/Thanksgiving	American site	Would be good around events (eg the Martinborough Fair) – could assist in choosing a good route to get to a destination during these times and the optimal time to leave to avoid heavy traffic – especially useful if integrated with a travel route information application. One participant had concerns that the introduction of such a site/application could result in a shift of congestion to the times/routes recommended by the site – therefore real-time information (eg via the radio) could be more beneficial than information based on historical trends. One participant thought the information could be surplus to requirements, as most locals would already have knowledge of times/areas to avoid, based on previous experience.

33 Some websites were not presented to this focus group, as the facilitator felt it unnecessary given the consistency of feedback received - participants in general thought the websites (such as the congestion websites and the crowdsourced information) were useful, but not for them personally, because living in a rural area meant there wouldn't be enough people to warrant the system.

Website	Prior knowledge	Participants' opinions
New Jersey Evacuation Plan www.state.nj.us/njoem/plan/evacuation-routes.html	American site	Thought such information had little relevance to their area as the number of roads in and out of Masterton meant it was generally shut off in major events, with no possible escape or alternative route.
Transport for Christchurch www.transportforchristchurch.govt.nz	Participants were not aware of this site	Liked this site but thought that it should be integrated with a route guide to make it more useful. Also thought this information would be best fed into a GPS system so it could be accessed in trip. Would be beneficial if it provided updates where roads had been attended to (eg if a road was strengthened and was then able to have trucks again, this should be an update included on the site).
Tiramisu https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8 & Waze www.waze.com/	American applications	Applications that used crowdsourcing were much more relevant in an urban context than rural. The accuracy of such an application was dependent on the number of people using it and it wasn't believed that there would be enough potential users in the area to make this worthwhile here. One participant was concerned about the possibility of such an application becoming a distraction for drivers. A freight driver suggested it could be used by commercial dispatchers as a way of sharing information, such as alerting other freight operators where stock or tractors are being moved or logging is occurring along rural roads. Another participant thought the above information could be good road safety information to share with rural schools.

Appendix C Websites and applications shown to the focus groups

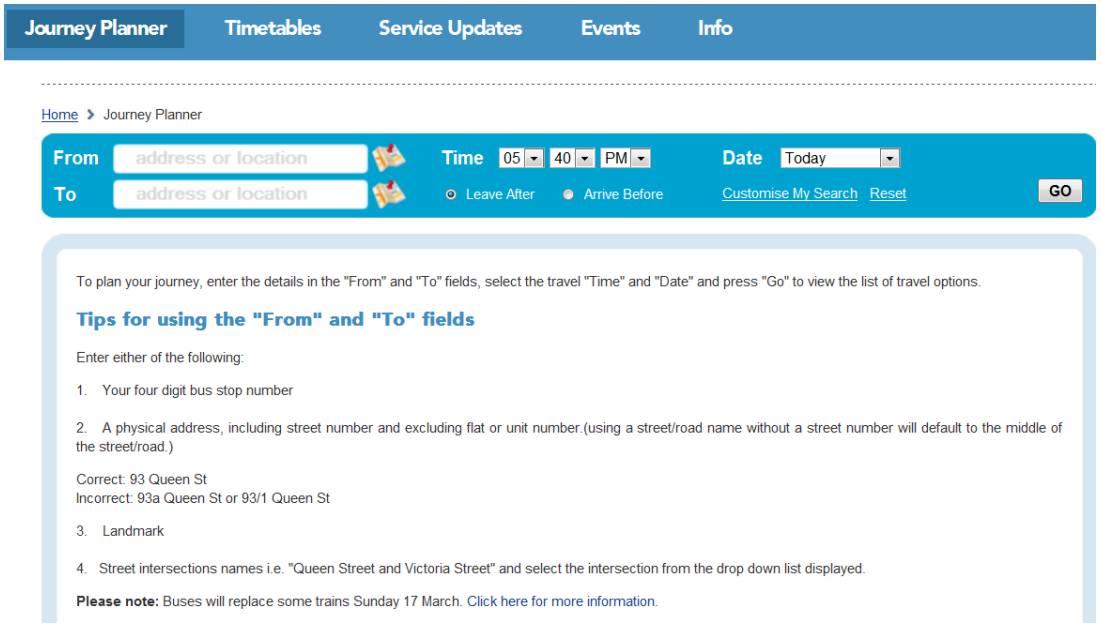
C.1 Auckland Transport

www.maxx.co.nz

Main features:

- Show walk map option
- Trip price
- Route options
- Time options
- Real-time information
- Bus stop information
- Return journey information
- Route diagram map
- Trip duration
- Map locations show walk map option
- Information on Northern/Inner/Southern Express links
- Map of venue bus stops
- Train timetables
- Ferry – link to Journey Planner
- Links to:
  - Take the Bus
  - Ride the Train
  - Cruise the Ferry
  - Other Services
  - Network Map and Regional Guides
  - Park-and-ride Facilities
  - MAXX Train Updates Text Service
  - Lost Property
- Final ferry departure times
- Walking information
- Link to venue website
- Print button
- Event date/time
- How to travel information
- Links to area maps
- Train network maps
- Central Auckland departure map
- Cycling information
- Link to Auckland transport site
- Link to order Cycle guides
- Print button

Figure C.1 www.Maxx.co.nz



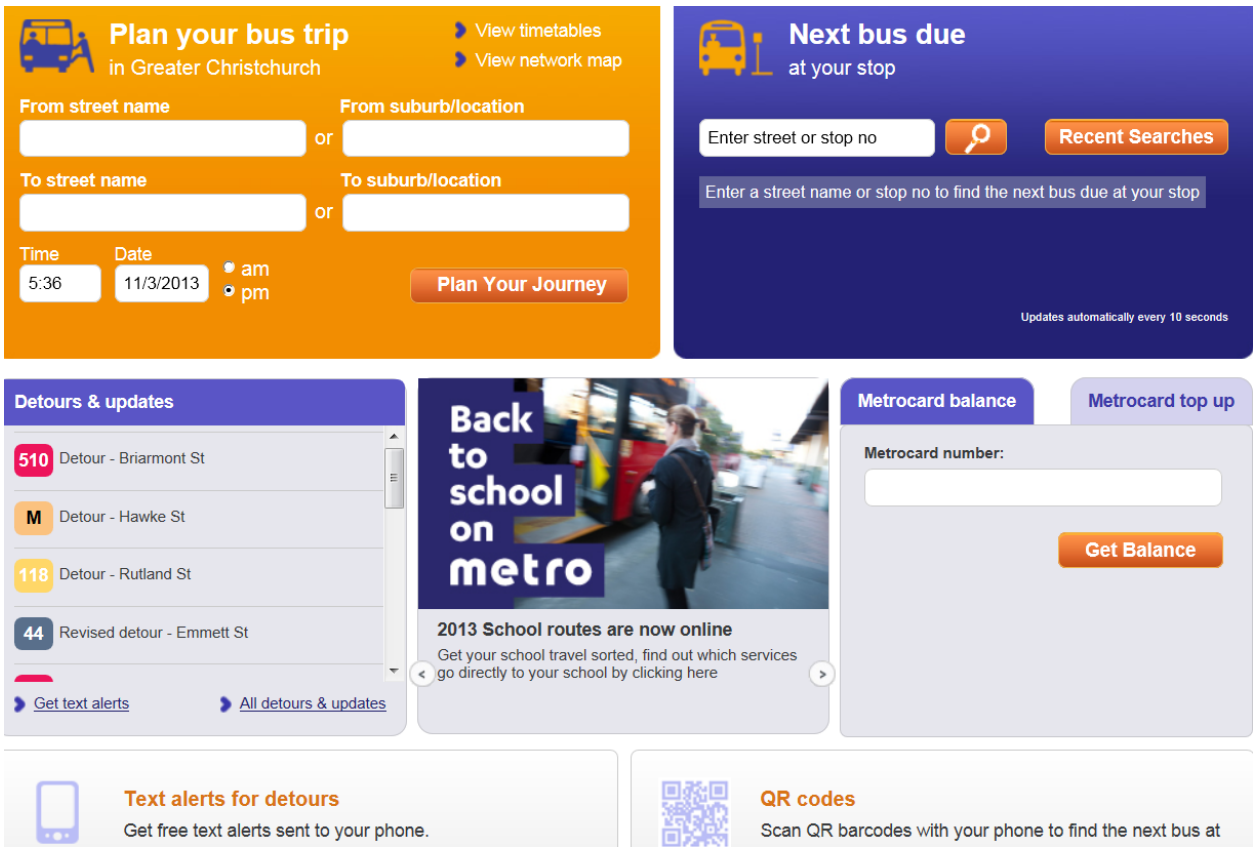
C.2 MetroInfo Christchurch

www.metroinfo.co.nz/Pages/default.aspx

Main features:

- Plan Your Bus Trip
- Timetables
- Maps and Timetables
- Timetables
- Public Holidays
- Ferry
- Community Services
- Contact Us
- Fares
- Text Alerts for Detours
- Lost and Found
- Metrocard
- Get a Metrocard
- FAQ
- SuperGold Card
- Metrocard Agents
- Network Map
- Detours and Updates
- Bus Detours and Updates
- Network Map
- Central Station
- School Services
- Travel and Fares Info
- Feedback
- Bikes on Buses
- QR Codes
- Code of Conduct
- Metrocard Top Up
- Terms
- Metrocard Gift Voucher
- Cando Card
- Metro Timaru

Figure C.2 www.metroinfo.co.nz/Pages/default.aspx



C.3 Metlink – Wellington

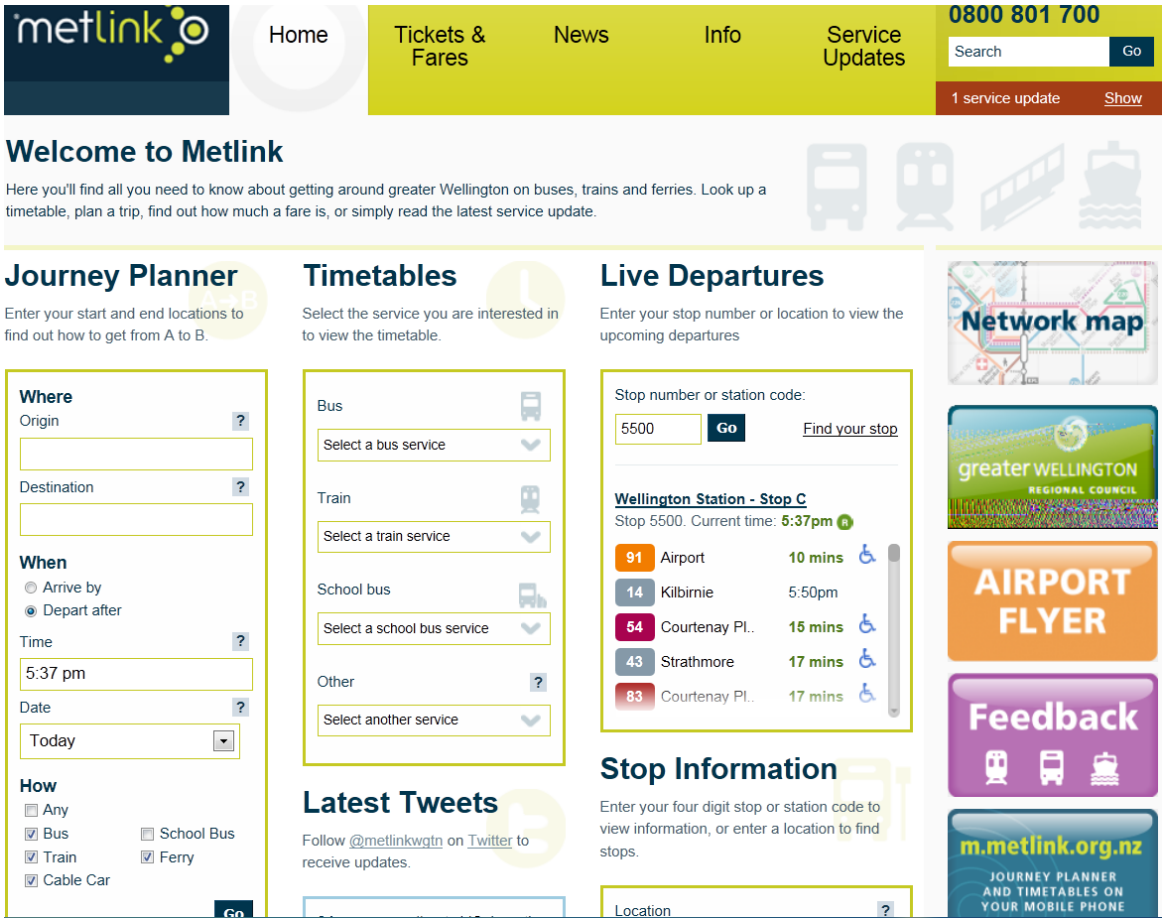
www.metlink.org.nz/

Main features:

- Select Journey options
- Total duration
- Route diagram map and Satellite
- Bus, school bus, train, ferry, cable car options
- Live departures
- Latest Tweets
- Ticket and Fares
- Accessibility information
- Compliments and complaints
- iPhone applications
- Leave and arrive time
- Exchange options
- Trip price
- Timetable links for bus, train, school bus and others
- Stop information
- Quick link to airport buses, network map, txtBUS, txtTRAIN, cycling and walking journey planner
- Latest public transport news
- Carpooling
- Cycles and cycle lockers information
- Google Transit Feed

- Lost property
- Network map
- People with mobility information
- Travelling to hospital options
- Metlink mobile site
- Park-and-ride car parks information
- Trains meeting buses at stations
- Real time service updates

Figure C.3 www.metlink.org.nz/



C.4 TransportDirect.info

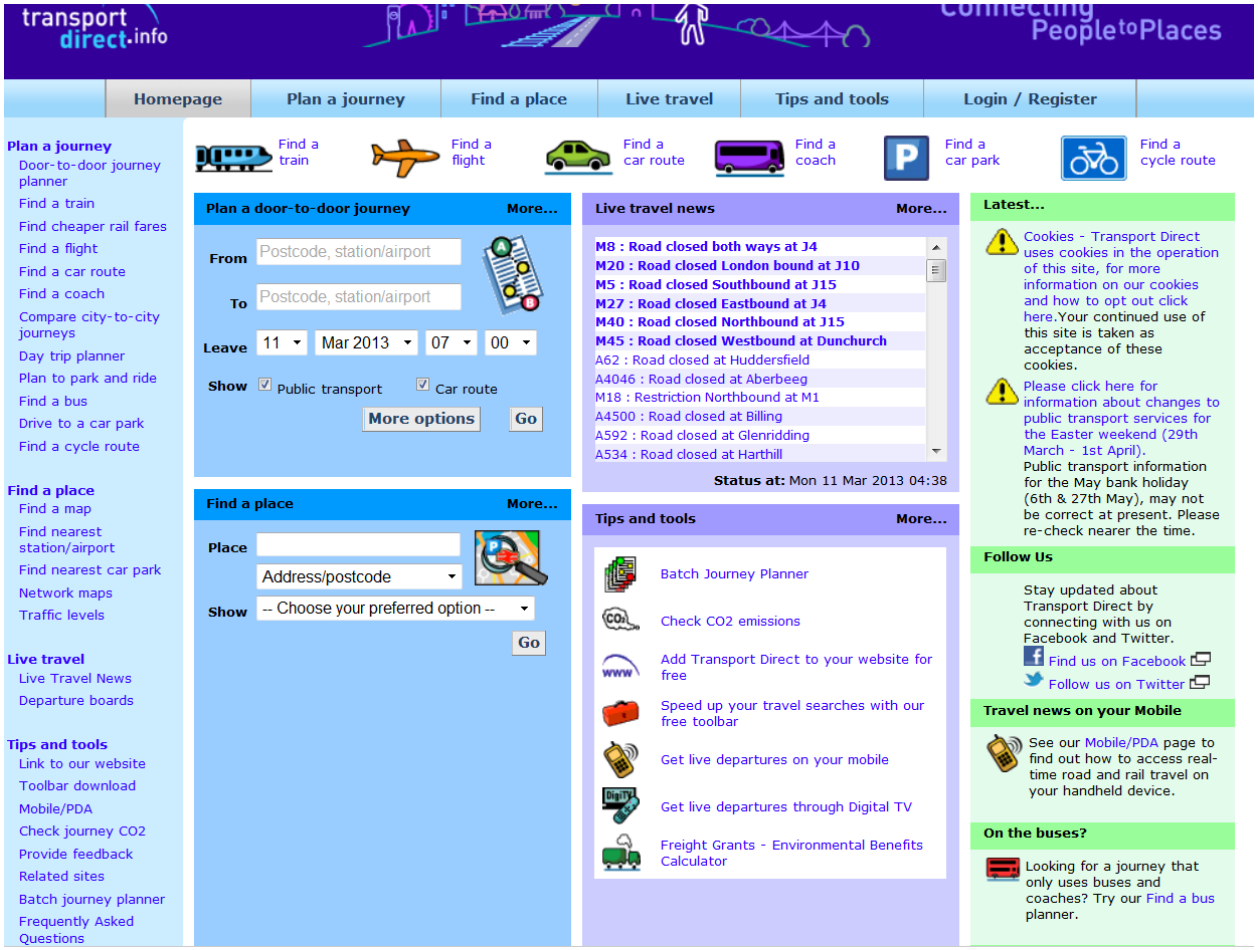
www.transportdirect.info

Main features:

- Select Journey options
- Tickets/Cost
- Check CO_2
- Summary link
- Links to social media sites
- Map links
- Modify Journey
- Detailed timeline of journey
- Link to walk directions

- Links to:
  - Door-to-door journey planner
  - Find a train
  - Find cheaper rail fares
  - Find a flight
  - Find a car route
  - Find a coach
  - Compare city-to-city journeys
  - Day trip planner
  - Plan to park and ride
  - Find a bus
  - Drive to a car park
  - Find a cycle route
  - Option to send to a friend

Figure C.4 www.transportdirect.info



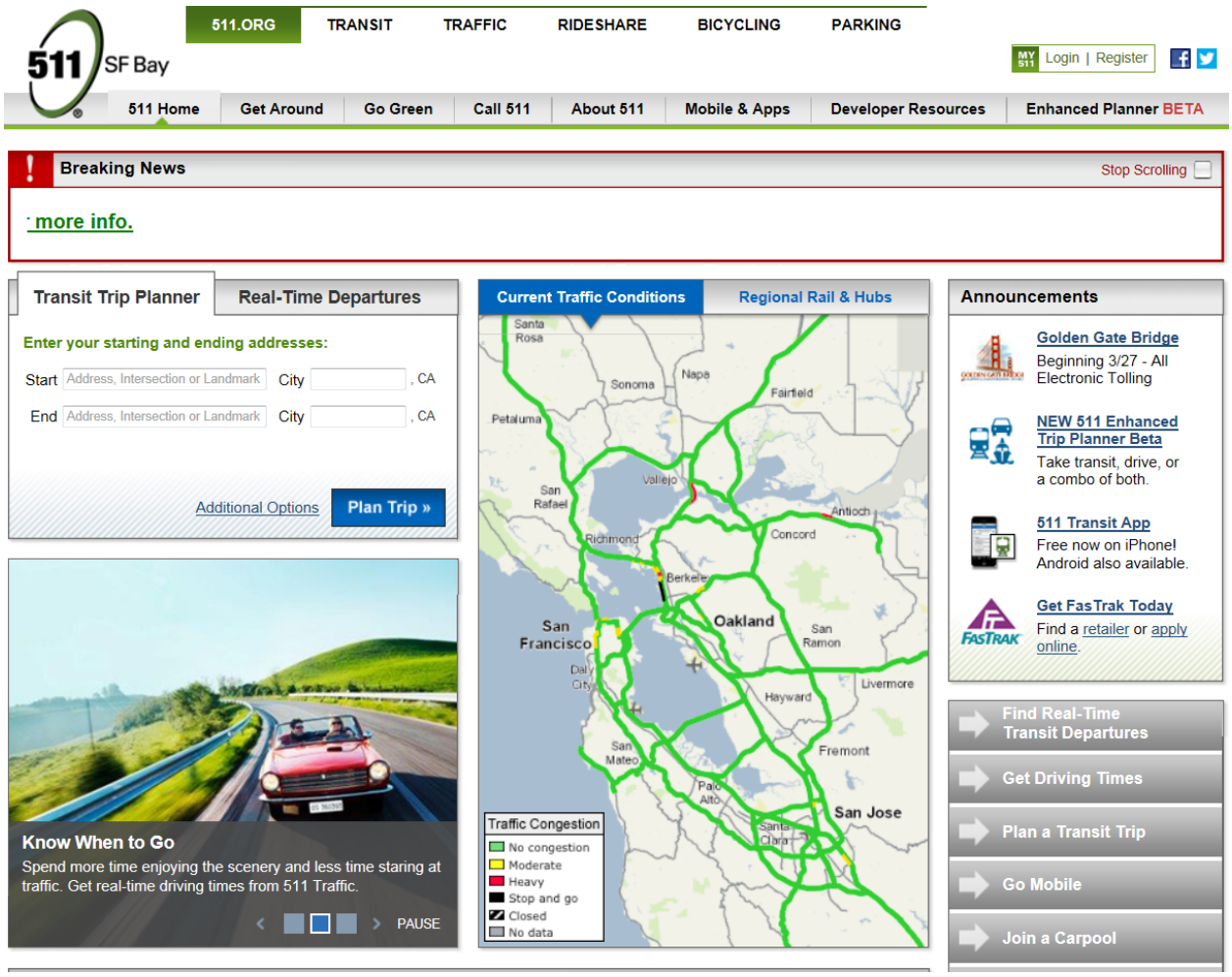
C.5 511 SF Bay

www.511.org

Main features:

- Get-around information, sign up for MY511 to save favourite trips, get email and text message alerts
- Commuting links by car, train or bus, carpool, bike-accessible services
- Tolls information and links to more information
- 511 freeway aid information
- Transit disruptions solutions and contacts
- Taking a leisure trip by train or bus, car links
- Airports information and links
- Leaving the Bay area information
- Local traveller information services links
- Preparing for emergencies information and services contact
- Go Green – take transit, join a carpool, drive smart, bicycle, walk , carshare, telework
- Popular destinations information and link to destination website
- Information on how to go Green
- Call 511 to connect with a Live Operator
- Speed through 511 live information
- Recognition problems reporting
- Safety tips
- FAQ on call 511
- 511 phone features, web features, Mobil, suggestions and brand toolbox information
- 551 Transit APP
- 511 Mobil to receive real-time transit departure predications, plan public transit trip, check real-time conditions, get current driving times
- 511 departure times texting
- Third-party Apps links
- Third-party websites links
- Developer customizable tools and features
- Website Languages
- Tweet
- Facebook
- Plan a trip: select station/stops, ferry landing, landmarks, preferences by fastest trip, fewest transfers, less walking, lower fare, and maximum walking between points
- Nearby stops and routes: location at address, intersection or landmark, within distance, includes modes (rail, bus, ferry, cable), service time, displays nearby stops and routes
- Real-time departures: agency, route, route description, direction and stop
- Schedules and route maps
- Fares
- Agency profiles
- Regional information: transit basics, popular destinations, all night services, accessibility and seniors, announcements
- Ridesharing information: ride match, carpool, can pool, commute rewards information and employer's registration, contacts, services, links and benefits
- Smart driving information and options
- Real traffic map
- Bicycling maps, bike-to-work information, infrastructure, safety and resources
- Parking map, search engine on city and nearby parking, information and suggestions

Figure C.5 www.511.org



C.6 Transport of London/Freight Planner

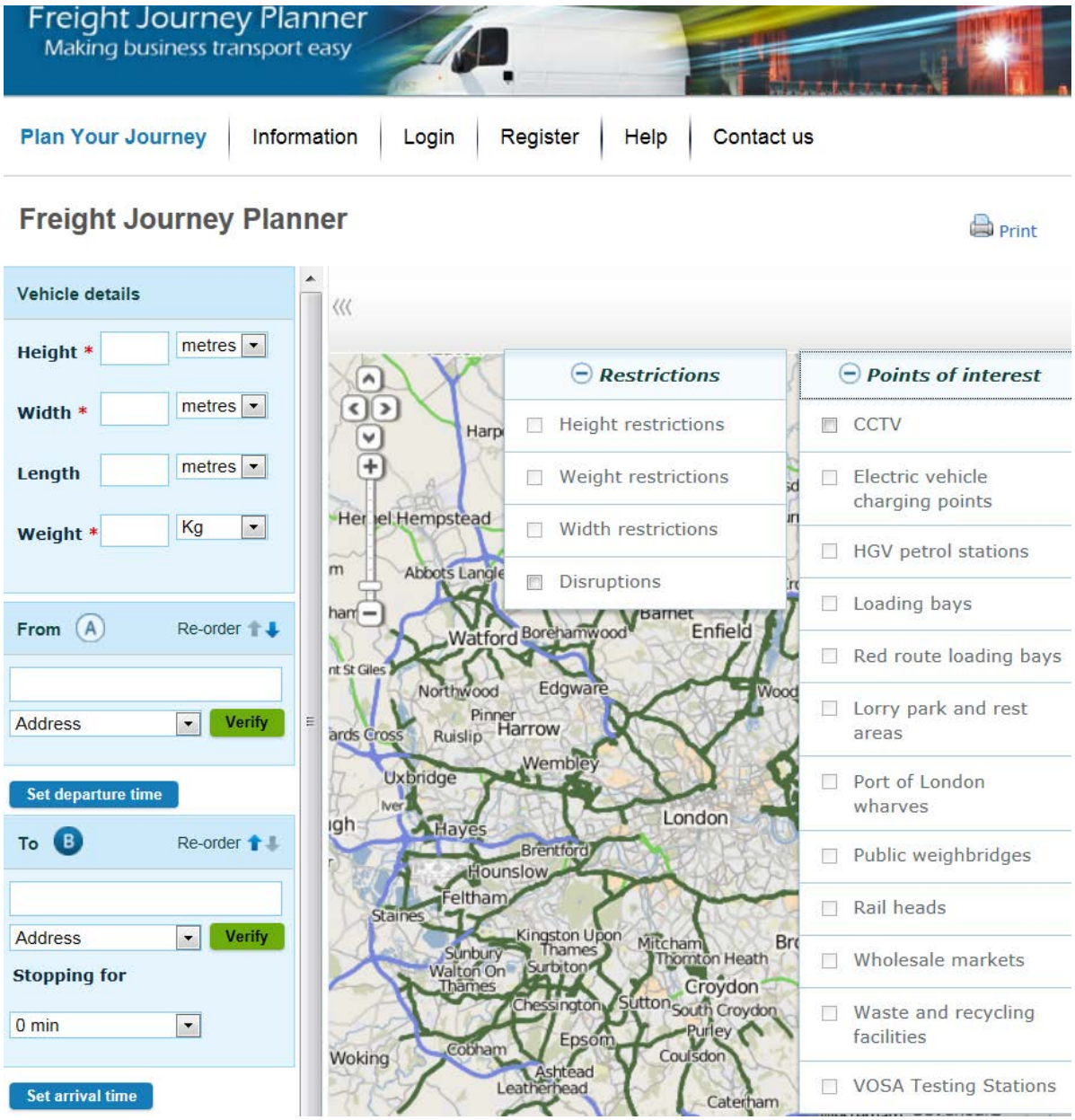
http://freightplanner.tfl.gov.uk/user/freightJourneyPlanner.php

Main features:

- Freight Route planner using postcodes, addresses and motorway junctions. Includes London congestion charge online payment and Low Emission Zone information.
- Accessibility options
- Links to Station information
- Link to ticket and fare options
- Journey planner with options to choose travel preferences, eg bus, train, cycling, walking, etc.
- PDF and interactive maps.
- Route options ie fastest or with least changes, etc. The website will give a variety of options around the time requested.
- Detailed timeline
- Maps
- Route options
- Transit information through the stations to your connection and leg journey times.
- Traffic updates by Twitter if driving.

- Live travel news and planned works/ disruptions.
- Ticketing and payment options including Oyster Cards and contactless credit cards.
- Live Traffic incidents, links to AA traffic incident information.
- Carriage of dangerous goods information.
- Route restrictions and Points of interest.
- Links into Station sites for more detailed information.
- Cycle hire and docking stations, also video.
- Other Links for Freight and Haulage information.
- Link to Michelin international route planner.
- Weather information.

Figure C.6 http://freightplanner.tfl.gov.uk/user/freightJourneyPlanner.php



C.7 Congestion Trends for Virginia Interstates over Five-Day Thanksgiving Travel Period

http://people.virginia.edu/~seb4v/TG/Thanksgiving.html

Main features:

- 30 minutes time bar to show day and time
- Road map with terrain option
- Satellite maps with label options
- Colour codes for little to no congestion, moderate congestion and heavy congestion

Figure C.7 http://people.virginia.edu/~seb4v/TG/Thanksgiving.html

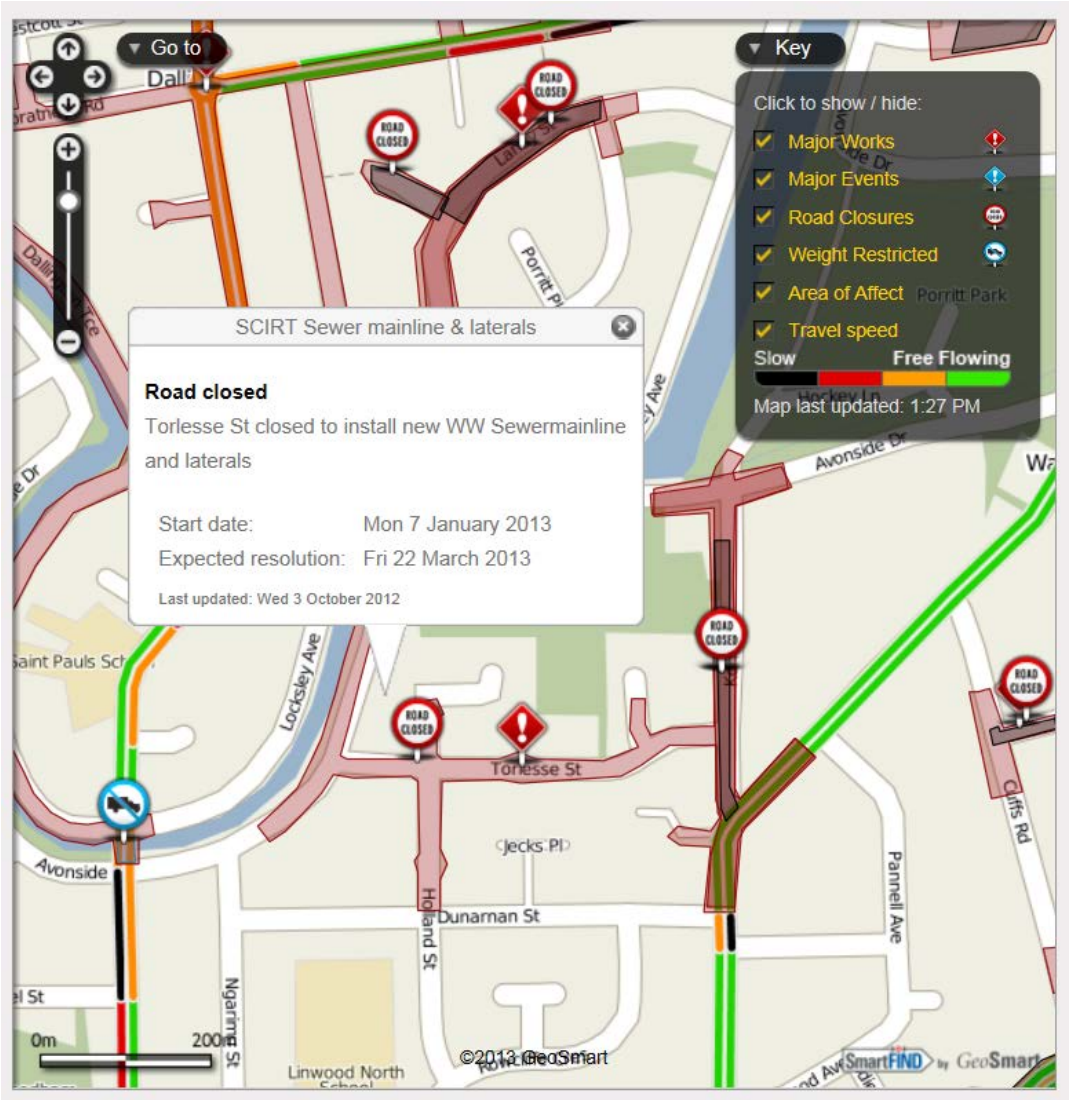
C.8 Transport for Christchurch

www.transportforchristchurch.govt.nz/

Main features:

- Road map, enable to select suburbs
- Real-time map shows major works, major events, road closures, weight restricted areas, area of affect, and travel speed
- News and events, can be filtered by news type
- FAQ
- RSS
- Link to NZ Transport Agency, Environment Canterbury Regional Council, Selwyn District Council, Waimakariri District Council, Greater Christchurch Urban Development Strategy, Christchurch City Council websites
- Link to MetroInfo for bus services
- Information on travelling by walking, cycling, bus, motorcycle and carpooling
- Useful information on transport
- Contact us information
- Facebook link
- Tweet

Figure C.8 www.transportforchristchurch.govt.nz/



C.9 London Bus Mapper video clip

www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu

Main features:

- Find buses and routes in London
- Can provide multiple options from A to B
- Estimated travel times

Figure C.9 www.youtube.com/watch?v=wNQGAnXMjWQ&feature=relmfu

C.10 Tiramasu crowdsourcing public transport application

https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8

Main features:

- Real-time arrival information
- Voice-over capabilities
- Can let others know when a bus is not stopping/is full

Figure C.10 https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8

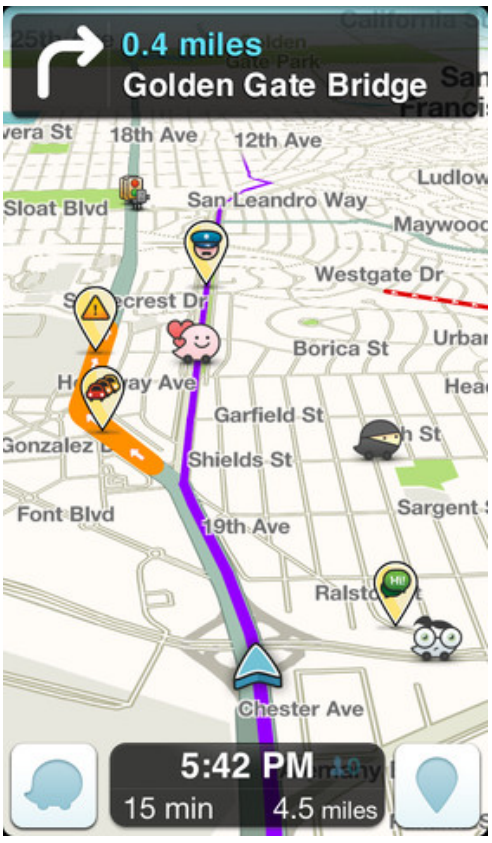
C.11 Waze crowdsourcing application

www.waze.com/

Main features:

- Community-based traffic and navigation app
- Can share real-time traffic and road information and avoid 'dead ends'
- Alerts driver to the presence of police, accidents, road hazards or traffic jams
- Through Facebook, can see other friends also driving to the destination
- Can coordinate a group's arrival times
- Helps driver to navigate to the cheapest petrol station on the route, using crowdsourced information on petrol prices

Figure C.11 www.waze.com/



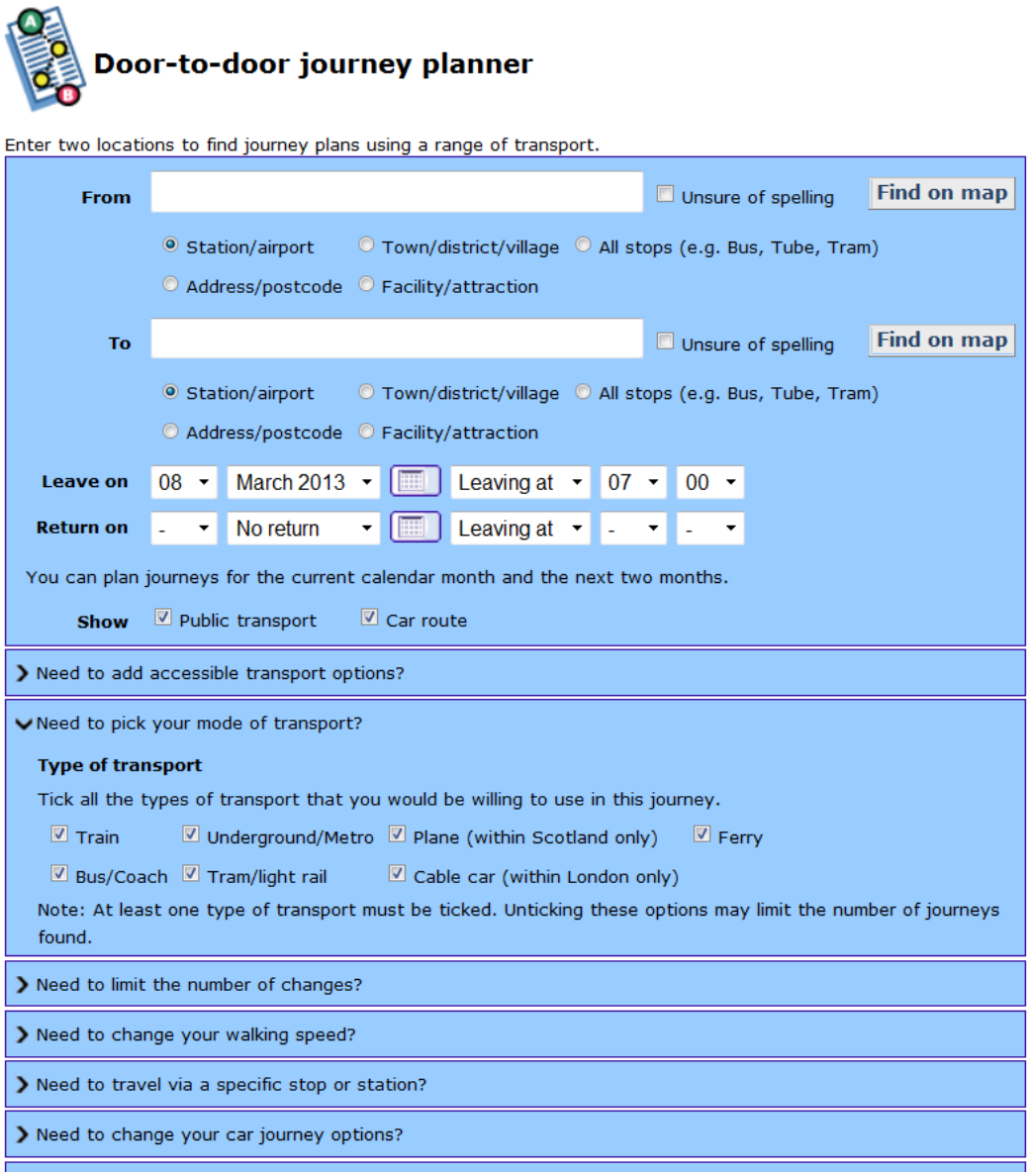
Appendix D Information provided to participants in the online survey

D.1 Transport Direct's 'Door-to-door' journey planner

www.transportdirect.info

Door-to-door journey planner

The following website allows the user to input the start and end point of their journey and then compare trip times and routes for various travel modes (e.g. available public transport types and private car). The following screenshots provide a view of the input and output screens. Please take a few minutes to study the images, including the types of information that is available and how the output is displayed.



Journey(s) found for Darlington to Edinburgh Airport

Details

Details | Summary | Maps | Tickets/Costs | Modify journey | Check CO2

Outward journeys for Fri 08 Mar 13 leaving after 07:00

Option	Transport	Changes	Leave	Arrive	Duration	Select
1	**Bus, Train, Walk**	**2**	**07:02**	**10:07**	**3 hours 05 mins**	◉
2	Bus, Train, Walk	2	07:22	11:03	3 hours 41 mins	○
3	Bus, Coach, Walk	2	10:20	17:16	6 hours 56 mins	○
4	Car	0	07:00	10:35	3 hours 35 mins / 194.7miles	○

Details: Outward journey 1 Show map Show in table

Start

leave **07:02** **Darlington Parkgate/Civic Theatre(Out)**

Bus **13A**
1 min

Take Arriva North East/13A towards Darlington

Map

arrive **07:03** **1** **Darlington Rail Sta Bus Stops-Parkgate**

Walk
3 mins

Walk to Darlington rail station

Map

depart **07:06** **2** **Darlington**

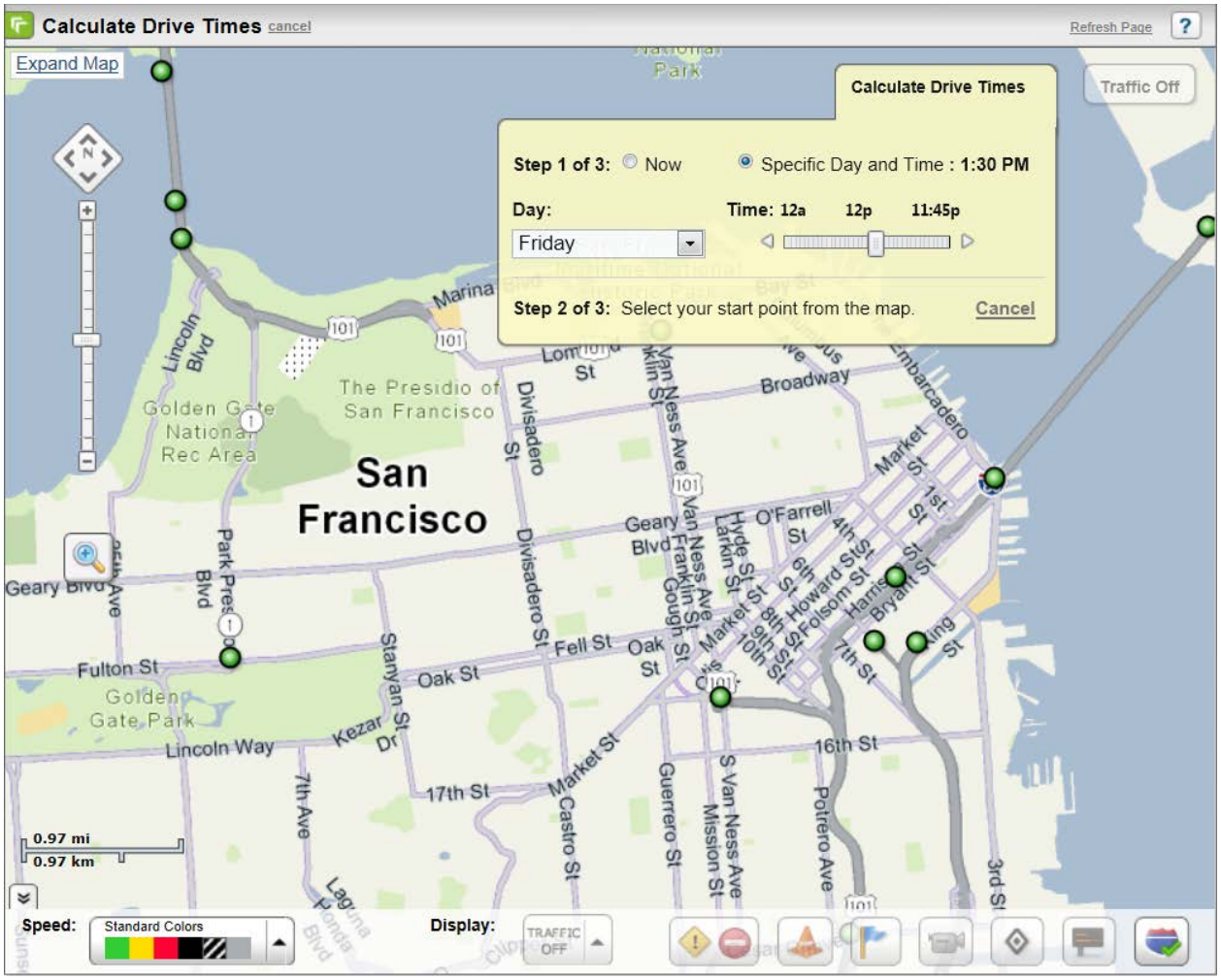
Departures

D.2 Drive-time calculator

511.org

Drive time calculator

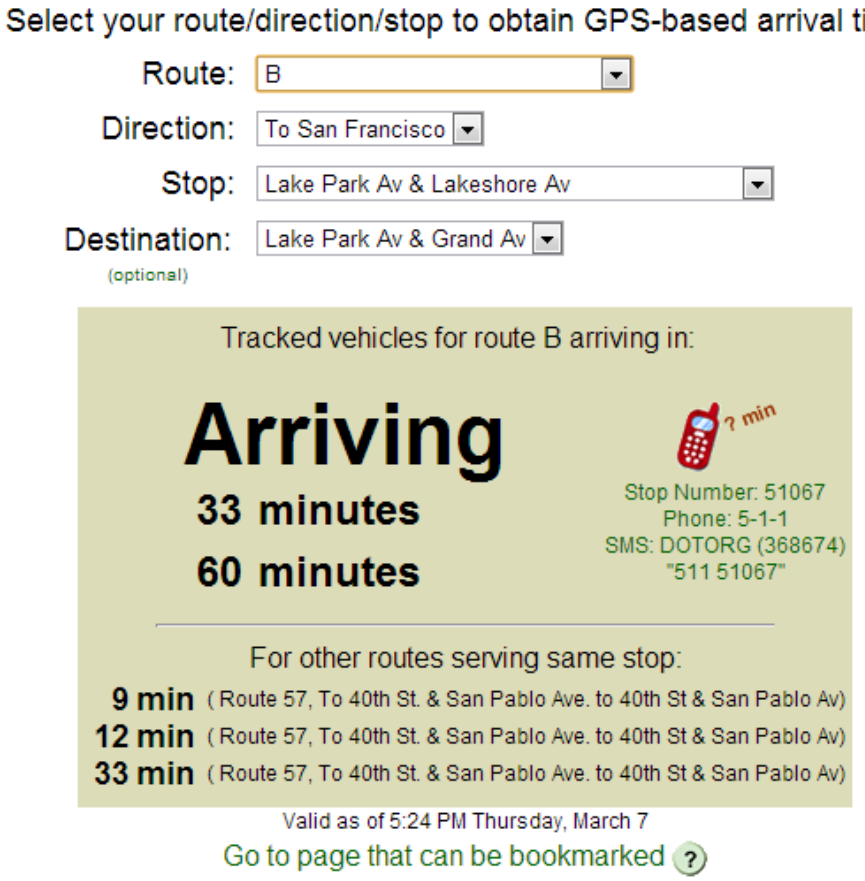
The following website allows the user to compare travel times at different days and times for specific trips. Travel times are calculated based on historical congestion trends and real-time data, allowing the user to minimise travel times by choosing less congested times to travel. The following screenshot provides a view of the input screen. Please take a few minutes to study the image before answering the following questions.



D.3 'Next bus' real-time bus information application

Real-time bus information

The following application allows the user to obtain real-time information about the next bus arriving at a specified stop (based on the actual location of the bus rather than the scheduled time of arrival). This kind of information can also be obtained for trains. The following screenshot provides a view of the input screen. Please take a few minutes to study the image before answering the following questions.

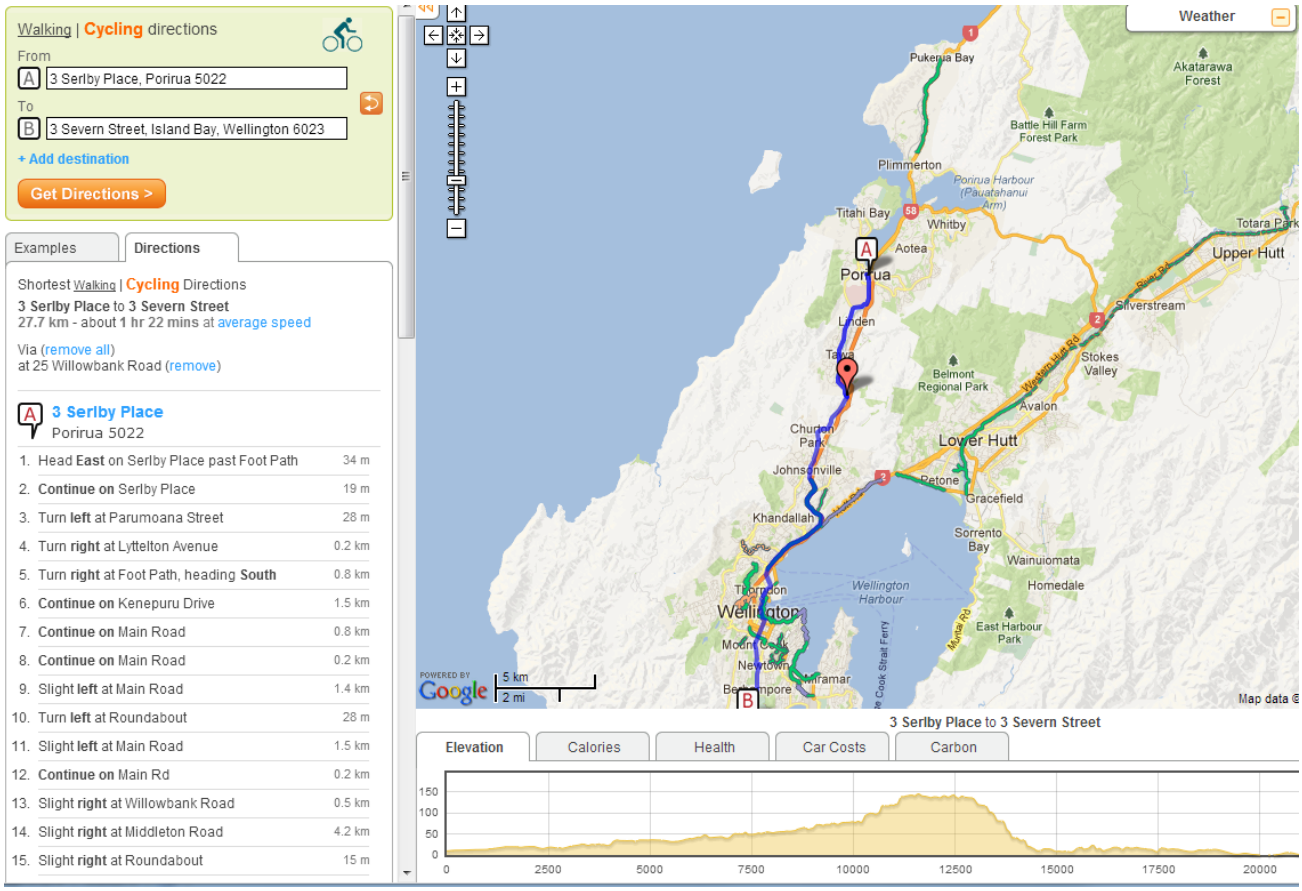


D.4 Wellington region active transport website

www.journeyplanner.org.nz

Active transport information

The following site allows the user to plan either a walking or cycling trip by specifying the desired start and end points. As can be seen in the screenshot, the output provides turn-by-turn directions for the trip. In addition to direction information, the site provides information on: elevation, calories burned, comparative trip costs by car and CO_2 emission savings. The following screenshot provides a view of the input screen. Please take a few minutes to study the image before answering the following questions.



D.5 Crowdsourcing information

https://itunes.apple.com/us/app/tiramisu/id429707931?mt=8

Crowdsourcing

Crowdsourcing gathers information from the public such as a GPS location and speed data from users travelling in a car, bus or train, for example. Information such as this can be automatically obtained from the users phone. Other information can also be supplied by users (e.g. the fullness of buses or the location and severity of incidents affecting the flow of traffic).

The shared information is not used to identify individuals. It is used to tell other users information such as:

1. The bus they are waiting for is 10 minutes late, or
2. On a specific street traffic is congested and travelling slower than usual.

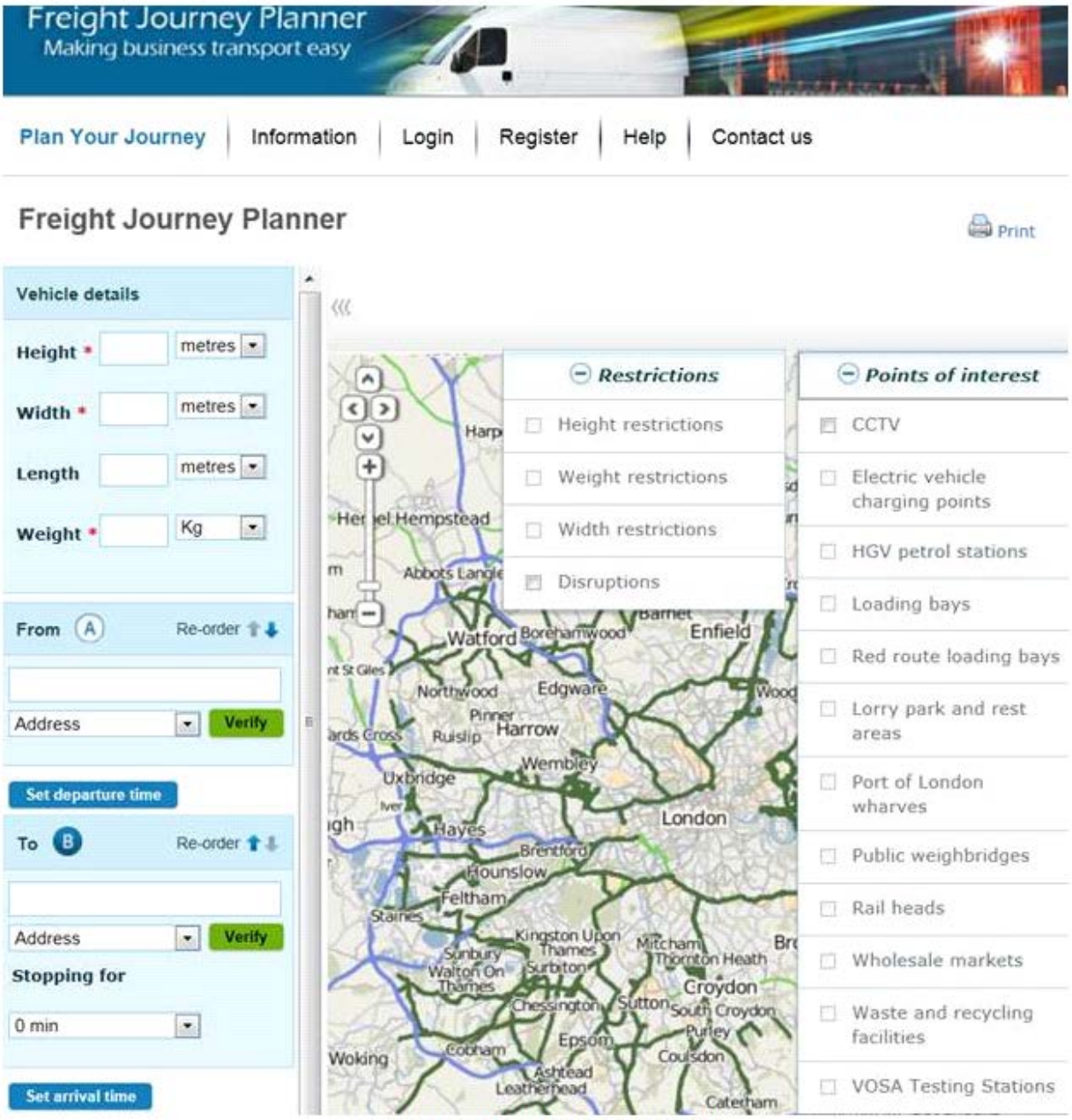
The following smartphone screenshot provides an example of how you could provide crowdsourced information. A user waiting at a bus stop would indicate that they are getting on or saw the bus 61D at their current location (thereby providing other users with real-time information about where the bus is on the route) or that the bus was too full for them to get on so that other users know that it is unlikely to stop at the next stops either.

D.6 Freight journey planner

http://freightplanner.tfl.gov.uk

Freight journey planner

The following screenshot is taken from a freight journey planner from the UK. As can be seen in the picture below, the planner allows the driver to input their truck's specifications, stipulate departure/arrival/break times, list a number of restrictions and identify a variety of points of interest when planning a route. Please take a few minutes to study the image before answering the following questions.



Source: http://freightplanner.tfl.gov.uk

Appendix E Online survey weighting information

Weighting variables were created to control for any biases in the online survey sample based on age, gender and main mode choice for commuter trips. The sample was compared to data from the Ministry of Transport's New Zealand Household Travel Survey (NZHTS), a representative dataset of New Zealand travel. The actual proportion of the online survey sample that fitted each age and gender category, and used each travel mode, was calculated and compared to the proportion of the NZHTS sample that fitted these criteria (based on millions of hours travelled for each group).

A weighting variable for age and gender was created by dividing the proportion from the NZHTS by the proportion from the current sample. A second weighting variable was created for mode choice by dividing the proportion of the NZHTS sample that used each travel mode by the proportion from the online survey sample. An overall weighting variable to control for age, gender and mode choice was then created by multiplying the two values. This weighting was then applied to the information priority scores.