Detailed customer requirements of travel information services, and the effectiveness of current channels

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Executive summary

Advances in technology and an ever-increasing consumer uptake in a wide range of apps and technology provide the NZ Transport Agency (Transport Agency) with multiple ways to communicate with their customers. The purpose of this report was to build on the previous Transport Agency research report 540 'Customers' requirements of multimodal travel information systems' (RR 540), to provide practical market and customer research on the delivery methods customers would prefer, and to identify which would have the greatest impact on improving the quality of customers' travel experiences.

This research was undertaken in seven stages:

Stage 1: Literature and best practice search

Stage 2: Baseline customer information needs (secondary analysis)

Stage 3: Review of traveller information in New Zealand

Stage 4: User-centred design workshops

Stage 5: Implementation plan/interactive workshop

Stage 6: Testing component

Stage 7: Dissemination of information.

Key findings

The outputs of the implementation plan were divided into four broad areas:

1 What are the delivery methods the transport sector should focus its efforts on, and in what order should these be prioritised?

2 What recommendations and guidelines of best practice should be used for each of the different delivery methods?

3 How should the traveller information delivery methods be evaluated to compare their benefits and effectiveness?

4 What prioritised tasks should the transport sector take to improve the provision of travel information?

Feedback on all stages of the research project emphasised the need for information to be accurate, delivered in a timely manner and user friendly. Websites, smartphone apps, radio and navigation systems all featured as high priorities for development for both private motorists and commercial operators. Smartphone apps, websites, paper timetables/brochures and voice announcements at stops all featured as high priority for development for public transport users.

The main differences in travel information required according to location include:

- Information needs in rural areas are related to whether particular routes are open during critical events such as flooding, storms, snow and ice. Information needs in rural areas are less likely to include public transport due to the limited to non-existent availability of public transport in these areas.
- For regional locations where congestion is not a serious issue, user needs are related to advanced notice of scheduled delays and detours, parking information, and information about delays caused by

unexpected weather events, particularly for inter-city travel where alternative route options are limited.

- Drivers in main metropolitan locations are faced with more complicated information needs relating to unscheduled and scheduled delays as they arise (congestion, crashes etc). People in these areas are more likely to be trying to optimise their journey times.

The prioritised list of recommended tasks includes:

- agreeing priorities and getting 'buy-in' within the wider transport industry
- improving the data quality and ease with which it can be exchanged
- developing operating procedures for people putting out information to ensure consistency
- formalising incident management communication between agencies involved in distributing information
- applying the developed standards to existing trials and implementations
- undertaking ongoing monitoring.

Abstract

The purpose of this report was to build on Transport Agency research report 540 'Customers' requirements of multimodal travel information systems' to provide practical market and customer research on the delivery methods that customers would prefer and to identify which would have the greatest impact on improving the quality of customers' travel experiences.

This research was carried out between October 2014 and May 2015 in seven stages:

- Stage 1: Literature and best-practice review focusing on identifying best practice for travel information systems, and methods to measure the effectiveness and customer satisfaction of travel information content and channels.
- Stage 2: Baseline customer information needs (secondary analysis of data from RR 540) relating to New Zealanders' current access and priority ranking of travel information needs.
- Stage 3: A review of traveller information in New Zealand
- Stage 4: User-centred design workshops and in-depth interviews
- Stage 5: User-intercept and online surveys
- Stage 6: Development of an implementation plan
- Stage 7: Dissemination of information.

This report describes the above work and provides recommendations for future actions, which include: improvements to data quality, development and implementation of consistent standards and operating procedures, and ongoing monitoring.

1 Introduction

Advances in technology and an ever-increasing consumer uptake in a wide range of apps[1] and technology provide the NZ Transport Agency (Transport Agency) with multiple new ways to communicate with their customers.

The Transport Agency research report 540 (Chang et al 2013) 'Customers' requirements of multimodal travel information systems' (RR 540) presents evidence-based recommendations on various customer groups' key travel information needs and provides guidance on how travel information can best be tailored to individuals. The report identifies a number of guiding principles to apply to the delivery of traveller information.

RR 540 provides a broad basis of information that was built on for this project. Key findings of relevance to this new body of work included:

For the general public:

- Web-based information had the best market penetration or reach with almost all (95%) respondents currently accessing travel information via this medium.
- Real-time information at public transport stops came in second, at 69%.
- Paper-based information was third most commonly accessed, at around 66%.
- Information that was accessed less frequently by respondents included one-on-one communications direct with staff (eg in person or via a telephone) (16–23%).
- 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.

For freight drivers:

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

- Mapped routes and the location of road closures were rated the most helpful types of information available to freight drivers. Mapped routes were accessed by almost all (92%); road closure information was accessed at a lower rate (78%).
- Road closure information, locations with weight/height restrictions and incident information were rated as most helpful.

Key to the current project was the development of an implementation plan that would provide the transport sector with clear direction on:

[1] Apps for the purpose of this report are any applications, websites, or programs that can be used on mobile devices such as tablets and smartphones.

- where travel information is succeeding in reaching customers
- where growth in travel information should be focused
- how to measure the effectiveness and customer satisfaction of travel information channels.

The methodology for this project was designed to build on the information learned in RR 540 to provide clear implementation guidance.

1.1 Key research questions/project objectives

The purpose of this research was to build on RR 540 to provide practical market and customer research on the delivery methods that customers would prefer and identify which would have the greatest impact in improving the quality of customers' travel experiences.

The key objectives of the proposed research include assessing:

- how various customer groups currently access travel information (ie what existing sources and channels are there?)
- the preferred channels selected customer groups (private car user, PT user, commercial road user) expect travel information to be delivered through
- customers' expectations of the methods through which traveller information should be delivered, inclusive of:
  - the content the various customer groups are most interested in
  - the customers' expectations of the regularity of the information
  - the most effective ways for delivering (eg displaying) the travel information
- what we can learn from the transport industry overseas
- how we can measure the effectiveness and customer satisfaction of travel information channels
- where travel information is succeeding in reaching customers and how this should be extended
- the provisions of a detailed information provision implementation plan for the transport sector.

Additionally, the project Steering Group further requested that a priority be given to:

- commercial and public transport users, and motorists
- the information channels of internet (including social media), apps, signage and radio
- in-trip versus pre-trip information
- rural versus urban and inter-regional versus intra-city (within a city)
- a way to measure the effectiveness of the delivery of travel information by each channel.

Note that this scope did not include investigations specific to provisions for people with different abilities, or information designed specifically for people who utilise services like Total Mobility. We recommend that such investigations be undertaken in the future.

1.2 Key project stages

This research was undertaken in the following seven stages with each stage building on information from the previous:

Stage 1: Literature and best practice search

Stage 2: Baseline customer information needs (secondary analysis)

Stage 3: Review of traveller information in New Zealand

Stage 4: User-centred design workshops

Stage 5: Implementation plan/interactive workshop

Stage 6: Testing component

Stage 7: Dissemination of information

1.3 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 future travel information services.

2 Review of literature and practice

2.1 Introduction

This literature and best practice review was undertaken in October and November 2014. It builds on and updates the information outlined in RR 540.

The review addressed two key questions posed by the Transport Agency:

1 What can we learn from the transport industry overseas, in terms of best practice for different delivery methods and content? This specifically considers best practice guidelines which cover aspects such as customer expectations on regularity of information.

2 What is the best way to measure the effectiveness and customer satisfaction of travel information channels?

2.1.1 Travel information provision content definition

For the purpose of this research the same definition of travel information provision content was used as in RR 540:

> *Travel information provision includes any type of information that could be collected and displayed/sent to travellers, which allows travellers to make informed decisions regarding whether to change their route, mode, departure time, and/or destination.*

Travel information falls into two main types of content:

1 Static: information which does not change over time (over the short term) or due to conditions

2 Variable: information which changes over time, or due to conditions. Such information may be related to events which are recurrent, or non-recurrent in nature and information can be updated in real time.

Travel information could include (but is not limited to):

- traffic delays (eg congestion)
- travel-planning tools
- ridesharing
- information on the cost/sustainability of different modes
- incidents
- weather conditions
- special events
- road works/restrictions
- parking availability/location

- real-time bus/next-bus information
- travel times/distances
- emergency alerts
- alternative routes
- walking routes/facilities/travel times
- cycling routes/facilities/travel times
- accessibility information, eg for people with disabilities, luggage and strollers.

2.1.2 Definition of travel information delivery channels

Travel information delivery channels are the means by which travel information is provided to travellers. Different channels can deliver information in formats that range from traditional methods to high-tech:

- Traditional channels include paper-based timetables and maps, radio (including dispatch) and telephone communications.
- High-tech channels include websites and mobile websites, VMS, smartphone apps, CCTV live video feeds, social media (including crowdsourced information), and in-vehicle devices (eg GPS).

While traditional channels tend to provide more *generalised* information, high-tech can increasingly be *personalised (or customised)*, for example by delivering information specific to their current location, to meet individual travellers' needs. Technology advances and innovations mean that travel information systems are expected to continue to change rapidly in the future.

2.1.3 Travel information in New Zealand: overview of existing knowledge

2.1.3.1 RR 540

From RR 540 we learnt travel information content needs vary widely depending on the user. These needs can depend on the:

- trip purpose
- mode (being travelled or compared)
- place(s) (including place of origin, route and destination)
- stage
- the traveller's level of experience with the trip locations or mode(s).

RR 540 includes a literature and best-practice review of travel information provision with discussions regarding:

- the demand for travel information
- the benefits of providing multimodal travel information, including the long-term changes to travel behaviour

- travel information requirements for:
  - new versus experienced users
  - urban commuters
  - freight drivers
  - long-distance commuters
  - local rural travellers
  - international travellers/tourists
  - Civil Defence emergencies/planned evacuations
  - people with different abilities, and minority groups
- demographics and travel information usage
- barriers to the use of transport information
- data quality and opportunities
- willingness to pay for transport information systems
- travel information currently available in New Zealand
- user feedback on information provision in New Zealand
- international examples of travel information provision.

Additionally, RR 540 contains the findings of primary research regarding travel information in New Zealand, including:

- travellers' use of, and satisfaction with, current New Zealand travel information
- critical factors in the quality and display of information
- information provision and resource implications
- initial perceptions of different information media
- information requirements for different user groups
- future travel information provision priorities in New Zealand
- requirements for freight drivers (including current use and future priorities.

Table 2.1 is taken from RR 540 and provides a summary of the information needs of different types of travellers.

Table 2.1 Summary of potential information needs for different user types

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 drop-off points, broken lifts/escalators, walking information and accessible websites, help in identifying the correct bus and exit stop) Timetables and fares for public transport 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 Public transport alternatives Ridesharing options (although participants did not think they were likely to use this) Also: Ability to compare rental cars and specs (eg hybrid) Good rest areas and cafes Clean toilets Major delays/crashes 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

Trip purpose	Potential information needs
	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 Road works 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

Additionally, based on primary research undertaken with New Zealand travellers, RR 540 suggests the most effective channels for travel information provision in New Zealand are as follows:

- Pre-trip information could be provided via the internet, smartphone or radio.
- For in-trip information, radio and VMS 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.
- Public transport information via mobile phone/smartphone is 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.

2.2 Commercial users' needs

One area of particular interest to the present study is the travel information needs of commercial users; however, this appears to be an under-researched area (Pan and Khattak 2008) and as such, no particular commercial information provision user requirements were found[2]. In the absence of specific information, we have used judgement to consider the tasks of commercial drivers to see where they may differ from those of private motorists or public transport users.

For the purpose of this report we have used a definition of commercial vehicle operations adapted from Wheeler et al (1998) to include vehicles used for commerce, such as transporting passengers or property. Note that under this definition freight operations are a form of commercial vehicle operation utilising larger vehicles. Table 2.2 summarises the information needs of different types of commercial travellers.

[2] Such documents may exist, but may be commercially owned or sensitive and not publically available.

Table 2.2 Information needs of commercial travellers

Type of commercial operation	Characterised by	Information needs
Commerce	Involves the movement of goods and materials from one location to another (can be over short or long distances).	Requires information to aid in the reduction of delays (as delays cost money).
Personal transport	This category includes taxis and buses.	Needs to know how the trip can be made as quickly and cost effectively as possible. May need to meet scheduled arrivals and may be constrained by a schedule and specific route.
Emergency response operations	Police, fire service, ambulances and also includes tow-truck drivers.	Require rapid route information to desired point or destination. May require additional information to bypass traffic/other delays. Need to coordinate with other services. May have a secondary person to seek and communicate information.
Freight operations	Require larger turning areas, take up more lane width, and parking space and may exceed height and/or weight restrictions.	Require information to determine routes suitable for the vehicle size/weight constraints.

Note: Some of these will be commercial operators who have access to a dispatcher who can source travel information and provide real-time assistance. One main difference between commercial operators and private travellers is that commercial operators may have access to a dispatcher who can source travel information and provide real-time assistance.

2.3 Best practice for travel information systems

The following literature and best practice review builds on the existing knowledge generated in RR 540 and in chapter 3 of this report. Section 2.3.1 begins by providing a review of overseas best practice for travel information systems, channels and content. It then provides specific travel information best practice for a range of channels and content, where such best practice guidance exists. More specific guidance is provided for:

- VMS
- travel time information
- websites
- public transport
- smartphone apps
- social media
- real-time information
- journey planners
- printed material
- radio.

Specific best practice guidance was not found for travel information delivered via television, text or telephone. However, these channels are covered by the general best practice guidelines outlined in tables 2.3 and 2.4.

2.3.1 General best practice guidance for travel information systems, channels and content

Table 2.3 provides a review of evidence-based, general best practice recommendations for all travel information systems. These systems should be diverse, resilient and adaptable. Additionally, different types of users should be provided for, and users should be made aware of the full range of information services available.

Table 2.3 General best practice for travel information systems

Best practice recommendations	Evidence	References
Travel information systems must be resilient.	Information systems should be designed to ensure they can operate in an emergency or after a disturbance – this includes allowing changes/updates to be made remotely.	Chang et al 2013
	Consider giving emergency services access to update information channels, eg access to VMS if the local operation centre is not open 24 hours.	FHWA 2004
Travellers should be made aware of the range of travel information channels and content available for them to use before and during a journey.	Lack of awareness is a major reason that travellers do not access available travel information.	Farag and Lyons 2008; Marks 2008; Pathan et al 2011; Hedden et al 2011; Chang et al 2013
Ensure a range of content and channels are provided.	Not all users have the same needs and preferences, or access to the same channels. Therefore, a diversity of channels is key to ensuring a wide range of needs are met.	Robinson et al 2012
	Some low-tech information channels continue to be very important, particularly for certain types of users (see chapter 3 of this report). New Zealand research shows that paper-based information is the second most frequently used information channel (after the internet)	Chang et al 2013
Assess the roles of different parties, including public agencies and the private sector, in collecting and providing travel information content and channels.	One agency does not need to be responsible for all channels, or even for all data sources and information. Good information can be provided by agencies and third parties; the latter may be better placed to innovate and develop channels.	Robinson et al 2012
	Data access should be free or cheap. Appropriate and consistent data standards should be employed to ensure ease of use.	Robinson et al 2012
	Agencies should evaluate travel information effectiveness to assess if desired outcomes are being achieved.	Robinson et al 2012
Agencies should be able to monitor and adapt to changing user needs, and to changing technology.	Agencies should evaluate and monitor travel information, and should also expect a dynamic system which changes over time as technology, traffic conditions and access to transport options change.	Cowherd 2008
	Agencies should expect technology to advance in a range of ways to increase the effectiveness and efficiency of travel information, and acknowledge that user needs will change over time.	Robinson et al 2012
	Local travel information system monitoring is important to evaluate what is working, what is not, and how needs are changing over time.	Hedden et al 2011

Best practice recommendations	Evidence	References
Provide information in universally accessible formats for people with different abilities	This is most often cited in terms of information provision for public transport. This document provides guidelines for public transport.	New South Wales Ageing and Disability Department (2000)

Table 2.4 provides a review of evidence-based, general best practice recommendations for all travel information channels and content. These recommendations include that travel information should be as accurate and reliable as possible, be targeted where there is most need and at different user types such as novice/experienced and tech savvy/not tech savvy.

Table 2.4 Best practice for travel information channels and content

Best practice recommendations	Evidence	References
Travel information should be current and regularly updated, and also should be as accurate and reliable as possible.	The reliability of travel information is important, as this is a key determinant of whether or not it is used, how often, and with what level of confidence.	Lappin and Volpe 2000a; Chang et al 2013
The best travel information should be available where it is most needed.	Certain types of trips are more likely to attract the use of travel information, and as such these trips appear to have the highest need for travel information. Such trips include those where the trip arrival is time-sensitive, or when travel time is uncertain or variable.	Peirce and Lappin 2003
	The local travel context can also dictate peoples' expectations of regularity as well as customer satisfaction. For example, in Los Angeles traffic conditions are so volatile that people expect live information, but feel that it cannot be relied on as conditions could change at any time.	Petrella et al 2004
	Dynamic travel information is most useful in situations where there is uncertainty.	Pan et al 2008
	Additionally, findings show that areas with higher congestion and delay, as well as places with alternative routes available, experience higher use of travel information (most used is VMS and radio).	Petrella et al 2014
Information should be provided to meet the needs of those who are tech savvy and those who are not tech savvy.	Non-tech savvy travellers will still require a telephone call centre capability.	Zografos et al 2010; Marks 2008
	Physical resources such as paper-based maps, have been shown to be more effective at increasing multimodal trips than a range of other tools.	Zhang & Stopher 2011
	Of all channels, internet-based information provision services are associated most strongly with travel behaviour change.	Khattak et al 2008; Cluett et al 2003
Information should be consistent between sources	Consistency in messages across multiple channels is important to maximise the probability of mode shift. Findings indicate customers tend to find government-agency sourced information the most credible.	Pathan et al 2011
Having people sign up for updates on the system, or 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

Best practice recommendations	Evidence	References
	Users increasingly want personalised, specific travel information. Customer registered push notifications are an important aspect of this type of information delivery.[3]	Hedden et al 2011
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.	FHWA (undated); Cats et al 2011
	A lack of 'landmark knowledge' can be supplemented with landmark information. For example, information providers 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
	'Notification information' is critical to all users, including experienced users – events that warrant notification can also create the most frustration in experienced users, because of their expectations.	Higgins et al 1999
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.	Nielsen developed usability heuristics for interface design. These heuristics are used to aid in the design of usable computer/human interfaces as well as for evaluation. One of these heuristics relates to matching information in the interface to the 'real world'. To achieve this it should use words, phrases and concepts familiar to the user, rather than introducing new terms.	Nielsen 1995
	42% of people who frequently use public transport 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 public transport lines, straight route layouts and good labelling to help people remember information.	Dziekan 2008; Ayoob et al 2010

2.3.2 Best practice: variable message signs (VMS)

VMS, also called changeable or dynamic message signs, are used to provide real-time information to travellers, in order to change travellers' behaviour or increase their trip satisfaction. VMS are used to advise or give advance notice to travellers of a problem and may also suggest a course of action such as an alternative route/lane to use or an advisory speed (Dudek 2004).

Guidelines for VMS display in New Zealand were developed by Chang (2008a) for the Transport Agency based on driver comprehension testing (Chang 2008b). These guidelines were subsequently developed into draft NZ Transport Agency operating policy and procedures documents (NZ Transport Agency 2011a and 2011b). These guidelines cover message construction, terminology and design, and the rules of displaying information. Table 2.5 provides a review of evidence-based, best practice recommendations for the use of VMS.

[3] Bearing in mind that in-vehicle travel information must be able to be delivered both safely and legally.

Table 2.5 Best practice recommendations for variable message signs

Best practice recommendations	Evidence	References
Messages text and content should simple, brief, and standardised.	Consideration should be given to the road and environmental conditions that may limit the length of time travellers can view the message, and therefore the words that can be used. Factors include weather, obstacles and travel speeds.	Dudek 2004
	Consistent standards in the order and quantity of information, and the words and abbreviations used meet the expectations of travellers better, and are also more readily understood.	Dudek 2004
	Best practice from the FHWA recommends implementing standardised procedures for communication between regions/places with different traffic operation centres.	FHWA 2004
	Keep messages to one screen as much as possible, to allow motorists time to read it.	FHWA 2004
	Including travel times for different lane types (such as general traffic, and bus or HOV lanes) on the same sign is too complicated. Use separate signs where possible, or give difference in travel times between lanes.	FHWA 2004
Messages should be timely, accurate and useful.	To ensure VMS messages are trusted and retain credibility, information must be reliable, directly relevant, and updated as soon as it is available.	Dudek 2004
	Travellers are more likely to comply if they are told *why* there is a problem and *what* to do, eg traffic incident, right lane closed.	FHWA 2004
	Ensure travel time messages are readily distinguishable from other VMS information types.	FHWA 2004
Messages should only be used when necessary.	Information that is trivial, obvious, or repetitive (such as routine congestion) can reduce the effectiveness of VMS, as travellers may stop paying attention to them.	Dudek 2004
	Limit use of VMS to emergencies which affect the road users, rather than providing general emergency information.	FHWA 2004
Conduct public awareness campaigns before VMS is used.	To encourage a positive reception, ensure motorists understand both how to read the signs and where the information in them comes from.	FHWA 2004

2.3.3 Best practice: travel time

Travel time information is used to give travellers an indication of how long it is likely to take them to get from one place to another. It can be static, indicating usual travel time, or variable, indicating estimated time in current travel conditions. Travel time can be provided before or during a trip through various channels. Table 2.6 provides a review of evidence-based, best practice recommendations for travel time information.

Table 2.6 Best practice recommendations for travel time information

Best practice recommendations	Evidence	References
Travel times should be as accurate and current as possible	Travel time information must be reasonably accurate and current to be credible (better not to display then to display highly inaccurate information, otherwise people may stop using it).	Dudek 2004
	When information is not current or reliable, this should be communicated.[4]	Dudek 2004
	Travel times should be as accurate as possible, and change with conditions. Uncertainty should be treated conservatively.	FHWA 2004
	Real time travel time information error should be less than 20% to ensure that most users gain the benefit of on time reliability.	Park 2009
	Public transport travel time should be conservative (ie it is better to say it is coming earlier than it actually does, rather than later than it does, to avoid people missing it).	Steinfeld 2014
Travel times should be displayed to meet the needs of new and experienced travellers.	If distance is included beside the variable travel times, this will meet the needs of experienced and novice travellers.	FHWA 2004
Travel time displays should be useful, simple and easy to understand quickly.	For example, including travel times for different lane types (such as general traffic, and bus or HOV lanes) on the same sign is too complicated. Use separate signs where possible, or give difference in travel times between lanes.	FHWA 2004
	Providing travel times to destinations is more easily understood than providing speeds or congestion descriptions.	Lerner et al 2009

2.3.4 Best practice: websites

Websites can be used to convey a wide range of travel information to users, who can access the information via a computer or smartphone. It is important that websites should dynamically adapt to the browser (ie the site should recognise someone using a smartphone and adapt the formatting accordingly(5). Evidence-based, best practice recommendations for website travel information is provided in table 2.7.

[4] Kuhn et al (2013) have developed guidelines for communicating travel time information to describe its reliability, such as how best to describe: 95th percentile trip time, arrival time, average travel time, buffer time, departure time, recommended departure time and recommended route.

[5] A Steinfeld (Carnegie Mellon University), pers comm, May 2015

Table 2.7 Best practice recommendations for website- based travel information

Best practice recommendations	Evidence	References
Information must be accurate, timely, quick and easy to access.	Passenger information websites should be user friendly, accessible, consistent and current.	Currie and Gook 2009
	Website information must be quick, easy to access, reliable, and have extensive coverage of major roads and modes.	Marks 2008
	Ensure that a user's first experience with a website is easy, otherwise they are unlikely to return to the website again.	Kenyon et al 2001
Ensure website information is displayed in a format accessible to people with different abilities.	The New Zealand Office of Disability Issues has developed a list of accessibility barriers and which impairment types they impact on for websites in general. Solutions for these are provided in the New Zealand Government Web Standards and Recommendations.	The New Zealand Office of Disability Issues and the New Zealand Government Web Standards and Recommendations
Utilise human factors information provision principles.	The output of this project produced 6 principles and 20 best practices for public transport website design.	TCRP Synthesis Project SB-8 2002
	Provides design principles and best practice guidelines for public transport website design.	Kenyon et al 2001

2.3.5 Best practice: public transport

Internationally a number of best practice guidelines have been developed for public transport. Best practice for public transport websites are included in table 2.7, the remaining recommendations are in table 2.8.

Table 2.8 Best practice recommendations for public transport

Best practice recommendations	Evidence	References
Bus stop recommendations	Information provision at bus stops should: • allow potential users to identify where the stop is • communicate time of departure and return • confirm which bus stop it is to people on the bus TTI and Nustats International (1999) suggest the following information should also be displayed: • *Bus system logo/name* • *Information telephone number* • *Route number/s of the services that use the stop* • *Names of streets and landmarks where the bus stops* *The Bus system logo and the route number should be viewable at 9 meters by someone with low vision (20/200) in general daylight. The street name should be visible half a block away or across the intersection whichever is further away.*	TTI and Nustats International (1999)
System map	System specifications for a system map from TTI and Nustats International (1999) include: • display of information (layout, font size etc)	TTI and Nustats International (1999)

Best practice recommendations	Evidence	References
	• wording • route diagrams/maps/use of landmarks/transfer points • legends.	
	Provide specification for indicating: • route labelling, symbols, scales, font size, legends, colours and codes, timing points • specifications should be universally accessible.	New South Wales Ageing and Disability Department 2000
Timetables	Provide specifications for people with different abilities including: • font type, font size, use of contrast, spacing, layout, language, paper type • viewing format is also important for blind people using a screen reader (eg web format rather than pdf).	New South Wales Ageing and Disability Department 2000 Steinfeld 2014
Wayfinding signs	Transport New South Wales, 2002 suggest guidelines around: • consistency (being able to see the next sign, location, and look of signs) • clarity (messages should be unambiguous) • simplicity (shortest simplest path) • access (placement of signs).	Transport New South Wales 2002

2.3.6 Best practice: smartphone apps

Smartphones may be the channel with the most potential, as apps can provide travel information without users requesting it. An example of this is an app that knows a user's travel preferences, current location and next appointment, and can automatically tell the user when to leave, how they can get where they are going, and how to adapt travel as external conditions change during the trip (Robinson et al 2012). Personalised travel information can also be provided using push notifications to alert travellers to irregular events affecting their usual travel patterns (Chang et al 2013).

Best practice guidelines for apps are starting to be developed; however, little could be found regarding best practice for travel information apps. Table 2.9 summarises best practice recommendations for these.

Table 2.9 Best practice recommendations for apps

Best practice recommendations	Evidence	References
In general, app design and information content should be useful, quick, simple and easy to use.	User experience of an app is a key factor associated with use. User experience is shaped by how well, how easily, and how quickly, the app meets their needs by providing them with their desired information. Specific considerations for app-based information include: • prioritising important information, so it can be accessed with fewer clicks • using designs that are quick to load and not data-intensive • incorporating mobile phone features such as GPS	MobiForge 2013

Best practice recommendations	Evidence	References
	where appropriate • ensuring content is suitable for viewing on a small screen.	
Apps should be universally accessible.	Support accessibility features of the operating system, like VoiceOver and TalkBack.	Steinfeld et al 2011
Apps must be able to be used safely.	In-vehicle travel information must be able to be accessed in a manner that is both safe and legal for a driver to use (eg voice activated, docks into central column etc).	Robinson et al 2012

2.3.7 Best practice: social media

The use of social media by transport agencies is an emerging field for informing, updating and engaging with travellers. Social media channels include Twitter, text messages, emails, blogs and Facebook. For example, Transport for London allows travellers to subscribe to Twitter feeds for different public transport lines, news and services in order to push out daily real-time notifications and updates.

Transport agency social media presence provides the opportunity for:

- agencies to share information with travellers
- travellers to share information with agencies
- travellers to share information with other travellers.

Additional points of best practice for travel information provided through social media are captured in table 2.10.

Table 2.10 Best practice recommendations for social media

Best practice recommendations	Evidence	References
Implement social media policies and guidelines	It is important that agencies have appropriate polices and guidelines in place regarding the use of social media by staff, including basic principles of use, and codes of conduct[6] to ensure that all interactions reflect the public image the provider would like to convey.	Bregman 2012

2.3.8 Best practice: real-time information

Modern technology advancements mean that travel information content can be provided in real time, or near real time. Users can access this information before or during a trip via a variety of channels. Evidence-based, best practice recommendations for real-time travel information are summarised in table 2.11. Note there are similarities between best practice for real-time information and VMS.

[6] The New Zealand government provides guidance for government agencies use of social media: https://webtoolkit.govt.nz/guidance/social-media/

Table 2.11 Best practice recommendations for real- time information

Best practice recommendations	Evidence	References
Information should be current, timely and accurate, as well as safe and convenient to use.	Real-time information must be reliable for users to trust (and use) the system. If information is not accurate and timely, users will lose confidence in the system and stop using it.	Kandarpa et al 2010; Dudek 2004; Lappin and Volpe 2000a
	Travel time information must be reasonably accurate and current to be credible. If necessary, communicate the level of reliability (ie 20 minutes at 7.50am, or give a range). It is better not to display than to display highly inaccurate travel times, otherwise travellers may stop using the information. Uncertainty should be treated conservatively.	Dudek 2004; FHWA 2004
	If distance is included beside the variable travel times, this will meet the needs of experienced and novice travellers.	FHWA 2004
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.	It has been found that real-time public transport data can increase perception of safety and the amount of walking people do.	Ferris et al 2010
	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 what measures would get people to take public transport 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 and Kottenhoff 2007
	While waiting at a station or stop, real-time information (eg actual arrival times, delays and/or location of the vehicle being waited for) is generally preferred over any other form of information.	Cluett et al 2003
	Real-time public transport information appears to be most in demand in places where the network is complex or variable, and where travellers are younger and tech savvy.	Lappin and Volpe 2000(a)
	Public transport users accessing web-based travel information say they most value real-time information, followed by trip planning tools.	Molin and Timmermans 2006
	Subscription-based, real-time push notifications using mobile phones and/or social media should be pursued as they are likely to be the most useful form of travel information.	Wallace et al 2009
	Real-time bus-tracking information increased ridership levels in New York City with a median increase in trips of 2.3% per route, as well as increased satisfaction and reduced wait times in Tampa, Florida.	Brakewood et al 2015 Brakewood et al 2014

2.3.9 Best practice: journey planners

Journey planners are a form of travel information that allow users to plan a trip, often by comparing the range of routes and/or modes available based on time, cost etc. An overview of evidence-based, best practice recommendations for journey planners is provided in table 2.12.

Table 2.12 Best practice recommendations for journey planners

Best practice recommendations	Evidence	References
Integrated planners are more valued and effective than single-mode journey planners.	The Washington, DC travel planner RideGuide found that 70% of respondents said the website helped them make a public transport trip they would have otherwise made by car.	FHWA (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%, public transport 39%, carpool or vanpool 2%, and bicycling <1%). 92% were satisfied with the service.	FHWA (undated)
	Users need to be able to compare alternative routes/modes without having to use different apps or areas within one app (eg they do not 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
	Integration of accessible transportation, relevant accessible local infrastructure, and local points of interest is both desired and useful.	GeoAccess Challenge Team 2011

2.3.10 Best practice: printed material

Travel information is frequently provided using printed material, particularly in the form of timetables and maps. Table 2.13 sets out best practice recommendations specific to printed material.

Table 2.13 Best practice recommendations for printed material

Best practice recommendations	Evidence	References
Printed material should be user friendly and easily accessible	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 and Lavelle 2010; Guo 2011

2.3.11 Best practice: radio

Travel information is also commonly provided via radio. Radio travel information can be broadcast area wide, and through short-range vehicle-to-infrastructure and vehicle-to-vehicle radio systems. Best practice guidance specific to radio is summarised in table 2.14. The reader should note that very little best practice guidance was found in the literature for the provision of radio travel information.

Table 2.14 Best practice recommendations for radio

Best practice recommendations	Evidence	References
Signs should be posted in advance to notify travellers of the radio availability and frequency.	If travellers are not aware of that radio travel information is available, then they will not know to use it.	ODOT 2006
Information should be accurate, clear and simple, follow a standard format, and not be contradictory to other sources of travel information.	Credibility may be reduced if inaccurate information is given. Inaccurate, complicated or contradictory information may cause driver confusion.	ODOT 2006

2.4 Measuring the effectiveness and customer satisfaction of travel information content and channels

Robinson et al (2012) argue that the effectiveness of travel information, and the channel used to deliver it, depends on the intention or desired outcome of the provision, ie how well did the travel information content and channel produce the intended or desired result? Additionally, Robinson et al (2012) make the case that an effective travel information system should meet the demands and expectations of travellers, and that the result will be an optimal information system and satisfied travellers.

In general, there is a 'lack of efficient, scientifically derived techniques to quantify operational impacts of TI programs' (Robinson et al 2012, p8). However, in practice, travel information content and channel effectiveness tend to be measured based on measures of output, or measures of outcomes.

Output relates to the *use* of travel information system(s). For example, a website may log the number of users that visit per day. Measures of output tend to be statistics related to the use of a travel information channel or particular content. For example the number of copies printed, site visits, phone calls and app downloads.

Outcomes relate to the *effect* of the travel information on either improving travel experiences or travel decisions/behaviour by customers. Improved travel decisions and behaviours of individuals may result in efficiency improvements in the transport system. Measures of outcomes fall into three broad categories (as reviewed by Robinson et al 2012):

1 Level of satisfaction with travel information systems/channels/content. Satisfaction measures include:

   a use of, access to, perception of and need for channel/content

   b level of satisfaction with information: timeliness, accuracy, availability, accessibility

   c the effect of travel information on trip comfort/reduced frustration (ie simply knowing why they are 'stuck')

   d ease of use of channel: eg how quickly and simply can a user access the primary information they need, (ie how many 'clicks' or how much 'clutter')?

2 Effect of travel information systems/channels/content on individual travel behaviour. Behavioural measures include changes to route, mode, departure time, destination, or an avoided trip, where such changes may result in:

a improved arrival time reliability

b travel time reductions

c increased travel predictability.

3 The effect of travel information systems/channels/content on the wider transport system. These may occur as a result of cumulative changes in individuals' travel behaviour. Measures include any measure of network performance, such as reduced congestion, mode shifts, travel time savings, reduced vehicle kilometres travelled.

2.4.1 Travel information evaluation methods

Methods to evaluate the effects of travel information can be broken into three main approaches (Robinson et al 2012; Hedden et al 2011):

1 Stated use and stated preference studies

2 Observational studies

3 Modelling and simulation.

Additionally, 'a heuristic review'[7] can be a useful way to evaluate the performance of travel information systems relative to best practice criteria, although it does not assess effectiveness (output or outcomes) per se.

Each of these methods are now reviewed in tables 2.15 to 2.18, including a review of when they are best used, and their strengths and limitations. Case studies are listed to demonstrate their application.

2.4.1.1 Stated use and stated preference studies

The most widely used approach to evaluate travel information systems is through capturing peoples' stated uses, preferences and responses (Bifulco et al 2014). Measuring customer satisfaction is seen as a useful (and perhaps the most useful) tool to identify traveller priorities, and areas of dissatisfaction, thus allowing priorities to be set (Ritter et al 2013). However, measures of satisfaction are not well standardised (OECD 2001). Additionally, it is important that stated preference surveys are designed very carefully to ensure they produce valid and useful results (Bifulco et al 2014).

[7] Heuristic reviews were developed by Jakob Nielsen and Rolph Molich in the 1980s. Heuristic reviews are often used to provide a quick (and less expensive) way to assess the usability of information provided.

Table 2.15 An overview of using stated information to evaluate the effectiveness of travel information

	Type of stated information used	Reference
Outcomes captured	Stated level of use Stated level of satisfaction, or information needs	Eg Lappin et al 2000(a); Lappin et al 2000(b); Petrella et al 2004; Wallace et al 2009; Ritter et al 2013
	Stated effect on travel behaviours	Eg Robinson et al 2012; Petrella et al 2004; Ritter et al 2013
	User perceptions/comprehension/interpretations	Lerner et al 2009
Information gathered	Stated use Stated satisfaction Self-reported behaviour change	Robinson et al 2012
Description	Ask people to report their level of satisfaction, perception, or behavioural change that results from using travel information	Robinson et al 2012
Methods	Paper or web survey Focus groups Interviews	Robinson et al 2012
	Traveller logs and diaries	Eg Peirce and Lappin 2003
	Stated response to scenarios	Eg Bifulco et al 2014
Sample	Both users and/or non-users of travel information	Robinson et al 2012
Strengths	Relatively cheap, can usually achieve larger sample size The variables of interest can be directly explored (eg through scenarios as this research used)	Robinson et al 2012 Bifulco et al 2014
Limitations	Can be reasonably accurate, if study is well designed	Robinson et al 2012
	Participant recall may not be reliable People's stated and actual behaviours are not always the same	Ritter et al 2013; Boyle et al 2014
	Measures are not well standardised	OECD 2001
Channels and content which can be assessed	Any	Eg Lappin et al 2000(a); Lappin et al 2000(b); Petrella et al 2004; Wallace et al 2009; Ritter et al 2013
Examples/case studies	A survey panel of travellers was used to assess behavioural responses to travel information, of those who use the route of interest. Baseline stated use/preference was captured (measured typical travel in the corridor, their satisfaction with their peak hour trips, their awareness and use of real-time traffic information, and their satisfaction with the information), and surveys were triggered after incidents measuring use of information and its impact on travel during incident conditions.	Petrella et al 2014
	Customer feedback was used to evaluate the effectiveness of a 511 travel information phone system and website for pre-trip and en-route use.	Cowherd 2008
	The effect of in-trip, real-time travel information displayed via VMS on route choice was examined, using a stated use research design	Bifulco et al 2014

	Type of stated information used	Reference
	This study assessed behavioural response to real-time travel information regarding road network congestion during a period of construction which involved road and lane closures. A sample of travellers was surveyed regarding their use and response to information, including: travel times, mode choices, alternate route choices and selection of sources of information on traffic conditions.	Kattan et al 2013
	This study measured the proportion of users who said they went on to make a public transport trip that they would otherwise not have made, due to the use of a telephone travel information service.	Lodden et al 2004
	The effect of non-traffic-related VMS messages (safety and public service announcement) on traveller behaviour was assessed using a stated preference survey. The survey gathered respondents' views on whether the message was a practical and functional use of VMS, and whether or not the message changed the respondents' behaviour	Boyle et al 2014
	This study developed measures to assess satisfaction with web based, real-time travel information. Three constructs were developed to measure overall satisfaction: utility (ease of use and usefulness of information), efficiency (how well designed, organised and integrated the information was), and customisation (degree of personalisation of service), which were found to be robust measures of traveller satisfaction.	Horan and Abhichandani 2006
	One recent study used short, event-triggered surveys ('pulse, or event triggered surveys') and a research panel of travellers for a longitudinal study. Channels in this study were real-time VMS and 511 telephone travel information centres and the implementation of an integrated corridor management system (which coordinates real-time information from multiple agencies). Participants were recruited using licence plate databases to capture vehicles of interest. Surveys captured use of information before and during trip, and satisfaction.	Ritter et al 2013

2.4.1.2 Observational studies

Table 2.16 An overview of using observational studies to evaluate the effectiveness of travel information

	Type of observational study	Reference
Outcome measured	Level of use (eg monitoring usage of website, or downloads of an app)	eg Lappin et al 2000(b)
	Effect on travel behaviours Effect on transport system	Robinson et al 2012
Information gathered	Observed use Observed behaviour change (at an individual or network level)	Robinson et al 2012
Description	Observations on the use of, or the effect of, travel information are made in the 'real-world' or in laboratory-based experiments	Robinson et al 2012
Methods	Usage statistics can be collected. Sensors are used to detect how transport patterns or behaviour change after travel information is provided, for example sensors can include inductive loops and video cameras.	Robinson et al 2012 Toledo and Beinhaker 2006

	Type of observational study	Reference
Sample	Both users and non-users of travel information (or 'intervention and control')	Robinson et al 2012
Strengths	Relatively accurate	Robinson et al 2012
Limitations	Can be expensive, may have sample size limitations Real-world observations can only test existing conditions, not new conditions, and the researcher may have less control over experimental variables	Robinson et al 2012 Bifulco et al 2014
Channels which can be assessed	Usage statistics can be collected for most travel information Real-world observations appear to be used most frequently to evaluate the effect on behaviour of VMS on diversions Laboratory experiments appear to be used most often to evaluate the effect of en-route travel information on behaviour	 Robinson et al 2012 eg Weihong-Guo 2008
Examples	One study assessed the effect of real-time travel information displayed via VMS on use of alternative routes by measuring diversion patterns, using sensors (Doppler radar and remote traffic microwave sensors)	Qin et al 2010
	A laboratory experiment was used to observe the effects of travel information using audio-visual scenario simulations, this study gauged individual's behavioural response and perception of travel information	Weihong-Guo 2008
	Bluetooth or GPS traffic monitoring (reliable, accurate, granular and real time, and can be long-term) of VMS diversions	Robinson et al 2012
	There is potential for observing trip characteristics of travel information users versus non-users (or different types of users), through GPS, mobile phone positioning etc.	Robinson et al 2012
	Effectiveness can be measured by comparing provided and actual travel times	Martin 2007

2.4.1.3 Modelling and simulation

Table 2.17 An overview of using models and simulation to evaluate the effectiveness of travel information

	Type of modelling/simulation	Reference
Outcome measured	Modelled effect on travel behaviours. Simulated effect on transport system.	Robinson et al 2012; Pan et al 2008
Description	Uses existing stated or observational behaviour data to create behavioural models, combined with traditional transport system modelling to simulate the effect traveller information may have at another site, or at the same site in the future. A range of effects on the transport system can be measured and then evaluated.	Robinson et al 2012; Pan et al 2008
Strengths	Can demonstrate the potential effect of travel information on transport network performance.	Robinson et al 2012
Limitations	Expensive and requires a significant level of data, modelling, and computation. Relies on assumptions about how travellers will respond to the information. Model parameters and assumptions can significantly affect the outcomes.	Robinson et al 2012 Ritter et al 2014 Toledo et al 2006
Channels/ content which can be assessed	Any, so long as stated or observed data exists relating to behavioural effects, and that this data is able to be modelled, and that a transport model is available.	Pan and Khattak 2008

	Type of modelling/simulation	Reference
Case studies	Ensor (2010) proposed a method to simulate the effectiveness of transport system performance, which could also be applied to measure the effect of travel information. The author suggests that existing SCAT systems (Sydney Coordinated Adaptive Traffic Systems), which typically use inductive loops to monitor traffic and adjust traffic signals in a dynamic, real-time manner, could be combined with software which simulates traffic system performance to provide proxy measures of congestion, travel time, delay, level of service, spare capacity etc. Such a system could potentially be applied to monitor the effects of some types of travel information, such as VMS.	Ensor 2010
	This study developed a travel behaviour model based on a stated use mail survey, which asked motorists whether and how they had adapted their travel (used an alternative route) based on in-trip, real-time travel information via the radio. The behavioural model was combined with a transport model to simulate the effect of travel information in a new setting.	Pan et al 2008

2.4.1.4 Heuristic review

Lastly, travel information systems can be evaluated using a heuristic review, which assesses how they perform relative to multi-criteria developed from established best practices. While this approach does not directly assess the effects of travel information systems in terms of output or outcomes, it is an important way to objectively assess the performance of travel information systems against current best practice.

Table 2.18 An overview of using a heuristic review to evaluate travel information systems

	Heuristic review	Reference
Outcome measured	Degree of travel information provision compliance with best practice	
Description	Objectively assesses the performance of travel information systems against multi-criteria developed from best practice	
Strengths	Relatively cheap and quick Can identify areas for improvement in travel information services Allows for comparison between similar types of travel information services	Currie and Gook 2003
Limitations	Cannot directly evaluate customer satisfaction, or the effect of travel information on travellers' behaviour or on network performance	
Channels/ content which can be assessed	Any for which best practice criteria are, or can be, established	
Case study	This study developed an objective, multi-criteria report card to assess transit passenger information websites based on good practice. Criteria included accessibility, usability, consistency, and both dynamic and static content and functionality.	Currie and Gook 2003

2.5 Summary

This literature and best practice review built on and updated the information generated in RR 540 by Chang et al (2013) and addressed two key questions:

1 What can we learn from the transport industry overseas in terms of best practice for different delivery methods and content? This specifically considers best practice guidelines which cover aspects such as customer expectations on regularity of information.

2 What is the best way to measure the effectiveness and customer satisfaction of travel information channels?

A travel information system is complex and consists of a broad variety of travel information content, delivered to people planning or taking a trip, via a range of 'channels' or delivery methods. Continuous technology advances in this area mean that travel information systems, as well as customers' expectations and needs, will continue to change rapidly.

From RR 540 we learnt that travel information content and channel needs are broad, and vary widely depending on the users':

- trip purpose and type
- travel mode (being travelled or compared)
- trip place(s) (including place of origin, route, and destination)
- trip stage (before or during)
- level of experience with the trip locations or mode(s).

Best practice for travel information content and channels is equally broad and varied. However, key themes can be established. Travel information systems should:

- be promoted so that travellers know what is available and where
- provide a range of content and channels to meet diverse and varied user needs
- ensure travel information is easy to access and simple to use
- be resilient to disruption, and adaptable to changing technologies and needs
- be regularly evaluated
- provide useful, current, accurate, reliable, and integrated information
- provide a customised service if possible, such as through push-notifications
- be available in universally accessible forms
- focus the best delivery where there is greatest need:
  - for trips that are time-sensitive
  - where travel time is uncertain or variable
  - in areas with higher levels of congestion and delay
  - in places where alternative routes and modes are available.

There are a range of ways to measure the effectiveness and customer satisfaction of travel information channels, and the *best way* is dependent on the objectives of, and reasons for, providing the information.

First, it is possible to measure:

- **Outputs**, which include measures of use
- **Outcomes**, including the effect on peoples' travel experiences and behaviour, or on the transport system in general
- **Performance**, relative to established best practice criteria.

Additionally there are different methods available to capture these measures. These include:

- **Stated use and stated preference studies**, which can capture peoples' use, satisfaction or perceptions of travel information, and stated behavioural effects
- **Observational studies**, which can capture travel information usage, and effects on peoples' behaviour or the transport system
- **Modelling and simulation**, which can model travel behaviour and transport systems, and simulate scenarios
- **Heuristic review**, which can evaluate the compliance of travel information systems with best practice.

Each of these methods has strengths and weaknesses, which are captured in table 2.19.

Table 2.19 Strengths and weaknesses of different methods to evaluate travel information systems

	Strengths	Limitations
Stated use and stated preference studies	Relatively cheap, can usually achieve larger sample size The variables of interest can be directly explored (eg through scenarios as this research used)	Can be reasonably accurate, if study is well designed Participant recall may not be reliable People's stated and actual behaviours are not always the same Measures are not well standardised
Observational studies	Relatively accurate	Can be expensive, may have sample size limitations, unless it can be automated (which would increase expense).
Modelling and simulation	Can demonstrate the potential effect of travel information on transport network performance	Expensive and requires a significant level of data, modelling, and computation Relies on assumptions about how travellers will respond to the information Model parameters and assumptions can significantly affect the outcomes
Heuristic review	Relatively cheap and quick Can identify areas for improvement in travel information services Allows for comparison between similar types of travel information services	Cannot directly evaluate customer satisfaction, or the effect of travel information on travellers' behaviour or on network performance Any for which best practice criteria are, or can be, established

3 Baseline customer information needs (secondary analysis)

3.1 Method

Secondary analysis was conducted on the dataset from the online survey component of RR 540. The analyses conducted during the initial research project were extended by examining baseline measures that had not previously been weighted to match the New Zealand travelling population. This further analysis provides a better representation of New Zealand traveller information needs and gaps than previously available, with a good understanding of information delivery methods currently being used in New Zealand, including any deficiencies in information provision. This information therefore forms an excellent platform for the remainder of the current project.

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 with 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 with 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.

For a more complete description of the survey method undertaken, including the calculations undertaken to develop the weighting variable used here, see RR 540. A consequence of this weighting exercise was that the resulting data was only representative of information access for commuter trips (however, these trips made up 78.9% of the most frequent trips for the sample, meaning that the majority of trips were still captured).

Measures of interest from the original survey included:

- **Demographics** including age, gender, ethnicity, main mode of travel, area type and access to different technologies
- **Baseline use of travel information type** including different types of information delivery (eg website, mobile phone app, 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)
- **Quality of information services' characteristics** including measures of perceived ease of use, regular updating, usefulness, reliability/accuracy, comprehensiveness, consistency between information sources, providing multimodal information

These measures of interest (excluding demographics) were broken down by area type and age group throughout the findings.

3.1.1 Sample (weighted)

The weighted sample of travellers was made up of 1,277 respondents (66 freight drivers also responded to a separate set of items relating to freight information provision in New Zealand; key findings relating to their use of traveller information are provided in sections 3.5 to 3.7). Of these respondents, 56.4% (N=720) were male. A summary of key demographic data for the weighted sample is provided in table 3.1. As stated above, the sample was post-weighted to match the New Zealand travelling population in age, gender and main mode for commuter trips, meaning the proportions reported are equivalent to the wider population in New Zealand. The majority of those in the sample (76.5%) identified themselves as European. Living in a suburban area was also most commonly reported by respondents (55.9%).

Table 3.1 Key weighted sample demographics (N=1277)

	N	%
Age group		
16-34 years	301	23.5
35-64 years	804	62.9
65+ years	173	13.5
Ethnicity		
European	972	76.5
Māori	44	3.5
Pacific Islander	17	1.3
Asian	92	7.3
Other	145	11.4
Area type[8]		
Urban area	427	33.4
Suburban area	714	55.9
Rural area	136	10.7
Main mode for commuter trips		
Car as driver	960	75.2
Car as passenger	85	6.7
Walk	108	8.4
Cycle	27	2.1
Bus	62	4.8
Train	7	0.5
Other	28	2.2

[8] Note that this measure is self-reported, and so is subjective and may not relate perfectly to official area labels in New Zealand.

Chi square analysis revealed significant differences in main mode for commuter trips by both area type ($\chi^2(4, N = 1250) = 33.7$, $p<.001$) and age group ($\chi^2(4, N = 1250) = 95.1$, $p<.001$). With regards to area type, those living in urban areas were significantly more likely to report their main mode as active transport (eg walking or cycling) and less likely to report using a private vehicle as their main mode compared with those living in less dense areas. Those from rural areas were more likely to report using a private vehicle as their main mode for their commuter trips. By age group, younger travellers (16–34 years) were significantly less likely to report their main mode for their commuter trips to be private vehicle compared with their older counterparts, and in contrast were more likely to use active and public transport as their main mode. These differences are important, as, variation observed in the travel information these groups access will be related to this variation in the ways these groups of people travel.

Table 3.2 presents current and intended future access to a range of technologies by which traveller information can be accessed, again important context for the following sections. As can be seen, there was an overall high rate of access to the technologies listed, with most of the sample anticipating access to a WiFi connection, laptop and/or smartphone within the next five years. This has important implications for the channels through which travel information can be provided to the population.

It should be noted that, as the survey was conducted online, reported access to certain technologies among the sample may be higher than among the general population (eg only those with some level of access to the internet and a computer (or similar) could complete the survey). Previous work undertaken on this dataset has revealed there is also a variation in rates of access by age group (see Rive et al 2015), with younger groups having higher rates of access to most technologies. This is therefore also important in relation to the channels through which information is currently, and in the future will be, accessed by different travellers[9].

Table 3.2 Current and intended access to key technologies for accessing traveller information

	Current access		Intended in next five years	
	N	%	Cumulative N	Cumulative %
WiFi connection	1047	81.9	1115	87.3
Laptop	1022	80.0	1146	89.7
Smartphone	826	64.7	1078	84.4
3G data package	574	45.0	724	56.7
Tablet/iPad	451	35.3	871	68.2
Other	102	8.0	153	12.0

3.2 How New Zealanders are currently accessing travel information

Access to different traveller information services is presented in table 3.3. This table provides the number of respondents from the sample reporting having accessed each service type in the year preceding the survey, as well as an approximate number of the total New Zealand public therefore likely to have accessed each service type based on this proportion.

[9] New Zealand's 2013 census data shows 76.8 % of households have home internet access, and 83.7 % of households have access to a cell phone.

As can be seen, travel information is accessed via websites most commonly in New Zealand, with almost all travellers reporting having accessed information via this medium (94.7%)[10]. Over half the population also chose to access information in paper form, or through real-time information at public transport stops, VMS or signage at public transport stops (in descending order). Accessing information via voice announcements at public transport stops or through telephone services appears to be less common among New Zealand travellers, with less than one-fifth of respondents suggesting they had previously used such services.

Table 3.3 Baseline access to different travel information service types (ordered by most frequently accessed to least)

	N	%	Total NZ public (N)
Websites	1209	94.7	3,346,054
Paper-based information (eg maps, timetables)	836	65.4	2,310,791
Real-time information at public transport stops	733	57.4	2,028,126
VMS	698	54.7	1,932,726
Signage at public transport stops	690	54.0	1,907,993
GPS navigation systems	597	46.7	1,650,060
Radio	521	40.8	1,441,595
Mobile phone apps	474	37.1	1,310,862
In person with a staff member	292	22.9	809,130
Voice announcements at public transport stops	226	17.7	625,397
Telephone services (eg call centres)	191	15.0	529,990
Other[11]	24	1.9	67,133
Total	1277	–	3,533,320

3.2.1 Comparison by area type

As can be seen in figure 3.1 (see appendix A, table A.1 for the corresponding table), there was some variation in the types of information services accessed by travellers residing in different areas. Accessing travel information via websites was again most common, with nearly all respondents from urban (94.1%), suburban (94.6%) and rural (96.8%) areas reporting using this medium. Those from rural areas were significantly less likely to access real-time information ($\chi^2(2, N = 1277) = 8.7$, $p<.05$) and signage ($\chi^2(2, N = 1277) = 15.3$, $p<.001$) at public transport stops compared with those in denser areas (in line with their lower use of this mode in favour of private vehicle, as highlighted in the sample section above). Accessing information in person with a staff member was significantly more likely for those in urban areas, with those in suburban areas being less likely to access information via this means ($\chi^2(2, N = 1277) = 13.6$, $p<.001$).

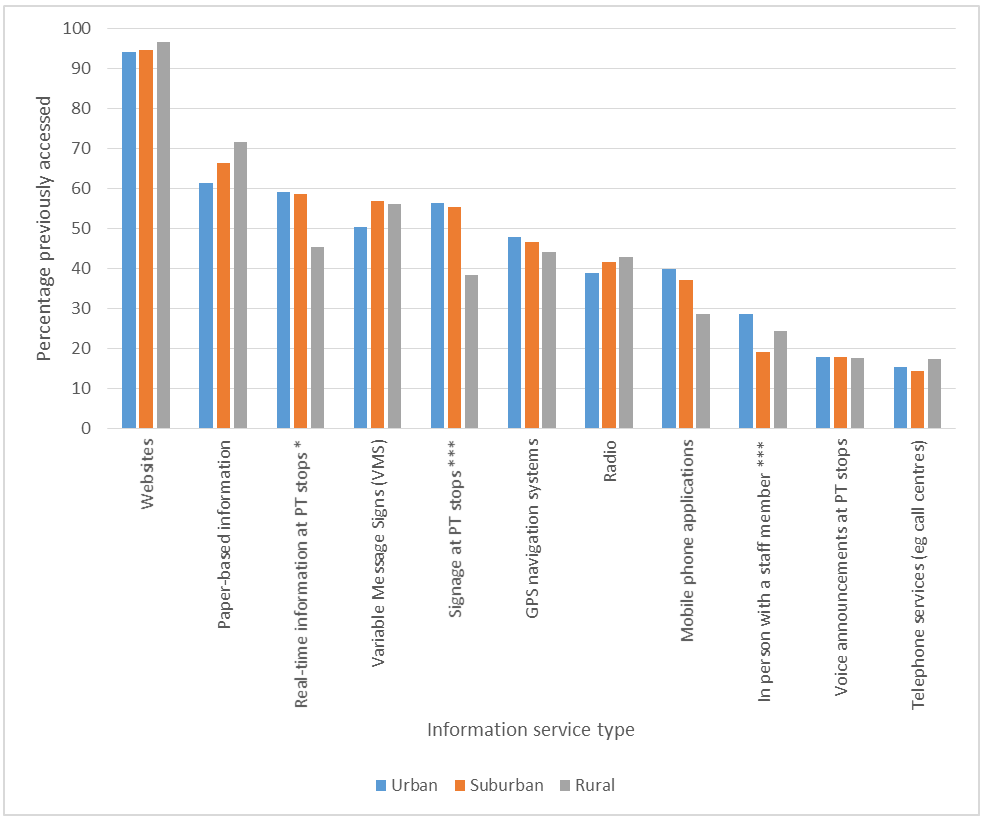
Therefore, there was overall only slight variation in the types of traveller information services accessed between those residing in different area types within New Zealand. It is likely that at least some of this uniformity in responses between area types is due to the fact that most New Zealanders have exposure to transport in different areas (eg rural New Zealanders will visit urban centres). When travelling within their

[10] As noted above, it is likely this number is inflated compared with the entire New Zealand population of travellers, due to the survey being conducted online.

[11] Such as asking others (including by phone, email or in person) and via social media.

local area travellers may not access all types of information, but may need to extend these and the means by which they access information when travelling longer distances. It is also possible that certain differences between types of area were reduced in the sample due to a high response rate in Christchurch compared with response rates in Auckland and Wellington. For example, 'voice announcements at public transport stops' are more likely to occur at train stations as opposed to bus stops, but there is no passenger train service in Christchurch. However, a chi square analysis showed that those from Christchurch were more likely to identify themselves as living in a suburban area than either an urban or rural area ($\chi^2(6, N = 1275) = 171.1$, $p<.001$). Those from Auckland were more likely to state they lived in urban areas, and those from 'other' regions were more likely to state they lived in rural areas.

Figure 3.1 Baseline access to different travel information service types by area lived (* p<.05, *** p<.001)



3.2.2 Age group comparison

When comparing the travel information services accessed by different age groups, it is evident that age is related to higher variation in the types of services accessed than area type (see figure 3.2; for the corresponding table see table A.2 in appendix A). Only four of the service types listed did not show significant variation by age (including websites, GPS navigation systems, receiving information in person with a staff member and receiving information via voice announcements at public transport stops).

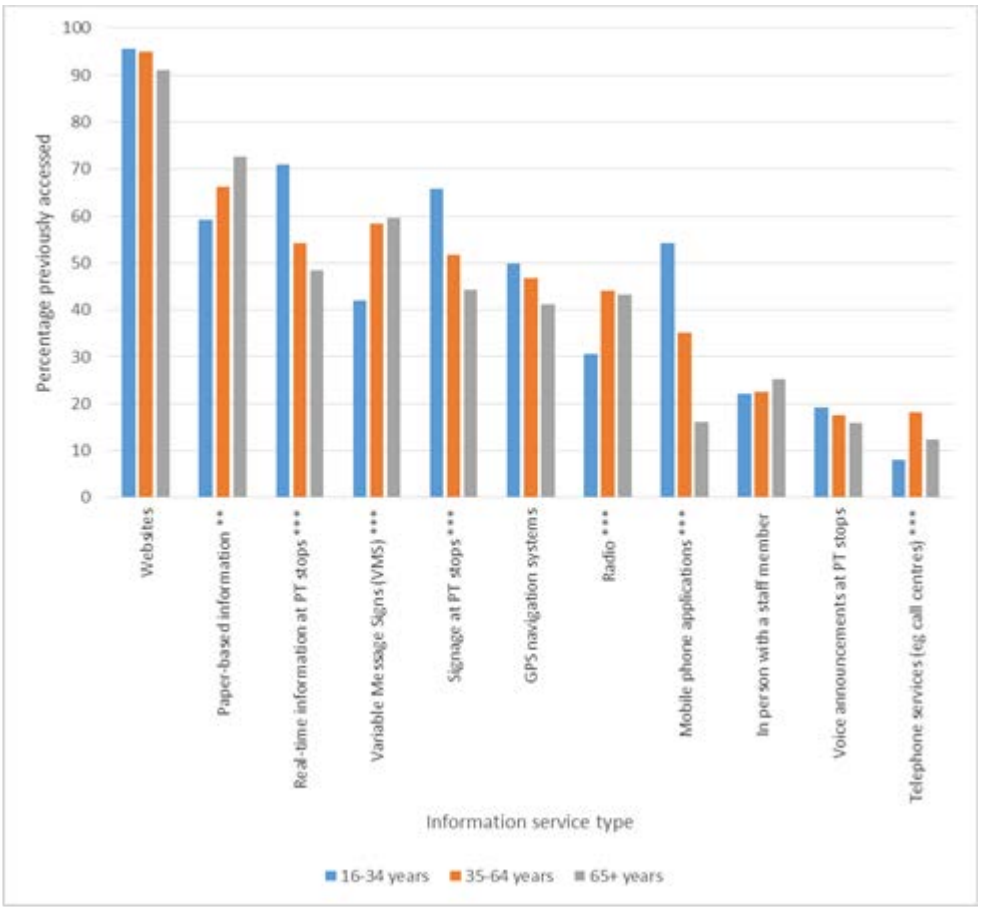
The significant differences between the three age groups[12] can be summarised as follows:

[12] The three age groups are 16–34 years, 35–64 years, 65+ years

- Younger travellers (those aged 16 to 34) were more likely to report accessing travel information via mobile phone apps compared with older travellers, $\chi^2(2, N = 1277) = 71.8$, $p<.001$
- Younger travellers were also more likely to report accessing information at public transport stops compared with older travellers, including real-time information at stops ($\chi^2(2, N = 1277) = 30.8$, $p<.001$) and signage at stops ($\chi^2(2, N = 1277) = 25.3$, $p<.001$)
- In contrast, younger travellers were less likely to report having accessed information via VMS ($\chi^2(2, N = 1277) = 25.9$, $p<.001$), radio ($\chi^2(2, N = 1277) = 17.3$, $p<.001$), telephone ($\chi^2(2, N = 1277) = 18.5$, $p<.001$) or in print (□2(2, N = 1277) = 9.5, p<.01) compared with their older counterparts (who were significantly more likely to have used these information sources).

It is important to keep in mind that variations in main modes of travel between these age groups are reflected in some of this variation (eg younger travellers being more likely to access public transport travel information). However, it is apparent that the means by which people of different ages access information is likely to be related to changing technology over time, with older travellers being more likely to access information through more traditional media (such as radio, telephone or print) and younger travellers using more modern forms of technology at a higher rate (such as smartphones).

Figure 3.2 Baseline access to different travel information service types by age group (p<.01, *** p<.001)**



3.3 Types of travel information New Zealanders are currently accessing

Tables 3.4 to 3.7 present rates of access to different travel information services by New Zealand travellers, including mean 'helpfulness' ratings of each. Perceived helpfulness was rated on a five-point scale where 1=very unhelpful to 5=very helpful (with the neutral midpoint=3), meaning higher scores represent a more highly perceived helpfulness of the information service. As with the previous table, an estimation of the total New Zealand population falling into the same overall age range currently accessing each information service is also provided. As can be seen across the tables, there appears to be a correlation between rates of use of different information services and ratings of perceived helpfulness, with those being accessed the most frequently also being rated as most helpful on average (this is illustrated in the figures in the following sections, which overlay the two measures).

In relation to information on mode comparison services (see table 3.4), public transport timetables are the most frequently accessed by New Zealanders, at 89.5%. Timetables were also rated the most helpful in this category. Overall, it appears New Zealand travellers are interested in travelling by a variety of different modes, with 70% or more accessing information on modes available for their trip, as well as travel time and costs by these different modes. Ridesharing appears to be relatively uncommon, with only a third of the sample reporting having accessed such information in the previous 12 months.

Route-specific information is also accessed at a high rate by New Zealand travellers (see table 3.5, with directions being most frequently accessed (88.8% of the sample) and rated most helpful. Alternative routes are also researched at a high rate (85.1%).

With regards to information on the provision of facilities (see table 3.6), route maps had previously been accessed by almost all travellers surveyed (92.9%). This was the information service accessed at the highest rate of all those listed. For real-time information (see table 3.7), GPS navigation was rated most helpful overall. However it was accessed at a lower rate compared with many other real-time information services.

Table 3.4 Current level of access to, and mean helpfulness rating of, mode comparison travel information services (ordered by most frequently accessed to least)

	Mean helpfulness rating	SD	N accessed	%	Total NZ public (N)
Public transport timetables	4.2	0.9	1143	89.5	3,162,321
Travel time by different modes	4.0	0.9	988	77.3	2,731,256
What modes are available for a journey	3.9	0.9	922	72.2	2,551,057
Travel costs by different modes	3.8	1.0	894	70.0	2,473,324
Ridesharing information	2.9	1.1	424	33.2	1,173,062
Other [(a)]	3.6	0.9	159	12.4	438,132

[(a)] 'Other' information services accessed rated by participants included: bus stop maps, distance of a journey, environmental impact scores and experience as a bus driver.

Table 3.5 Current level of access to, and mean helpfulness rating of, route- specific travel information services (ordered by most frequently accessed to least)

	Mean helpfulness rating	SD	N accessed	%	Total New Zealand public (N)
Directions	4.1	0.9	1,134	88.8	3,137,588
Alternative routes	4.0	0.9	1,087	85.1	3,006,855
Pictures/names of key route landmarks	3.9	0.9	944	73.9	2,611,123
Comparison trip times for different travel times/days	4.0	1.0	931	72.9	2,575,790
Other [(a)]	3.4	1.0	93	7.3	257,932

[(a)] 'Other' information services specified by participants included: facilities available on specific routes, weather and traffic conditions, break downs and congestion, road closures and scenic routes for long distance trips.

Table 3.6 Current level of access to, and mean helpfulness rating of, provision of facilities travel information services (ordered by most frequently accessed to least)

	Mean helpfulness rating	SD	N accessed	%	Total New Zealand public (N)
Route maps	4.2	0.8	1,186	92.9	3,282,454
Location of points of interest (eg petrol stations, restaurants, accommodation)	3.9	0.9	927	72.6	2,565,190
Location of parking	3.7	1.1	876	68.6	2,423,858
Walking routes/facilities/journey times	3.9	0.9	875	68.5	2,420,324
Location of public toilets and rest areas	3.9	1.1	866	67.8	2,395,591
Location of park-and-ride facilities	3.5	1.1	627	49.1	1,734,860
Cycling routes/facilities/journey times	3.6	1.0	584	45.7	1,614,727
Presence of steep hills/slopes	3.4	1.1	582	45.6	1,611,194
Location of unlit roads	2.9	1.2	422	33.0	1,165,996
Disability information	3.2	1.0	331	25.9	915,130
Other [(a)]	3.5	1.0	65	5.1	180,199

[(a)] 'Other' information services specified by participants included location of public transport stops, facilities on public transport 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 3.7 Current level of access to, and mean helpfulness rating of, real- time travel information services (ordered by most frequently accessed to least)

	Mean helpfulness rating	SD	N accessed	%	Total New Zealand public (N)
Next bus information	4.2	0.9	1012	79.2	2,798,389
Weather conditions	4.1	0.9	987	77.3	2,731,256
Location of road closures	3.9	1.1	974	76.2	2,692,390
Location of road works	4.1	0.9	918	71.9	2,540,457

	Mean helpfulness rating	SD	N accessed	%	Total New Zealand public (N)
On-board public transport (eg next stop information)	4.0	1.1	877	68.6	2,423,858
Roading conditions (eg presence of ice/snow)	4.0	0.9	868	68.0	2,402,658
Location of traffic incidents	3.8	1.1	807	63.2	2,233,058
Anticipated travel times based on real-time updates	3.9	1.1	796	62.3	2,201,258
In-vehicle navigation information (eg GPS system)	4.3	0.9	790	61.9	2,187,125
Parking availability information	3.9	1.0	754	59.0	2,084,659
Congestion information	3.7	1.2	749	58.7	2,074,059
Traffic cameras (in real-time)	3.5	1.1	611	47.8	1,688,927
Information gathered from other travellers (including crowdsourced information)	3.8	0.9	564	44.1	1,558,194
Next train information	4.1	0.9	468	36.7	1,296,728
Next ferry information	4.2	0.8	437	34.2	1,208,395
Other[(a)]	2.8	1.0	51	4.0	141,333

[(a)] 'Other' information services specified by participants included break downs and congestion, traffic updates and security cameras.

3.3.1 Comparison by area type

Figures 3.3 to 3.6 present rates of access to, and mean helpfulness ratings of, these different information service clusters split by area type. In these figures, mean helpfulness ratings are overlaid over the main bar graph (with the bars depicting rates of use) using a line graph on a secondary axis (the right-hand axis). As previously stated, helpfulness was rated on a five-point scale where 1=very unhelpful and 5=very helpful. A mean score of 3 represents a neutral score on this scale. For the corresponding tables to these figures, see tables A.3 to A.6 in appendix A.

As can be seen in the figures, there is a general trend towards those living in denser areas (eg cities) reporting higher rates of use of the information types compared with those in less dense areas (eg those in suburban or rural areas). There are a few exceptions to this trend, eg for roading conditions. In addition, as mentioned above, there appears to be a correlation between rates of use and mean helpfulness ratings, so that those information types used by the largest proportion of travellers are also rated most helpful, on average. Again, there are a few exceptions to this, eg for disability information, and next train and next ferry information[13]. Note that only ridesharing information and information on the location of unlit roads were rated as unhelpful or neutral on average, which is in line with the overall data presented above.

[13] The high helpfulness for rural disability information may be due to long waits between options and limited services. This may also explain why rural helpfulness is higher for public transport timetables and next train/ferry.

Figure 3.3 Current level of access to (bar) and mean helpfulness rating (line) of mode comparison travel information services by area type (1=very unhelpful to 5=very helpful)

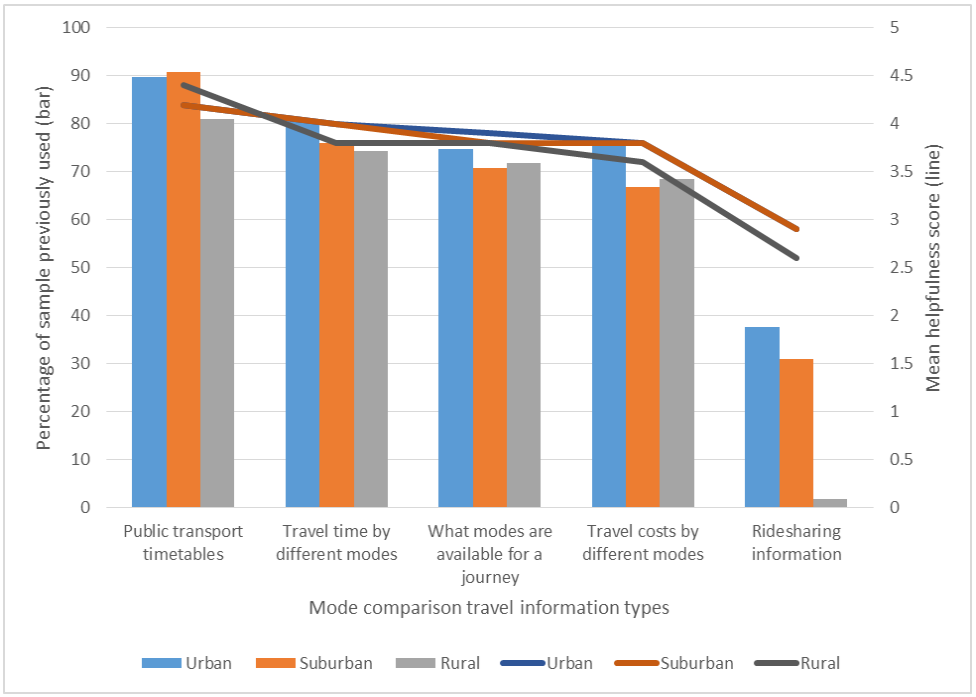


Figure 3.4 Current level of access to (bar) and mean helpfulness rating (line) of route- specific travel information services by area type (1=very unhelpful to 5=very helpful)

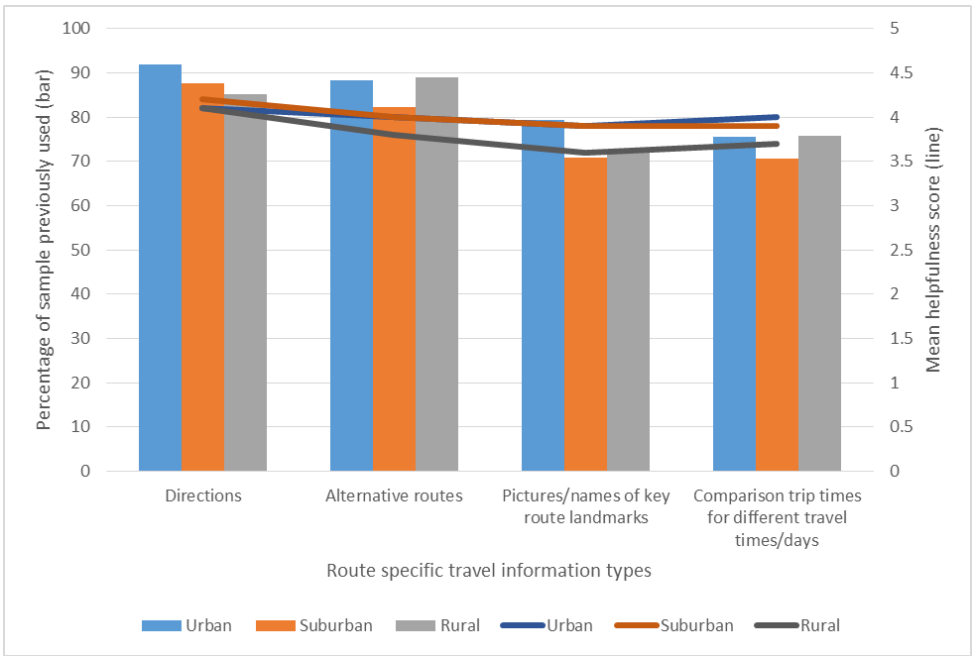


Figure 3.5 Current level of access to (bar) and mean helpfulness rating (line) of travel information on facilities provision by area type (1=very unhelpful to 5=very helpful)

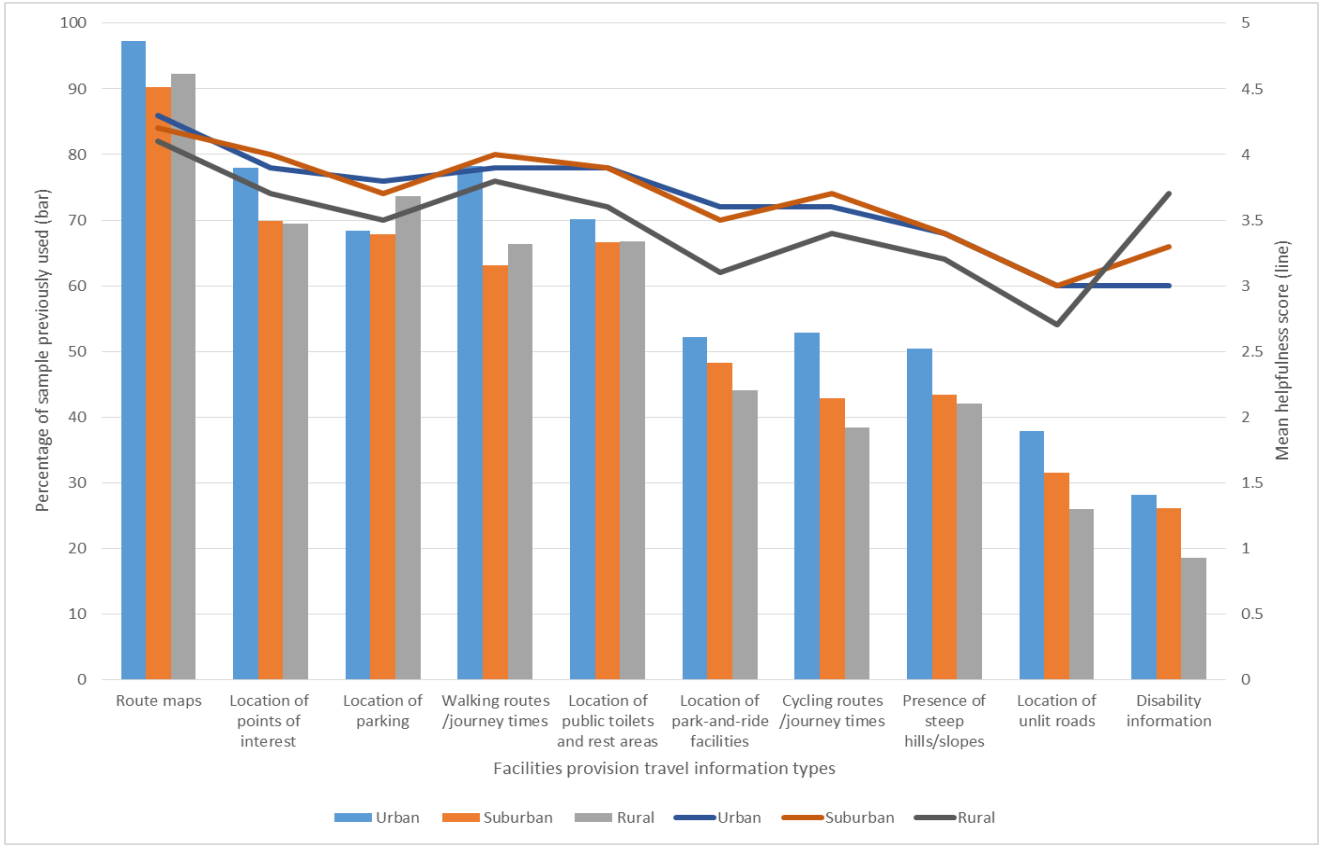
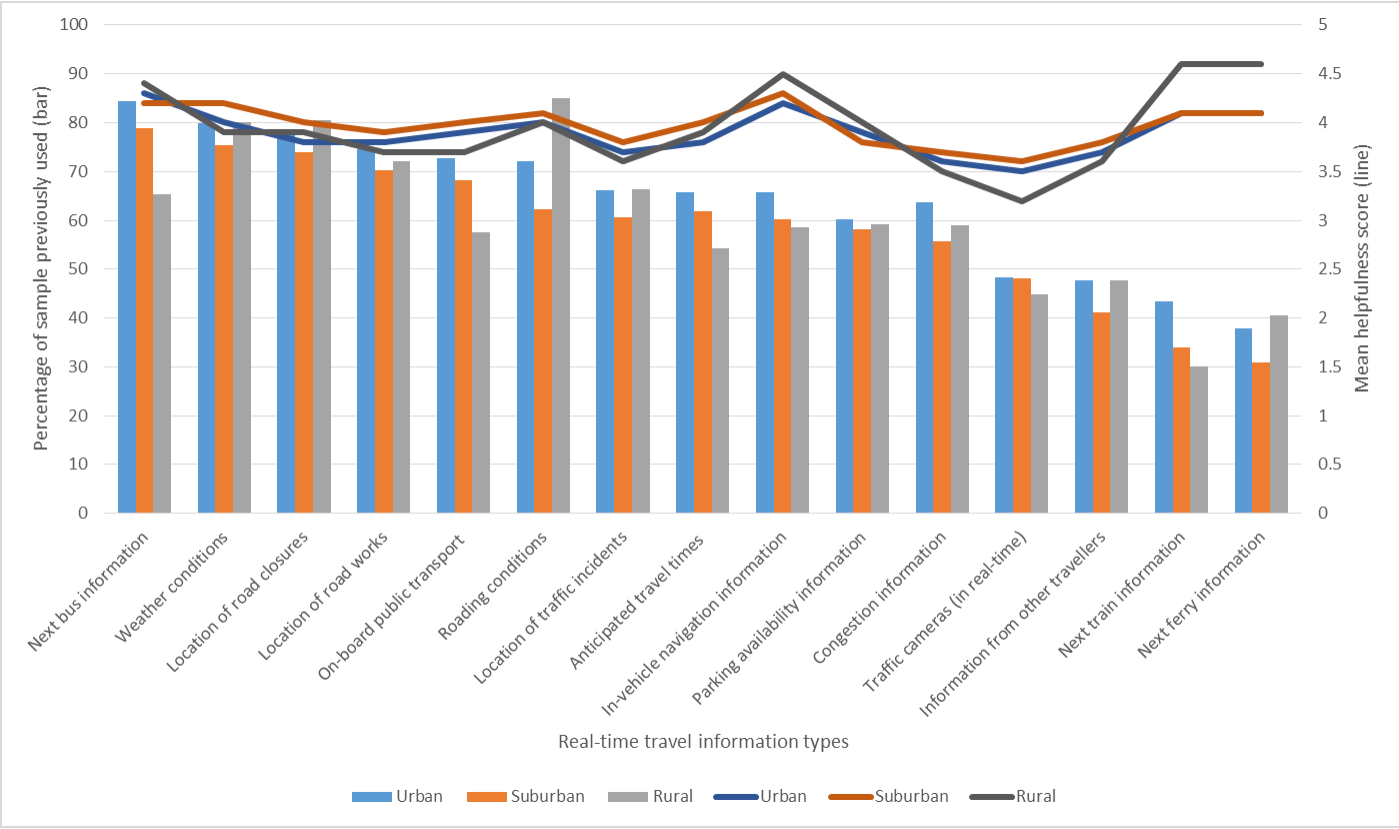


Figure 3.6 Current level of access to (bar) and mean helpfulness rating (line) of real- time travel information services by area type (1=very unhelpful to 5=very helpful)



3.3.2 Age group comparison

Figures 3.7 to 3.10 present rates of access to, and mean helpfulness ratings of, these different information service clusters split by age group (for the corresponding tables to these figures, see tables A.7 to A.10 in appendix A). The figures are presented in the same format as those above, with the mean helpfulness ratings being overlaid over the main bar graph (with the bars depicting rates of use) using a line graph on a secondary axis (the right-hand axis). As previously stated, helpfulness was rated on a five-point scale where 1=very unhelpful and 5=very helpful. A mean score of 3 represents a neutral score on this scale.

As can be seen in the figures, there is a general trend towards younger travellers accessing different types of travel information at a higher rate compared with older travellers (with the oldest travellers tending to access information at the lowest rate). Only the location of rest areas and public toilets was sought at a higher rate by older travellers compared with younger travellers (see figure 3.9). Frith et al (2012) assert that older travellers have a lower propensity for travel. Their lower rate of access of travel information may therefore by a function of their lower rate of overall travel. However, given the differences presented above in how travellers of different ages access travel information, it is also possible that when older travellers do access travel information, the types of information they access is different from that of younger people (for example, lower rates of access to real-time travel information could be a function of a lower likelihood of these travellers having access to a smartphone, and therefore travel information apps).

As with the previous data presented, there again appears to be a correlation between rates of access to information types and perceived helpfulness of information (again with a few exceptions). This is logical as those information types perceived to be helpful by travellers are likely to be accessed at a higher rate.

Figure 3.7 Current level of access to (bar) and mean helpfulness rating (line) of mode comparison travel information services by age group (1=very unhelpful to 5=very helpful)

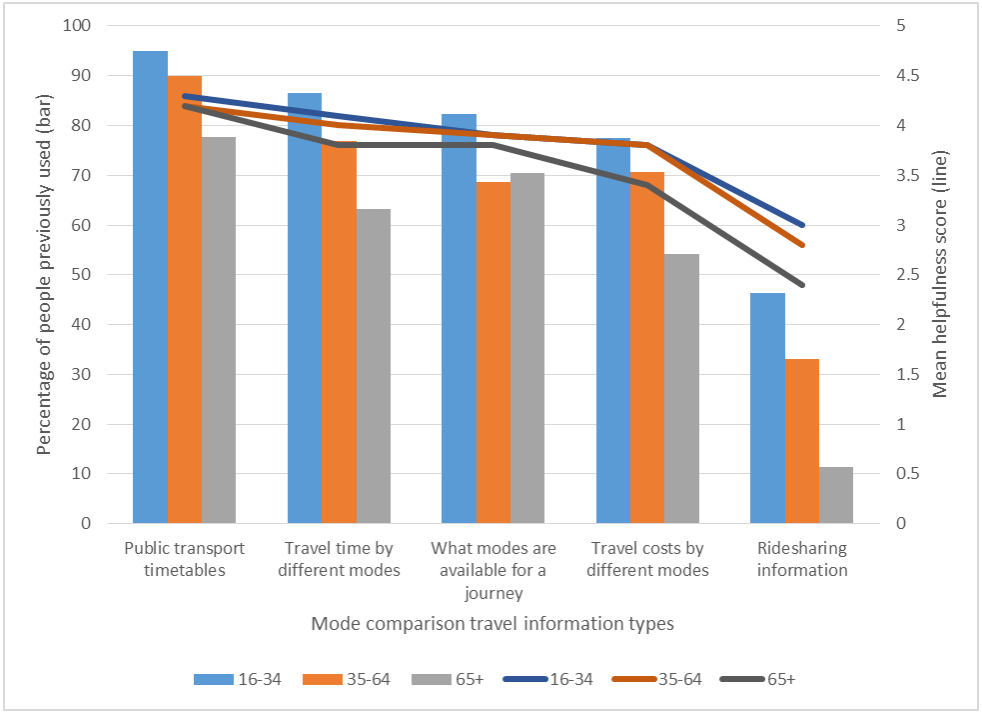


Figure 3.8 Current level of access to (bar) and mean helpfulness rating (line) of route- specific travel information services by age group (1=very unhelpful to 5=very helpful)

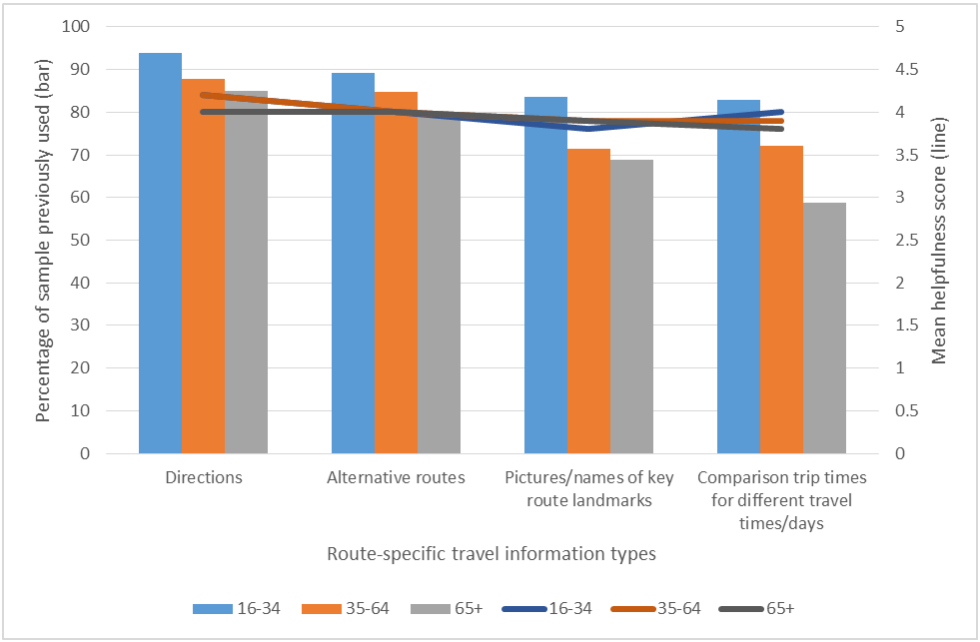


Figure 3.9 Current level of access to (bar) and mean helpfulness rating (line) of facilities provision travel information services by age group (1=very unhelpful to 5=very helpful)

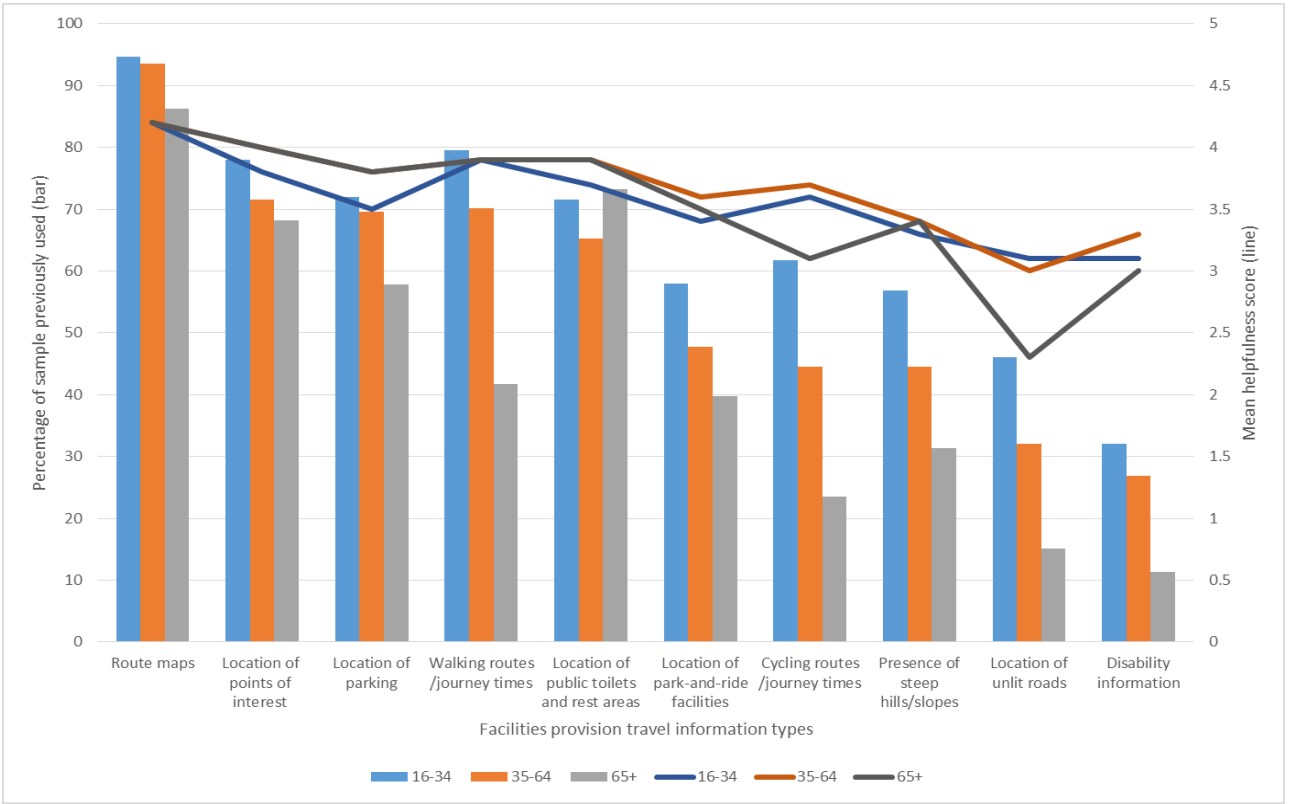
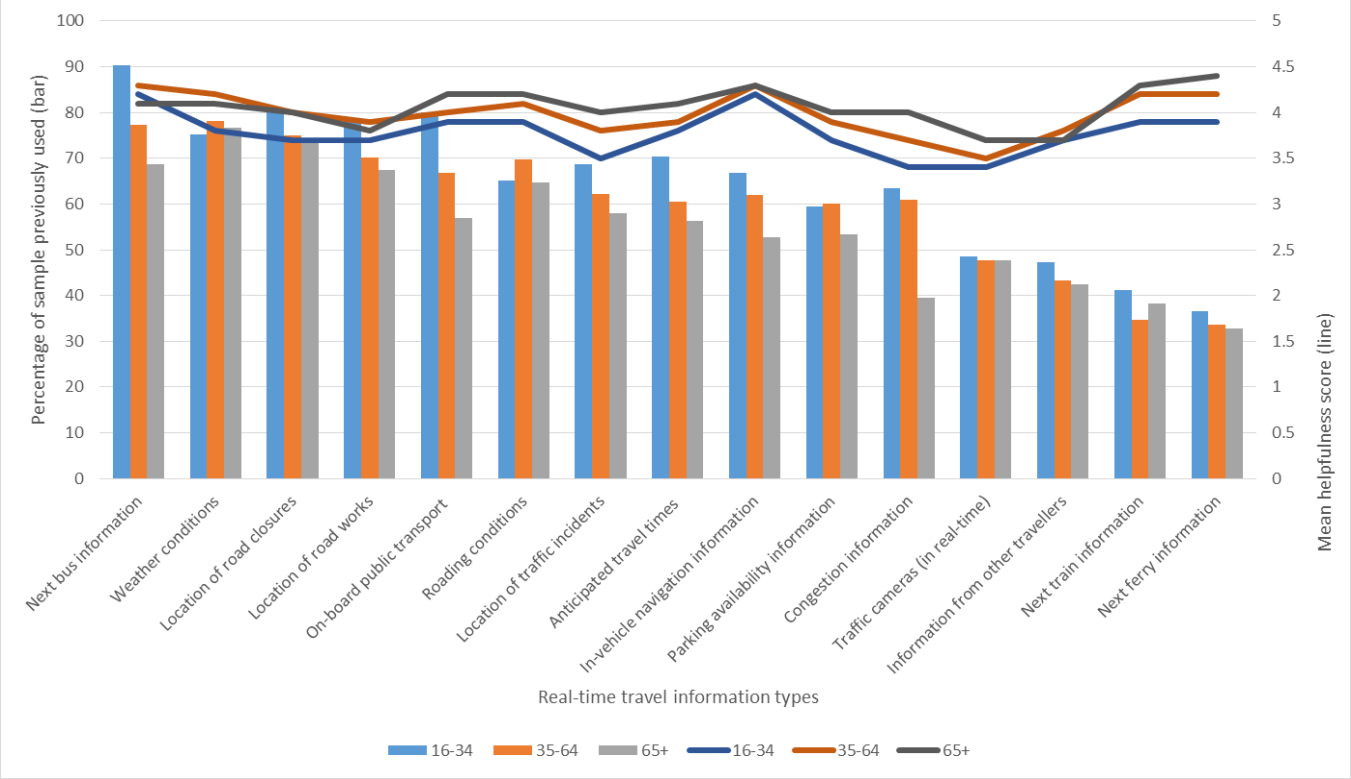


Figure 3.10 Current level of access to (bar) and mean helpfulness rating (line) of real- time travel information services by age group (1=very unhelpful to 5=very helpful)



3.4 Overall satisfaction with current information provision in New Zealand

Respondents to the survey were asked to rate the overall helpfulness of the travel information services they had accessed in the 12 months before completing the survey (on the same five-point scale discussed previously where 1=very unhelpful through to 5=very helpful). This overall rating received a mean score of 4.0 across the sample (SD=0.7), indicating that travellers found the travel information they had accessed 'helpful' on average. One-way analyses of variance (ANOVA) revealed there were no mean differences on this scale by either area type ($F(2, 1260) = 0.87$, p=.42) or age group ($F(2, 1260) = 2.0$, p=.13), with all means ranging from 3.9 to 4.0 on this scale. Therefore, all travellers found the travel information they had accessed previously to be helpful on average, regardless of the type of area they lived in or their age.

A further list of items exploring the perceived quality of a range of factors relating to travel information accessed were presented to participants, with each item rated on a five-point agreement scale (where 1=strongly disagree to 5=strongly agree, score of 3=neutral midpoint). These items are displayed in table 3.8 for the entire sample. A scale was formed using these 11 items which had a mean score of 36.8 (SD=5.8), ranging from 16 to 55, and a Cronbach's Alpha of .84, indicating the scale had good internal consistency. Individual item means are reported in table 3.8, arranged from highest mean (highest level of agreement with item) to lowest. Overall, it is evident that New Zealand travellers feel the travel information currently available is easy to use and understandable, trustworthy, helpful, provides route-specific information, value-for-money and is generally reliable and accurate. On the flip side, it appears there are some gaps in the service, including a lack of customisability, consistency between sources, regularity of

updating and comprehensiveness, and the inability to compare multiple travel modes at one source. These identified gaps directly relate to the final list of priorities for improvements to future information provision outlined in RR 540.

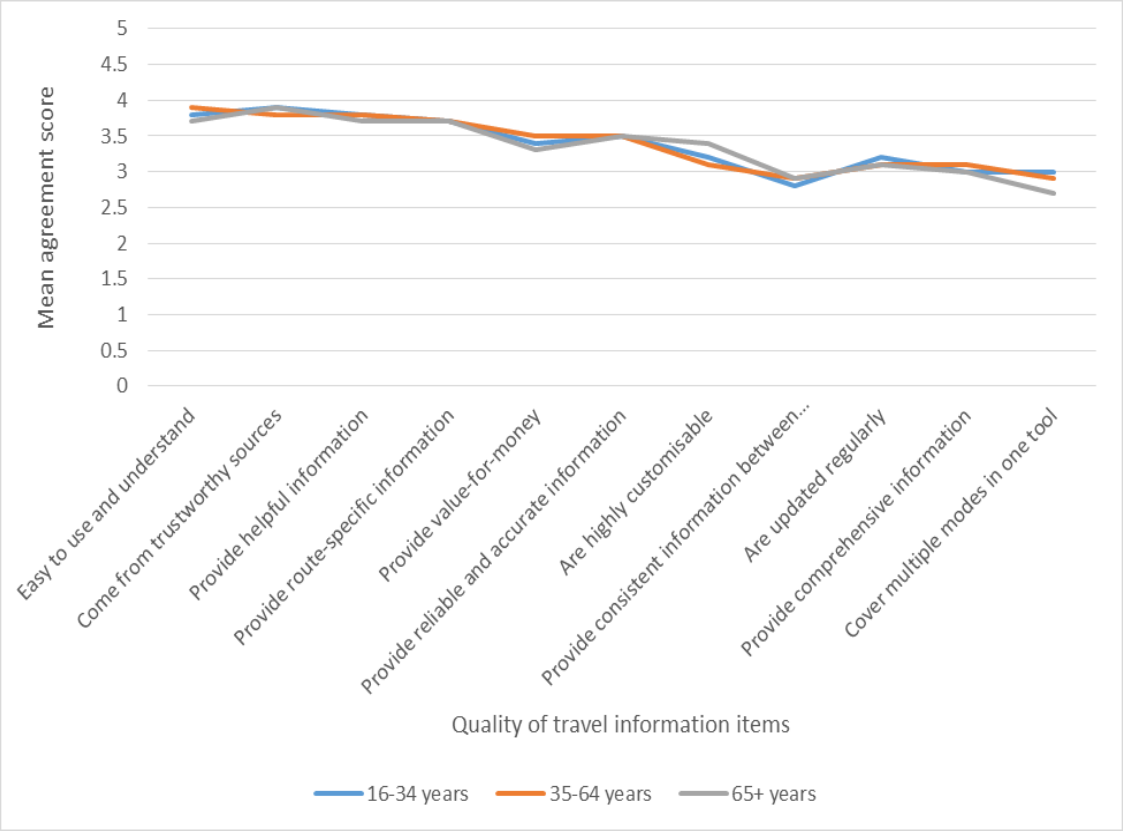
One-way ANOVA revealed there were no significant differences between area types on mean scores on the scale formed using these items ($F(2, 772) = 0.07$, $p=.93$), indicating that the perceived quality of information services did not differ between participants living in different areas across New Zealand. This data is therefore not broken down by area type. In contrast, there were differences on this scale by age group ($F(2, 772) = 6.4$, $p<.01$), with a small effect size (Eta squared = 0.2)[14]. The oldest travellers surveyed (aged 65+) scored significantly lower on the scale (M=34.9, SD=5.8) compared with both the youngest (aged 16–34, M=37.3, SD=5.7) and those who were middle-aged (35–64, M=37.0, SD=5.7). This indicates that older New Zealand travellers perceive the overall quality of the travel information services they have access to be lower than their younger counterparts. As highlighted above, older New Zealanders tend to access less travel information compared with younger New Zealanders, and therefore the differences may be related. Figure 3.11 presents mean scores for the individual items split by age group (see table A.11 in appendix A for the corresponding data). As can be seen, there was not a great deal of variation in individual item scores between travellers of different ages, meaning there were no particular facets of information provision quality that varied between those of different ages.

Table 3.8 Quality of traveller information services accessed scale item statistics (arranged highest mean to lowest)

	N	Mean	SD
In general, the traveller information services I have used in the past 12 months…			
Are easy to use and understand	1,262	3.8	0.7
Generally come from trustworthy sources	1,173	3.8	0.7
Provide very helpful information	1,266	3.8	0.7
Provide me with route-specific information	1,192	3.7	0.8
Provide value for money	1,102	3.5	0.8
Provide reliable and accurate information	1,240	3.5	0.8
Are highly customisable	1,070	3.2	1.0
Provide consistent information between sources	1,102	3.1	0.9
Are updated regularly (and so provide up-to-date information)	1,183	2.9	1.0
Provide comprehensive information	1,192	2.9	0.9
Cover multiple modes in one tool (eg I can compare car, public transport, cycling and walking options on one site)	997	2.9	1.0

[14] This means that age group accounts for 20% of the variation in overall satisfaction with travel information

Figure 3.11 Mean scores of quality of travel information items by age group

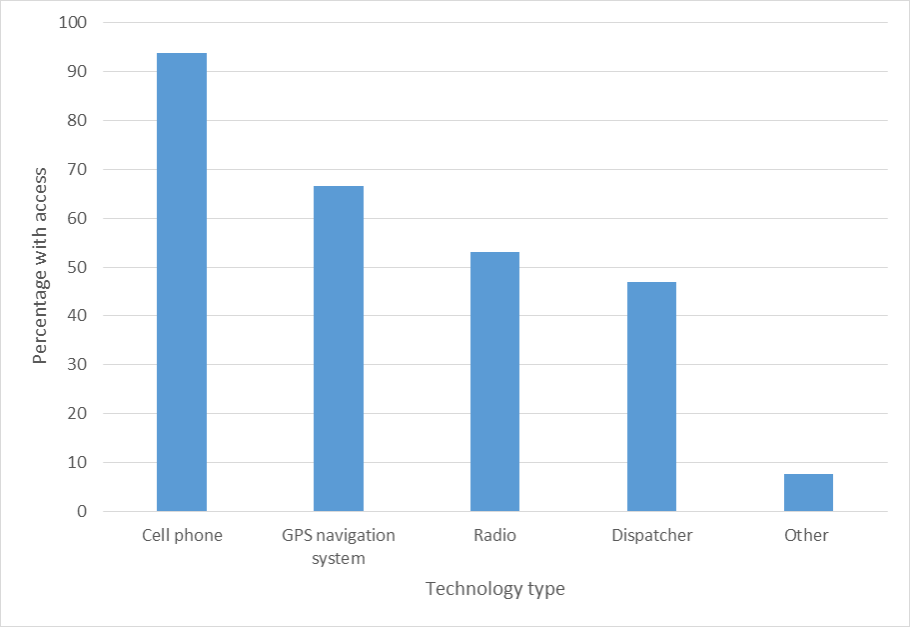


3.5 How the freight industry currently accesses travel information

For a full account of the data collected from the sample of 66 freight drivers, see section 9.15 of RR 540. The current section provides some basic data on baseline travel information access for this subsample of respondents to the survey.

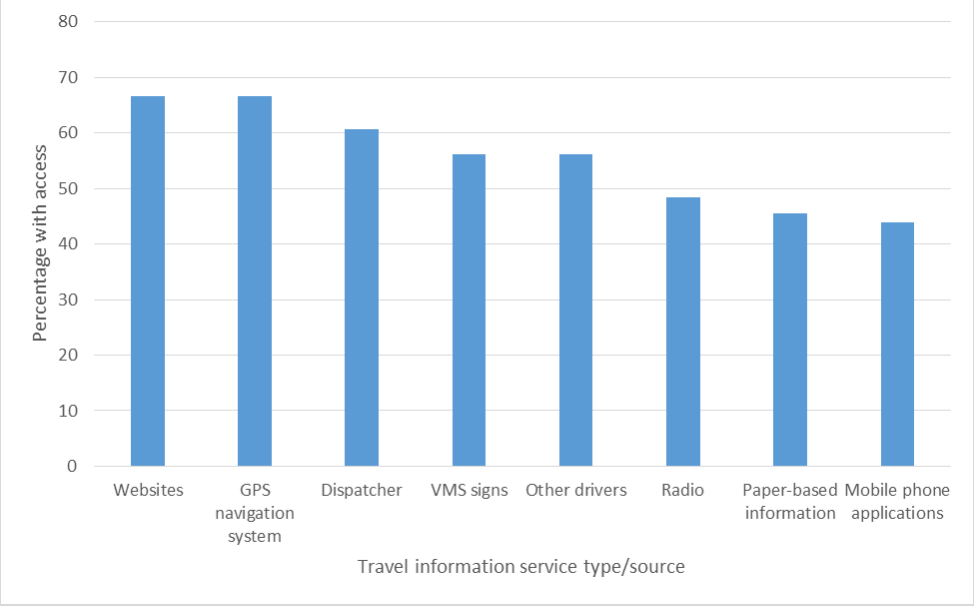
Figure 3.12 presents rates of access to different technologies for collecting travel information available in freight vehicles (for the corresponding table, see table A.12 in appendix A). As can be seen, almost all freight drivers reported having access to a cell phone (93.9%), with this being by far the most commonly accessed technology. Less than 50% of freight drivers reported having access to a dispatcher for their travel information.

Figure 3.12 Technologies available in freight vehicles, by which travel information can be accessed



The sources by which travel information is gathered by freight drivers are presented in figure 3.13 (see table A.13 in appendix A for corresponding data). Around two-thirds of the sample reported gathering travel information via websites and GPS navigation systems, with 60% reporting using a dispatcher. Mobile phone apps were used least frequently by freight drivers, at 43.9%.

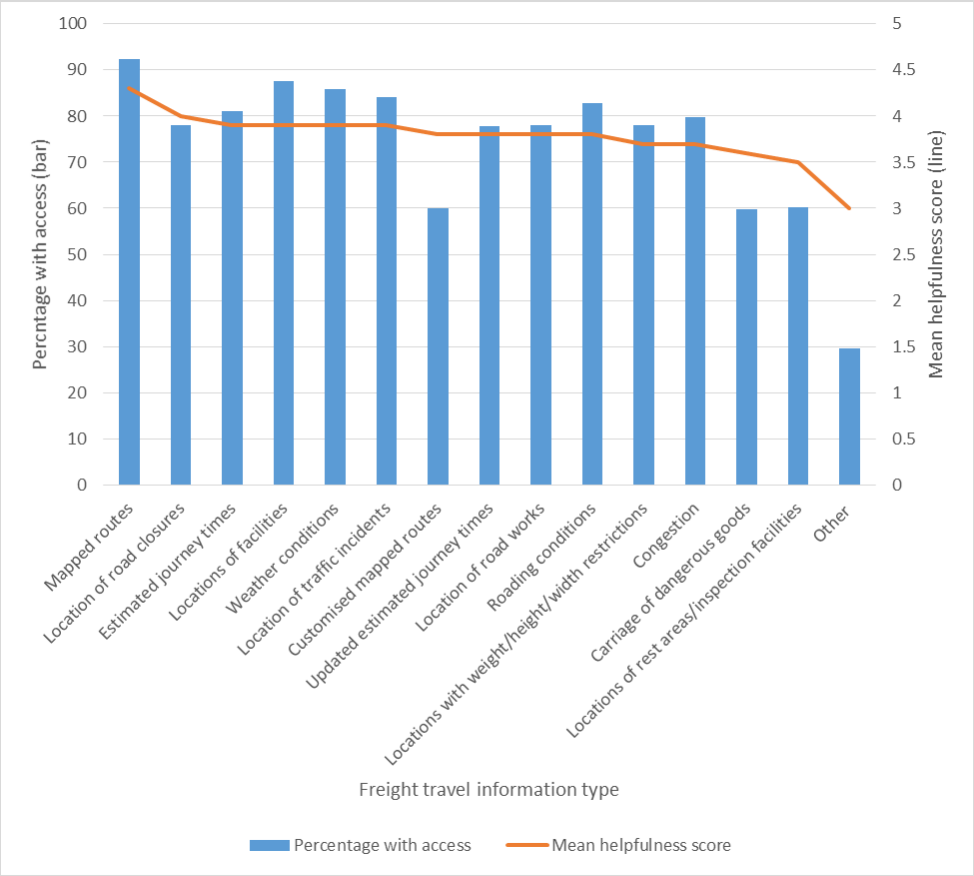
Figure 3.13 Baseline freight driver access to traveller information services/sources



3.6 Types of travel information currently being accessed by the freighting industry

The different travel information services currently being accessed by the freighting industry are presented in figure 3.14 (the corresponding data is provided in table A.14 in appendix A). As previously, mean helpfulness ratings for each information service is presented as a line graph over the bar graph showing rates of access. Helpfulness was again measured on a scale where 1=very unhelpful to 5=very helpful (with a score of 3 representing a neutral mid-point). As can be seen in the figure, there was again an association between rates of use of different information services amongst freight drivers and mean helpfulness scores. Those used by larger proportions of the sub-sample were also rated more helpful on average. Mapped routes were used most frequently by freight drivers, followed by information regarding the location of facilities, weather conditions and roading conditions.

Figure 3.14 Current level of access to (bar) and mean helpfulness rating (line) of traveller information services for freight drivers



3.7 Satisfaction with current information provision in the freighting industry

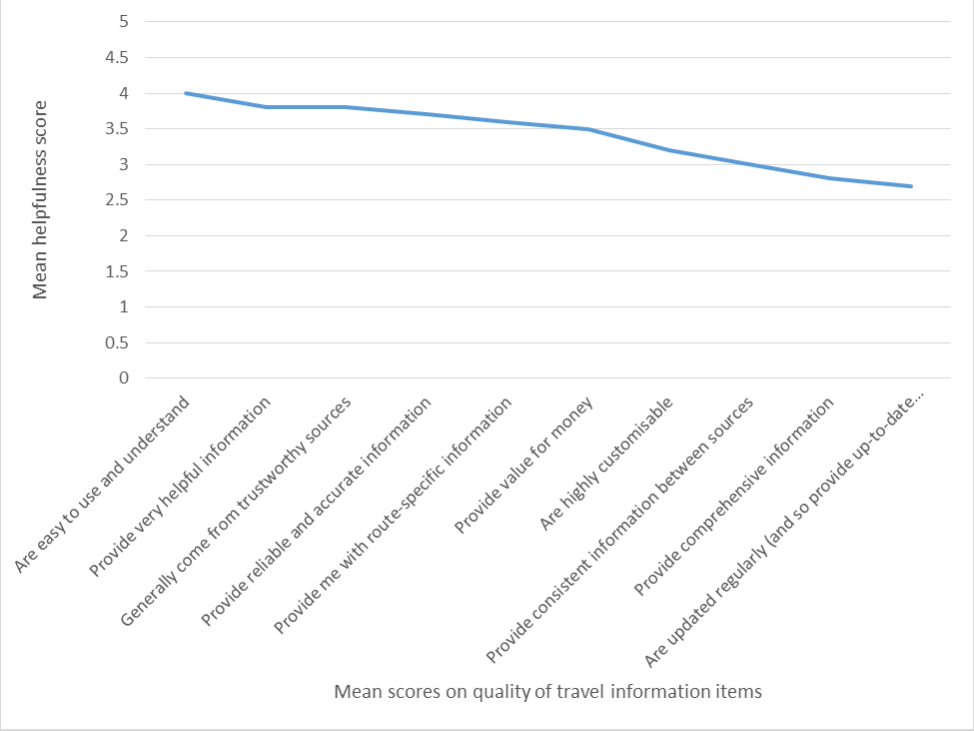
As with the sample of New Zealand travellers, the freight sub-sample was asked to rate the overall helpfulness of all traveller information they had accessed over the previous year. This item had a mean of

4.1 (SD=0.7), which indicates the sub-sample found the traveller information they had accessed 'helpful' on average.

A scale was also formed using 10 items to explore the perceived quality of traveller information services accessed previously (these individual items are shown in figure 3.15). This scale had a mean score of 34.2 (SD=5.4), ranging from 21 to 47, and the scale had good internal consistency (a Cronbach's Alpha of .87). Mean scores on the individual items are displayed in figure 3.15 (corresponding data available in table A.15 in appendix A).

As can be seen in the figure, the freight sub-sample agreed most strongly that the information services they had accessed over the past year were easy to use and understand, provided helpful information and generally came from trustworthy sources. Participants were undecided as to whether current information services provided consistent information between sources and disagreed that they provided comprehensive information or that they were updated regularly. Again this gives some insights into likely future priorities for improvements to the provision of freight information. For a full list of short-listed freight priorities, see section 3.8.5.

Figure 3.15 Mean scores of quality of travel information items for freight drivers



3.8 Summary

This section summarises the findings of the secondary analysis conducted on the dataset from RR 540 using data post-weighted to be representative of New Zealand travellers.

3.8.1 How do New Zealanders currently access travel information?

- Websites have the greatest reach for New Zealand travellers, with 94.7% accessing information via this medium. An estimated 3.3 million New Zealanders aged 16 years and older are accessing information via websites.
- However, modern technology has not completely replaced more traditional forms of information provision, with almost two-thirds of New Zealand travellers gathering information from paper-based sources (estimated to equate to 2.3 million New Zealanders). This highlights the need for information to be provided in a range of different forms to ensure all travellers are catered for.
- Less than 1 million New Zealanders aged 16 years or older are estimated to be accessing travel information in-person with a staff member, via voice announcements at public transport stops or via telephone services. There appears to be a lack of research into the particular needs of people who access information in this way. It may be important to find out whether there is a minority who will always need to access travel information from human sources.
- There is little variation in the ways New Zealanders from different areas choose to access travel information, with differences in the travel modes used most frequently by people from different areas likely to account for the variation observed (eg those in rural areas have a tendency to access less public transport specific information, but use public transport at a significantly lower rate compared to those in denser areas).
- Those from different age groups choose to access travel information via different means, with younger New Zealanders tending to use more modern technologies (eg smartphone apps) at a higher rate than their older counterparts, and older travellers being more likely to use more traditional technologies (eg radio, print, or via telephone). Some of the variation observed may again be related to differences in common travel modes for the different age groups (eg younger travellers use public and active transport at a higher rate and also access public transport-specific information at a higher rate).

3.8.2 What types of travel information do New Zealanders currently access?

- Route maps are the information type accessed by the highest proportion of New Zealand travellers, at 92.9% (or an estimated 3.3 million people). Public transport timetables (89.5%, 3.2 million), directions (88.8%, 3.1 million), and alternative routes (85.1%, 3 million) are also highly sought after travel information services in New Zealand.
- Ridesharing information, information for those with disabilities and information relating to train and ferry services are accessed least. It may be that these are accessed least because they are applicable to a smaller proportion of the population; however, they are still important services to provide.
- In general, travel information services accessed by the greatest numbers of New Zealanders are also those rated as most helpful by travellers.
- Those living in denser areas in New Zealand tend to access travel information more frequently than others (eg those in suburban or rural areas). This may be related to a lower need for travel information for those in less dense areas (where there are fewer opportunities to choose an alternative route, or to use alternative modes to private vehicles, and where there is also less congestion, for example).

- Younger travellers also tend to access travel information more than their older counterparts. This may again be because of the ways New Zealanders of different ages travel (eg younger travellers use alternative modes to private vehicles more frequently); however, it may also relate to lower rates of travel overall among older New Zealanders.

3.8.3 How satisfied are New Zealanders with current information provision in New Zealand?

- New Zealanders find the travel information they have accessed 'helpful' on average, regardless of where in New Zealand they live or their age.
- More specifically, New Zealanders tend to find the travel information they access provides reasonable value for money, it is quite easy to use, understandable and trustworthy, somewhat reliable and accurate, and generally able to provide route-specific information. However, there is some room for improvement in these areas.
- Identified gaps in the current service in New Zealand include a lack of customisability, comprehensiveness and consistency between sources, insufficient regularity of updating, and the inability to compare multiple travel modes at one source.
- Views regarding these specific features of the quality of information provision did not differ based on area within New Zealand; however, overall scores did differ due to age. The oldest travellers surveyed rated the overall quality of information provision in New Zealand lower than their younger counterparts, which may be because they tend to access less travel information overall. However, it could also mean that older New Zealand travellers are not currently being catered for as well as their younger counterparts.

3.8.4 Where can information provision be improved in New Zealand?

- Findings regarding New Zealanders' satisfaction with current information provision in New Zealand reveal some gaps where improvements could be targeted.
- The final list of priorities provided in RR 540 provides further clarification around where improvements can be made, revealing that the provision of high-quality, accurate real-time information is the highest priority for future improvements in New Zealand.
- In addition, information specific to a particular route, that allows travellers to compare travel mode options, and information regarding the provision of facilities were prioritised by New Zealand travellers.
- These priorities reveal that New Zealand travellers desire a customisable and comprehensive real-time information source. How such an information service could be provided in New Zealand will be further explored in this report.
- The potential to improve travel experiences within New Zealand highlighted in RR 540 through, by example, the ability to avoid delays by changing travel behaviour due to improved information provision, is an important priority for New Zealand.

3.8.5 Findings specific to the freight industry

- A sample of 66 freight drivers revealed that around two-thirds of freight drivers gather travel information from websites and GPS navigation systems, with 60% reporting using a dispatcher for this purpose. Mobile phone apps are used least frequently at 43.9%.
- Nearly all freight drivers have access to a cell phone to access travel information (93.9%) while working.
- Mapped routes are the information service used most frequently by freight drivers (as with the general public), at 92.4%. The location of facilities (87.5%), weather conditions (85.9%), traffic incidents (84.1%), roading conditions (82.8%) and estimated journey times (81.0%) are also highly sought after information services for freight drivers.
- As with the general travelling public, there is an association between the rate at which different information types are accessed in the population and how helpful they are perceived as being.
- Overall, freight drivers felt that the travel information they had previously accessed was 'helpful' on average, with the services also perceived as being easy to use and understand and generally coming from trustworthy sources.
- Gaps identified related to inconsistency between sources, a lack of comprehensiveness and insufficient regularity of updating.
- As outlined in RR 540 and in line with the general public, freight drivers in New Zealand expressed a need for up-to-date information provision, particularly around events that could cause delays to trips. Specifically, a user friendly, customisable, comprehensive and integrated website providing real-time information was prioritised by freight drivers.

4 Review of traveller information in New Zealand

4.1 Method

A range of travel information over a variety of delivery channels is available in New Zealand. For the purpose of this report, information provision has been broken down into the following provider types: information provided by the public sector (central and local authority information on public transport and road conditions such as road works and road closures), information distributors such as the Automobile Association (AA) and commercial providers.

A review of traveller information available in New Zealand was undertaken to provide a baseline of the information that can be accessed. The review was undertaken as a web search, supplemented through an online survey and phone calls. In addition to reviewing the travel information provided by the above organisations discussions were also held with developers and light commercial road users.

The purpose of this stage was to obtain more detailed information on the following:

- information and delivery channels used/provided
- key lessons learned via customer feedback of information and delivery implementations
- planned improvement to information provision
- feedback from customers
- information needs of commercial drivers.

Results of the investigations undertaken are provided below.

Note that a review of the different data collection methods (such as Bluetooth, radar etc) was outside the scope of this project.

4.2 Current information provision

4.2.1 Public sector information providers

The review of public sector information provision was undertaken in two parts. Part 1 looked at the travel information delivery channels broken down by the public sector delivery provider. Part 2 investigated the type of travel information provided by each public sector delivery provider. The public sector information providers selected were either nationally based or in larger urban areas as they were more likely to have public transport or alternative mode options and therefore provide information. The survey was conducted online. Results from the two stages are provided below. Table 4.1 considers the channel through which the information is delivered. Table 4.2 lists a 2014 snapshot of the type of travel information provided by selected public sector providers.

Note that this stage of the project did not include any evaluation of the individual implementation of information provision; the purpose of this section was to record what existed. Chapters 6 and 7 of this

report investigate the ways in which people access the information, as well as their assessment of the usefulness of current information provision in New Zealand.

Table 4.1 Travel information delivery channels provided broken down by public sector delivery providers

	Horizons Regional Council	Auckland Transport	Greater Wellington Regional Council	Environment Canterbury Regional Council	Transport Agency	SCIRT	Otago Regional Council	Land Information NZ	Christchurch City Council	Dunedin City Council	Tauranga City Council	Hamilton City Council	Wellington City Council
Website	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Paper timetables/signs/ maps etc	✓	✓					✓	✓	✓	✓	✓	✓	✓
Newspaper		✓	✓			✓	✓						✓
Talking to a public transport staff member (in-person)	✓	✓					✓						
Talking to a public transport staff member (by phone)	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓
Radio	✓	✓			✓	✓	✓						
Facebook/Twitter		✓	✓	✓	✓	✓	✓			✓		✓	
Apps	✓	✓											
Voice-announcements		✓	✓										
Real-time signs		✓	✓	✓	✓	✓			✓	✓			
TV					✓								
Live webcams		✓			✓	✓				✓	✓		

Table 4.2 Type of travel information provided by each public sector information provider

	Horizons Regional Council	Auckland Transport	Greater Wellington Regional Council	Environment Canterbury Regional Council	Transport Agency	SCIRT	Otago Regional Council	Land Information NZ	Christchurch City Council	Dunedin City Council	Tauranga City Council	Hamilton City Council	Wellington City Council
All modes													
Trip time	✓		✓	✓	✓		✓						
Weather										✓			✓
Ride-sharing options		✓	✓										
Private car travel													
Detours/delays					✓	✓			✓	✓		✓	
Planned road closures					✓	✓			✓	✓	✓	✓	✓
Major delays (incidents/crashes)										✓		✓	
Availability of alternative routes					✓				✓	✓		✓	
Comparative trip times for different times and days					✓	✓			✓			✓	
Parking availability and cost										✓		✓	✓
Unusual parking issues, eg resident parking rules			✓						✓	✓		✓	✓
Rest stops/toilets (holidays)									✓				
Road congestion													
Ability to compare rental cars & specs					✓	✓							
Requirements for chains					✓								
Multimodal travel (eg walking, cycling)													
Ability to compare different modes/options					✓							✓	✓
Where park-and-ride facilities			✓						✓				
Public transport													
Timetable	✓		✓	✓			✓		✓				

	Horizons Regional Council	Auckland Transport	Greater Wellington Regional Council	Environment Canterbury Regional Council	Transport Agency	SCIRT	Otago Regional Council	Land Information NZ	Christchurch City Council	Dunedin City Council	Tauranga City Council	Hamilton City Council	Wellington City Council
Tickets and fares	✓		✓	✓			✓		✓				
Stop information	✓		✓	✓			✓		✓				
Route maps	✓			✓			✓		✓				
Journey planner	✓		✓	✓	✓		✓		✓				
Service updates	✓		✓	✓			✓		✓				
Information specific to tourists													
Visual information to help orientation			✓				✓		✓	✓		✓	
Knowledge of what to visit and the easiest way to get there							✓		✓			✓	✓
Directions and how to use, alternative transport modes	✓		✓						✓				
Directions to parking places			✓						✓				
How to summon help, eg 111					✓							✓	
Rest stops/hotels													
Speed limits along the route					✓				✓				
Safe roads/ blackspots													
Safe times to travel					✓								
Commercial/freight													
In trip updates on road condition					✓					✓		✓	
Roadwork					✓	✓				✓		✓	
Pre-trip route planning information				✓								✓	
Locations that have height or weight restrictions					✓								
Location of rest areas and inspection facilities													
Points of interest (eg									✓				

	Horizons Regional Council	Auckland Transport	Greater Wellington Regional Council	Environment Canterbury Regional Council	Transport Agency	SCIRT	Otago Regional Council	Land Information NZ	Christchurch City Council	Dunedin City Council	Tauranga City Council	Hamilton City Council	Wellington City Council
rest areas, petrol stations)													

4.2.1.1 Comments

Although no evaluation of the individual implementations of information provision was undertaken for this project, it is of interest to note there is a wide range of differences in the ease of use of individual apps, the level of detail provided and in how 'up-to-date' the information is.

4.2.2 Information distributors of travel information

An online survey was used to obtain an understanding of travel information provided by non-public sector distributors. The survey was sent to the National Road Carriers Inc, Road Transport NZ and the New Zealand Automobile Association as requested by the Project Steering Group. The review was undertaken in two parts. Part 1 looked at the travel information delivery channels broken down by the delivery provider (see table 4.3). Part 2 investigated the type of travel information provided by each delivery provider (see table 4.4).

Table 4.3 Travel information delivery channels provided broken down by distributor

	National Road Carriers Inc	Road Transport Association NZ	NZ Automobile Association
Website	✓	✓	✓
Paper timetables/signs/maps etc			✓
Newspaper			
Talking to a public transport staff member (in-person)		✓	
Talking to a public transport staff member (by phone)		✓	
Radio			
Twitter			✓
Apps	✓		✓
Voice announcements			
Real-time signs			
TV			
Live webcams			✓
Call centre			✓

Table 4.2 Type of travel information provided by each information distributor

	National Road Carriers Inc.	Road Transport Association NZ	NZ Automobile Association

	National Road Carriers Inc.	Road Transport Association NZ	NZ Automobile Association
All			
Trip time			✓
Weather	✓		
Ridesharing options			
Car travel			
Detours/delays	✓		✓
Planned road closures	✓		✓
Major delays (incidents/accidents)			✓
Availability of alternative routes	✓		✓
Comparative trip times for different times and days			✓
Parking availability and cost			✓
Unusual parking issues, eg resident parking rules			
Rest stops/toilets (holidays)			✓
Road congestion			✓
Ability to compare rental cars & specs			✓
Requirements for chains (for weather related events)			
Multimodal travel (eg walking, cycling)			
Ability to compare different modes/options			
Public transport alternatives			
Where park-and-ride facilities			
Public transport			
Timetables			✓
Tickets and fares			✓
Stop information			✓
Route maps			✓
Journey planner			✓
Service updates			
Information specific to tourists			
Visual information to help orientate them			
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			✓
How to summon help eg 111			✓
Rest stops/hotels			✓
Speed limits along the route			✓
Safe roads/blackspots			✓
Safe times to travel			✓

	National Road Carriers Inc.	Road Transport Association NZ	NZ Automobile Association
Commercial/freight			
In trip updates on road conditions			✓
Roadworks			✓
Pre-trip route planning information			✓
Locations that have height or weight restrictions			
Location of rest areas and inspection facilities			✓
Points of interest (eg rest areas, petrol stations)			✓
Information gathering from companies to be shared			

4.2.3 Commercial sector information provision

A range of information is also available for the commercial sector (see table 4.5). It is noted that this summary provides a November 2014 snapshot of what was available, but it is expected that this list will change rapidly as new technologies are brought out or as existing ones evolve. This summary is not intended to be an assessment of commercial sector information provision.

Table 4.5 Summary of commercial sector information provision

Information provider	Information	Apps
Google Maps	• Aerial, terrain, street view • Bicycling (roads, unpaved/trail) • Traffic conditions (live, typical) • Turn-by-turn directions (car, bus, bike, walk) • Journey planning for public transport • Time estimates • Alternate routes • Provide coordinates (WGS 84) • Nearby places • SMS directions when out of mobile data range • BatchGeo (plots locations from a spreadsheet)	Google+, Facebook, Twitter, YouTube
Apple iOS Maps	• Turn-by-turn • Flyovers • Cloud storage	Facebook, Twitter, iPhone
Navman Smart GPS	• Navigation app for smartphones • Purchasable maps	Mobile devices, Facebook
Navman MyEscape III (available in Australia – but mentions can get NZ Maps loaded)	• Geared toward larger vehicles (campervan, trucks) • Avoids narrow bridges, tunnels, etc. • Additional cost to purchase maps	Mobile devices, Facebook
CoPilot Live	• Navigation app for smartphones • Maps do reside on device and do not need a data connection • Turn-by-turn requires purchase of premium app	Mobile devices

Information provider	Information	Apps
CoPilot truck	• As above, for trucks	Mobile devices
Garmin	• Australia and New Zealand maps for purchase • Includes points of interest • Turn-by-turn • Lifetime map updates • Truck specific device appears to be Australia only	Navigation system
Tom Tom	Navigation products for: • Car • Smartphone • Motorcycle • Fleet management and vehicle tracking	Navigation system
CamperMate (Motorhomes)	• Campgrounds (free and paid) • Public toilets and showers • Dump stations • Petrol • Road alerts • Wi-Fi • Police stations, hospitals • Supermarkets	Mobile devices, Facebook, Twitter, Google+
NZ Traffic App	• Live traffic cameras for Auckland, Hamilton, Christchurch, Wellington, Dunedin. • Congestion information for each webcam (where available)	App
ThunderMaps	• Free alert service to the public, which takes open TREIS (data feed from the Transport Agency) and allows the public to subscribe to updates inside their area of interest	Mobile devices, web
Itravel NZ App	• Provides mobile travel guide	Mobile devices

4.3 Feedback from public sector information providers

4.3.1 Public organisation information providers

Feedback from public information providers was sought in the areas of:

- key lessons learned in providing information to the public
- planned improvements
- feedback from customers.

Thirteen national or main urban centre New Zealand public sector information providers were contacted to provide feedback. The selected information providers spanned a range of transport sectors (eg public transport and roading information). For a list of the type of information that each provider gives see section 4.2.1. The following organisations provided feedback:

- Horizons Regional Council
- Greater Wellington Regional Council/Metlink Wellington (provides all of the public transport information for the Wellington region)
- NZ Transport Agency
- Stronger Christchurch Infrastructure Rebuild Team (SCIRT)
- Auckland Transport
- Environment Canterbury
- Otago Regional Council

4.3.1.1 Key lessons learned in providing information to the public

- **Horizons Regional Council** – Format of printed timetable can be confusing to visitors. This has led to a planned improvement in the next six months – a review of timetable layout and individual stop time, information at stops. Introduction of Google transit 'direction finder' and a 'real time' app within six months.
- **Greater Wellington Regional Council/Metlink** – Use both telephone, print and online but moving towards greater online focus to deliver information. Planned improvements include: rationalisation of printed information: printed timetables and other publications and how they are distributed - June 2015. Website redesign June 2015. App – June 2015. Signage – ongoing (all indicative dates).
- **Environment Canterbury Regional Council** – Needs to be clear, concise and provide not only the information but clear instructions on how to and where to use it. Planned improvements include: more technology, more development of its mobile website, development of apps.
- **NZ Transport Agency** – 'Customers want easy access to information. They only want information relevant to them. Freight/commercial customers have a great interest in pre-trip information. The public expect the Transport Agency to provide public transport information too. The public often do not know where to go for information. Public transport users want public transport information separated from motorists' information. The public are critical of data accuracy. Customers want both in-trip and pre-trip information. Planned Improvements include a highway radio pilot – a frequency with text-to-speech information on loop on main routes. Alternative travel times by route and mode. This is currently being piloted. The OnTheMove website is being improved to include arterial information in addition to the existing state highway information. HighwayInfo pages are being replaced by a newer more helpful format in March. The Transport Agency is working with local authorities to provide a new one size fits all National Incident Transport Management System that will include travel information provision. Due at the end of 2015.'

  Also flexibility for travel. Easy access and easy to read information. Data that is relevant to the individual customer. Live information telling them the best route for their journey (did not specify if this meant fastest or most direct).
- **SCIRT** – People hate delays but at least if they know to expect them they will be slightly more forgiving.
- **Otago Regional Council** – Customer feedback indicated the need for clear timetable information.

- **Horizons Regional Council** – Customers want specific reliable real-time information for buses at every stop.
- **Greater Wellington Regional Council/Metlink** – Customers want information that is simple and easy to understand and access.

4.3.1.2 How to evaluate travel information

- **Horizons Regional Council** – Evaluate their travel information via customer feedback. Changes are made when and where necessary to provide more and easily accessible information.
- **Greater Wellington Regional Council/Metlink** – Use an annual customer satisfaction survey. Evaluate each customer information campaign. Collect customer feedback BAU via online, phone, Twitter.
- **SCIRT** – Regular surveys of residents, but need to survey people who use the actual roads - hand them a form at the traffic lights with an incentive for them to fill it in or email a response (eg prize draw). Also business owners nearby – they should be surveyed before and after a traffic change.

4.4 Feedback from private sector information providers/distributors

The following organisations were selected by the Steering Group Chair as representing additional information providers who have expertise that could be useful to determine best practice/lessons learned:

- Christchurch International Airport Ltd
- Inter-Islander
- NZ Automobile Association
- The Radio Network (Auckland)
- The Radio Network (Christchurch)
- The Breeze Radio Station.

Feedback from the above organisations is summarised below.

4.4.1.1 Key lessons learned/planned improvements

- **Christchurch International Airport Limited** – Even though a range of media devices can be used, ie newspaper/radio etc, it is hard to reach all people. Planned improvements include – simpler information more focused on what it is looking to achieve. Noted that customers were also requesting more 'live' smartphone access. Currently utilise a customer survey to get feedback on its information provision to improve this over time.
- **InterIslander** – Get feedback on information via a monthly passenger survey. One question on the survey relates to the effectiveness of the signage to get to/from the ferry terminals. Feedback suggests this presents a problem which is worse in Picton than Wellington. Part of the problem is attributed to there being two ferry operators and two different check-in areas for the inter-islander (one for foot traffic and one for vehicles). Staff from the Picton terminal are currently working with the Transport Agency to improve this signage. Other initiatives include having an online map and

YouTube video that show the journey to the terminal so that drivers know what to expect. The YouTube video has had good feedback. Other methods of communication include:

- For passengers who book directly and have given an email or phone-number, ferry updates are sent if there is a delay.
- Use of terminal signage to advise passengers of any delays.
- The ferry also phones connecting bus service providers and advises of delays.

Noted that the people hardest to advise of delays are those who have booked off-shore as they do not have contact details for them.

Noted that freight/commercial operators often contact the Transport Agency and AA to seek out information on any road delays for when they exit the ferry.

Discussed that as ferry travellers are a captive audience more information could be provided, eg journey times to common destinations, road conditions for onward journey. This could be via directing people to the Transport Agency website, mobile website or through pamphlets.

Noted that the inter-islander has chosen not to develop an app as this would require downloading by passengers for something that is usually an infrequent or one-off trip (40% of current passengers are international tourists – who are likely to be one-off passengers).

- **NZ Automobile Association** – It is not enough to have accurate information once, customers have to know it is updated and current (eg when will the route reopen? If required to carry chains at 7am, do they still need to carry chains at midday, or has the snow/ice cleared? Is the alternative route still open?). Customers also want the best information about likely clearance time and options. Noted that there is low public awareness of available information. As the AA provides information for free they do not have money to promote it. The public uses Google, but its travel times are inaccurate, leading to road safety risks, eg the Google site used to say it takes 3.5 hours from Queenstown to Milford, but it takes about 4 hours, 20 minutes. Clarification from Google found that Google uses the posted speed limit and distance, yet the road cannot be driven at the speed limit, it has a much lower safe driving speed. People get half-way to Milford and realise that it is going to take a lot longer and speed up to catch the tour boat. There was a history of head-on crashes in this area. While lobbying has fixed this problem there are other examples around the country. Need guidelines on information provision for emergency situations (eg earthquakes) that acknowledge an emergency situation is not just a change from the normal – it is a whole new situation that needs/requires a different level of resources. It would be good if there was a way to get speed limit information by GPS. Currently this information is not held in one place (each road section is gazetted and held with local authorities)[15].
- **The Radio Network (Auckland)** – People want to know if there are 'no problems' on the main routes that are covered as well as the routes that have delays. Feedback from listeners is used to evaluate information provision.

[15] Note that the Ministry of Transport 2014 Intelligent Transport Systems Technology Action Plan contains the following action: Action 21 'The NZ Transport Agency and Land Information New Zealand, in consultation with road controlling authorities, will develop a business case for a coordinated, authoritative national land transport network dataset. This will include a centrally managed road speed limit map for New Zealand.'

- **Radio Network in Christchurch (Christchurch)** – Information is put out every 15 minutes between 6am and 9am and 4pm and 7pm. The information covers delays and crashes. Information is obtained from the Police media event publisher (though noted that often this does not contain a lot of detail), so the Radio Network will call the Police Media Communications people – who may be able to tell/or find out more. Christchurch Traffic Operations Centre (CTOC) staff also provide information in real time. The public can feed information in using: 0800 jammed – normally try to confirm this with the Police or the CTOC. There are some issues with the traffic cameras – in some locations cannot see if the traffic is backed-up – this is particularly a problem for the northern motorway. Mostly report on-air crashes within the Christchurch area, but if there is a major crash outside the area then they will also report this.
- **Breakfast on the Breeze Radio Station in Christchurch** – Uses the CTOC cameras in the studio and the travel time information. Internal improvements are underway to get the server running faster so the picture does not freeze
  - Most important information to provide is if there is a major problem on an arterial, people want to know if there is any change to their normal commute, then they want to know about alternatives (eg if Marshlands Rd is backed-up take Main North Rd). Wording to use is important, do not tell people things they already know, prefer to give information such as:
    - It is quicker than yesterday (which provides context).
    - Slow in the usual places.
  - Generally gives the same routes in the same order, but may modify.
  - Notifying incidents as they happen adds to the credibility of the information (credibility is very important). Has a system called ‘stars in cars’ whereby people who see an incident on the road call in and notify the radio for a chance to win a $100 petrol voucher from Caltex. As these reports come in they are broadcast. Noted that they can see the caller or text id and have not had any problems with getting incorrect information. This adds to the credibility of the information being put out as it is in real time. Notes that drivers are asked to call in while not driving.
  - Need to ensure that messages are relevant and not too specific (noted an example where a lot of information was pushed out for an event that would only affect a relatively small number of people).

4.5 Feedback from developers

Private developers were contacted for feedback on their experiences using the Transport Agency data to provide information to the public.

The following were consulted:

- George Willis from Media Suite (Christchurch and Wellington)
- Clint Van Marrewik from Thundermaps (Auckland)

- The three organisers of New Zealand Hackathons (Andrew Western from Propellerhead in Auckland, Mike Riversdale from Wellington and Tim Hatherley-Green from Christchurch)[16]. The Hackathon organisers also forwarded a request for feedback to participants of their transport Hackathons.

One comment echoed by the developers was around the quality of the data and the sophistication of the application programming interface (API) currently used by the Transport Agency. This was seen as a barrier to developing commercial apps:

- Current data feeds do not provide information across the entire road network.
- Current data feeds do not have a consistent level of information.
- The API requires a developer to write a programme to simplify the data acquisition. This needs to be done prior to the developer knowing if the data will be useful.

Thundermaps specific feedback

- More data coverage would be good (not just state highways).
- More information describing the geo-data incident, as is provided overseas.
- Keep it real time and/or move data more towards real time.
- There also tends to be feedback from data consumers (the public/businesses) that they want to report road and traffic incidents that are not in the system, but there is no avenue for us to feed back their 'non-authoritative' data.
- Another data feed that would be popular: road hazard and road risk locations that are not yet fixed – broken guardrails, potholes, motorbike hazards (anything dangerous).

Media Suite specific feedback

- Would like access to all data so they can determine what could be achieved.
- Need to be able to normalise data sources. At the moment get information from different sources – all measured differently, eg Bluetooth, magnetic loops/radar/density of traffic can lead to customer confusion over journey times[17].
- Disagree with the need for an incident to be officially verified before it can go on TREIS (Incident information that is pushed out by the Transport Agency). Provided an example of an incident whereby a hazard existed, it had been called in, but as it was not verified it had not been pushed out to the public. In the meantime the hazard caused a fatal accident that might have been avoided if the information had been pushed out to the public.
- Noted they are developing for a range of people (not just one customer) and that different people have different uses for the information.

[16] Hackathons have been organised in New Zealand to investigate ways of using transport information to build applications.

[17] Note that while the measurement techniques are outside of the scope of this project, it is in scope to discuss how that data is viewed by the end users.

4.6 Information needs of light commercial drivers

To further assess the information needs of commercial drivers the following organisations provided feedback.

- Post Haste
- Super Shuttles (Auckland, Wellington and Christchurch)
- Gold Band Taxis (Christchurch)
- Greencabs (Wellington).

4.6.1 Key feedback

- **Poste Haste** – Seeks out information relating to: in-trip updates on conditions that might cause delays and re-routing, road works and pre-trip information of route-planning. Has developed an internal intra-net for information, but this is not for public viewing.
- **Gold Band Taxis** – Planning an intranet upgrade. A useful improvement they would like is to have information emailed to them daily on road closures and alternative routes.
- **Super Shuttle** – Has its own driver app developed in-house. This app utilises feeds from the airport re: arrivals and departures and uses GPS so the dispatchers knows where they are. Utilises average times to get to the airport to determine when passengers should be picked up. This could be improved if more information was available regarding travel times on different days/times. Would like to be able to feed in information from the Transport Agency if available. At a strategic level it would like to know: the average times to travel through places at different times and where drivers could re-route for quicker travel times.
- **Greencabs** – Does not have a travel management system – but would love one. Relies a lot on drivers advising and sending through messages or updates from the Transport Agency about known closures.

4.7 Summary

This section summarises the results of the:

1 Information provided in New Zealand broken down by provider type and display method

2 Feedback from public sector information providers

3 Feedback from private sector information providers/distributors

4 Feedback from developers of apps

5 Feedback from commercial drivers on their information needs.

The results from this stage are consistent with the findings from the previous stages of this report that information needs to be easy, quick to access, up to date and accurate, and needs to be targeted to new and experienced users (including commuters).

It also supports the literature review finding that future efforts should focus on:

- trips that are time sensitive
- where travel time is uncertain or variable
- areas with higher levels of congestions and delay
- places where alternative routes and modes are available.

Feedback from the Interislander Ferry Service indicated that links to travel/traffic information could be displayed on the ferry to increase public awareness of information provision as travellers. while on the ferry, are a captive audience. This could also be a possibility in airports. It would help to address a common issue of the public and tourists not being aware of where to look for travel information.

Two innovative ways of communication were identified through the information provider discussion. The first is the use of 'stars in cars' by the Breeze to get timely information as an event unfolds. They noted this had a positive effect on credibility as the messages went out sooner. Broadcasts of this information were presented as 'reports coming in' to indicate they were not verified so people could be aware that they referred to an unfolding situation. This need for faster release of information was also requested by developers and the public; however, release of unverified information is not currently an accepted practice. The second innovative way of communication is the use of YouTube by the Interislander Ferry Service to show people what to expect to see and where to go when navigating to the terminal and then boarding the ferry. These ideas should be further explored in the next stage of this project.

Feedback from the developers suggests there is more work required to improve the data quality and coverage area and that a developer friendly API would also assist developers assess what data they may be able to use.

The findings from the commercial drivers suggest their main needs relate to knowledge of anything that might affect their travel time and an interest in better understanding how time of day and day of week impact on different routes they may want to choose between. This is consistent with the findings in the literature review in chapter 2.

5 The most effective transport information system for New Zealand

5.1 The most effective delivery method and content

We propose the following taxonomy for information provision, taking into consideration the findings from the previous stages of this work: the literature review, baseline customer information needs (secondary analysis), the review of traveller information in New Zealand and RR 540.

5.1.1 Taxonomy of effective delivery method and content for traveller information in New Zealand

The developed taxonomy is provided in table 5.1. Note that this taxonomy is further tested and refined down into priorities for development in chapters 6 and 7 of this report.

Table 5.1 Taxonomy of effective delivery method and content for traveller information in New Zealand

New person (either to mode or location)				
	Public transport	**Private motorist/multimodal**	**Light commercial**	**Heavy commercial**
Pre- trip	**Information best conveyed via:** • Web • App • Paper version • In-person/by phone • Radio **Information needs:** How to use the system: • Fares • Stops • Routes • Transfers • Trip time • Timetables/delays • Weather forecasts • Location, and operational status of, accessible infrastructure (doors, lifts, ticket machines, footpaths etc. that are accessible by wheelchair[a]	**Information best conveyed via:** • Web • App • Paper version • In person/by phone • Radio **Information needs:** • Travel time information • Delay information • Route planning information • Ability to compare different modes/options to mix modes • Parking availability and cost • Where park-and-ride facilities are; how they can link with other modes • Weather forecasts (are chains required) • Unusual parking issues, eg resident parking rules for out-of-town commuters • Rest stops/toilets (holidays) • Road congestion	**Information best conveyed via:** • Web • App • Via dispatcher • Radio **Information needs:** • Route-planning information that provides accurate journey times for different days/times • Points of interest (rest areas, petrol stations) • Weather forecasts (are chains required)	**Information best conveyed via:** • Web • App • Via dispatcher • Radio **Information needs:** • Route-planning information that provides accurate journey times for different days/times • Locations that have height or weight restrictions • Location of rest areas and inspection facilities • Points of interest (rest areas, petrol stations) • Weather forecasts (are chains required)
In- trip	**Information best conveyed via:** • App or mobile website • Signage (VMS and static)	**Information best conveyed via:** • Radio • VMS	**Information best conveyed via:** • Radio • VMS	**Information best conveyed via:** • Radio • VMS

New person (either to mode or location)				
	Public transport	**Private motorist/multimodal**	**Light commercial**	**Heavy commercial**
	Information needs: • Confirmation of route/stops • Delays or safety issues • Real-time arrival	• Mobile communication (for multimodal) **Information needs:** • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion • Are chains required	• Dispatcher **Information needs:** • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion) • Are chains required	• Dispatcher **Information needs:** • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion) targeted to • Heavy vehicles • Are chains required

Experienced person				
	Public transport	**Private motorist/multimodal**	**Light commercial**	**Heavy commercial**
Pre- trip	**Information best conveyed via:** • Web • App **Information needs:** • Next vehicle for particular route • Real-time arrival • Delay/breakdown information • Location, and operational status of, accessible infrastructure (doors, lifts, ticket machines. footpaths etc. that are accessible by wheelchair[(a)]	**Information best conveyed via:** • Web • App • Paper version • In person/by phone • Radio **Information needs:** • Travel time information • Delay/re-routing information • Are chains required	**Information best conveyed via:** • Web • App • Dispatcher • Radio **Information needs:** • Travel time information • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion) • Are chains required	**Information best conveyed via:** • Radio • VMS • Dispatcher **Information needs:** • Travel time information • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion) targeted to heavy vehicles • Are chains required
In- trip	**Information best conveyed via:** • Mobile communication • Signage (VMS and static) **Information needs:** • Updates on conditions that might	**Information best conveyed via:** • Web • App • Paper version • In person/by phone	**Information best conveyed via:** • Radio • VMS • Dispatcher	**Information best conveyed via:** • Radio • VMS • Dispatcher

Experienced person				
	Public transport	**Private motorist/multimodal**	**Light commercial**	**Heavy commercial**
	cause delays, re-routing or safety issues • Next vehicle information if transferring • Real-time arrival	• Radio **Information needs:** • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion • Are chains required	**Information needs:** • Travel time information • Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion) • Are chains required	**Information needs:** • Travel time information • Updates on conditions that might cause delays and re-routing (e.g. weather/incidents/congestion) targeted to heavy vehicles • Are chains required

(a) Note that while accessibility infrastructure is outside the scope of this project we have included it in this table and recommend that it is further investigated.

5.2 Assessment criteria for an information provision system

The following assessment system is recommended for current and future information provision.

- Undertake a heuristic review as part of the pre-release work and as part of a low-cost review of existing information.
- Undertake customer feedback with standard questions, which would ensure consistency, on a regular basis. Customer feedback could also be captured through online feedback channels such as Facebook, webpages and Twitter. However, it should be noted these approaches tend to oversample people comfortable with the technology. Therefore they should be done in parallel with complementary methods.

  Customer feedback should also seek to monitor changing customer preferences for information delivery over time, so that continual improvements can be made.
- Undertake a usability study for any areas that present poor customer feedback so that issues can be further investigated to ensure solutions do not create more problems. The usability study should take into account the different types of users the information is designed for.
- Evaluate the potential provision of travel time information in key corridors in main centres by using modelling and/or simulation to investigate its effect on the performance of the transport network.

6 User- centred design workshops and in-depth interviews

To further explore both the types of information required and the best channels to present this information, two methods were utilised:

1 User-centred design workshops with the general public

2 In-depth interviews with commercial operators.

The user-centred design workshops were used to gain a richer understanding of how people used information as they travelled, and how they would prioritise future developments in information provision.

The in-depth interviews with commercial operators were designed to gain a better understanding of how information provision could best fit in with commercial operators' existing business practices, constraints and timeframes.

6.1 User-centred design workshops

Using the information from the previous stages, user-centred design workshops were convened to explore how the wide range of possible information delivery methods might be utilised by different users during a journey. These workshops considered what pieces of information different user groups would want or seek at each stage, as well as their understanding regarding the regularity of information displayed through the different methods. Participants were asked to sort items of information into the delivery channel by which they would like to receive the information, and then to prioritise the development of each type of information. They were also encouraged to suggest additional information they would like, and to indicate which pieces of information were 'must haves' and which were 'nice to have'. This distinction was made in order to assist with prioritisation for future development. Participants were then asked to develop rules around the display of information on each delivery channel. Three workshops were convened in Dunedin, Palmerston North and Auckland. These locations were chosen by the Transport Agency as locations for the workshops to ensure the opinions gained represented a mix of population densities, and accounted for different transport challenges (see table 6.1).

Table 6.1 Characteristics of the user- centred design workshop locations

Location	Estimated population (city)	Notes	Public transport options
Dunedin	120,249[(a)]		Bus
Palmerston North	80,079[(b)]		Bus
Auckland	1,415,550[(c)]	New Zealand's largest metropolitan centre	Bus, rail and ferries

[(a)] City population estimate based on 2013 Census data from www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=15022&parent_id=14973&tabname=#15022

[(b)] City population estimate based on 2013 Census data from www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=14263&parent_id=14181&tabname=#14263

[(c)] Auckland City population estimate based on 2013 Census data from www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=13171&parent_id=13170&tabname=#13171

Advertisements were distributed through the existing Opus network, social media sites (eg Facebook), and local cafes and shops as a means of recruiting participants. These advertisements promoted a 'snowball' effect, encouraging the sharing of information and awareness about the study to friends and family of respondents to achieve a large participant base. Individuals who indicated an interest in participating in the study were forwarded a selection questionnaire to ensure that an adequate mix of backgrounds and demographic traits (ages, genders, etc) were selected for the workshops, and the final breakdown is presented in table 6.2. Each workshop was comprised of eight participants (four male and four female).

Table 6.2 Summary of user- centred design workshops

Location	Date of workshop	Number of participants	Age range of participants
Dunedin	5 February 2015	4 males 4 females	18–53 years
Palmerston North	11 February 2015	4 males 4 females	29–79 years
Auckland	12 February 2015	4 males 4 females	21–69 years
Total		24	

The workshops were held between 6pm and 8pm and as a token of thanks, participants were provided with dinner, refreshments and a gift voucher for attending. The facilitators followed a script with broad questions to encourage open discussion between the participants (see appendix B for full script). The workshop was run in two parts:

The first part sought to identify how information needs differed depending on the mode of transport (public transport versus car), and the experience level of the user (novice compared with experienced commuter). During this stage participants were encouraged to consider both pre-trip and in-trip scenarios.

During the second stage, participants were asked to collectively develop scenarios capturing the essence of how information is needed in travel. Several scenarios were developed in the context of pre-trip information needs, and this was repeated for in-trip information needs. Scenarios were prioritised in descending order of importance for development. Participants discussed and considered the information they would require to successfully navigate each scenario, including:

- the message being relayed to them and the frequency at which such information should be provided
- the channel through which the information is received and disseminated (eg smartphone app, website, phone call, radio)
- whether receiving the message by the method outlined was considered a 'must-have', 'nice-to-have' or was not needed

6.2 Results from the user-centred design workshop

6.2.1 Dunedin

6.2.1.1 Participant demographics

Eight participants (four male and four female), ranging in age from 18 to 53 years, took part in this workshop. Their reported primary mode(s) of transport to work or school are presented in table 6.3.

Table 6.3 Summary of Dunedin participants' mode of travel

Mode of transport	Number of participants who used mode
Car (driver)	6
Public transport	2
Cycle	2
Walk	4

Participants discussed the information needs of novice and experienced mode user groups, where novice users consisted of all individuals new to a trip or mode. Novice users are considered to have greater information needs as the trip is atypical of one they would usually make, and are therefore unfamiliar with stops, services and service times, directions, road layout and so on.

6.2.1.2 What information do you currently use and how do you seek it?

Dunedin participants relied on a limited range of information sources to inform their travel decisions. They suggested that, at different times, novice and experienced users relied on, or expected, bus drivers to relay information to them. It became apparent through discussion that the value a participant allocated to a source of information was associated with the purpose of the trip. For example, one participant suggested they placed greater emphasis on weather information when they were making a trip for recreational purposes as they were more likely to be outside.

> *For me if it is a pleasure trip I pay a lot more attention to what the weather is doing. Mainly because if it is raining I am going to get wet*

Other participants indicated that for both car and public transport users, weather information was at times pivotal in making decisions about their commuting trip, as it could influence their mode choice, or whether they were capable of making their trip at all, for example;

- whether road closures were likely
- if snow chains were necessary
- if a rain jacket would be necessary.

The primary information need of public transport users was considered to be bus time information which was currently accessible from the Otago Regional Council website and bus stop timetables. This information need was considered to extend to both novice and experienced user groups. Participants reported accessing bus arrival information either during the trip planning stage, or when in trip.

One participant described their difficulty accessing the arrival time information, while waiting at a bus stop, for a particular service by mobile phone.

> *I was at a bus stop trying to figure out if the bus was going to come or not and tried to find out on my phone. It downloaded some huge (document). I actually struggled to find out if the bus was going to come or not and so I just ended up waiting. I have only been in Dunedin for a year so I didn't know the suburbs.*

All participants agreed that for both novice and experienced drivers, navigation information was the greatest information need. While novice users relied on the information to reach their destination, experienced car users reported often using Google Maps as this provided reasonably accurate estimated arrival time information for the suggested route.

Participants were principally concerned with unscheduled delay information and the fact their route availability could change once in-trip. Scheduled delay information (eg scheduled road works) did not significantly influence trip times when travelling by car, as the size of the city meant everything was in close proximity. However, scheduled road works could affect the travel time. Overall, participants felt scheduled road closure information was already well communicated

> *If you were just going into the city for work and it's only going to hold you up for a minute, then road works are inconsequential really. If you are going down a harbour or driving somewhere else where the is only one road it could have a bigger impact*

6.2.1.3 How well is information working at the moment?

Participants felt the biggest issue was understanding how the bus system worked.

Participants outlined scenarios where the bus driver was considered to be the most practical and reliable source of information. These scenarios focused primarily on novice users, as they are the most unfamiliar with the public transport service network, and how best to arrive at their destinations. Experienced public transport users expected drivers to relay delay arrival times to passengers as technologies and systems were not established to allow them to independently obtain this information.

> *I'd expect the bus driver to tell me if there is going to be a delay, based on the traffic or something.*

As the perceived level of congestion in Dunedin city was considered low and generally undisruptive, participants suggested car users did not need in-trip information. Google Maps was, however, recognised as a valuable information resource for both novice and experienced drivers for both pre-trip and in-trip information needs.

> *Google Maps. I just use it all the time. My phone sits up on the dashboard and anytime I want to go anywhere I just plug in the address and start driving.*

Where additional information was sought by car users, they indicated a preference for having this information pushed through to Google Maps.

6.2.1.4 Prioritising of information

Table 6.4 summarises the information needs of novice and experienced users for pre-trip and in-trip information disaggregated by mode (eg bus and car). Information needs for public transport were considered greater due to the undeveloped nature of the information system for this mode. Car travel was

also thought to be less affected by delays in comparison. As such, a greater emphasis was placed on public transport information needs.

Table 6.4 Summary of information needs by mode type, user type and trip stage

Mode	Bus		Car	
User type	**Novice**	**Experienced**	**Novice**	**Experienced**
Pre-trip information	• Bus times • Bus route to take. • Fares • Maps en-route	• Bus times • Weather (ie what services are running) • What services are	• Want to know how to reach destination • How long will it take me to get there? • Parking information (eg Where can I park? How much will it cost?)	• How long will it take me to arrive at my destination? • Weather information (ie to identify if you need snow chains)
In-trip information	• Do I need to use multiple services to reach my destination? • Where is the bus stop? • What does the stop look like (eg landmarks)? • Are there delays between the services?		• Link road closure information to Google Maps.	• How long will it take me to arrive at my destination? • Road closure information for long distance trips where alternative routes are not possible (eg Lindis Pass)

6.2.1.5 What are the information gaps?

The group suggested fare information and en-route bus stop maps installed on buses would benefit both novice and experienced public transport user groups.

The participants indicated the need for easier access to journey planning information. A system which would outline in detail the transport options available to them (eg arrival and departure times for various services, stop locations for all legs of the journey), at the time they wished to travel would provide both user groups with more confidence when using bus services in Dunedin.

Displaying this type of information en route, ie service arrival and/or departure information for upcoming bus stops, would provide users with the ability to chain together trips.

> *You might have to catch two or three buses. So you might want to know (when those buses arrive), but you probably would've looked at that before you left.*

Participants also wanted better service information for both car and public transport where severe weather might influence the feasibility of travelling. On discussing personal accounts, it was revealed that public transport information altered regularly through the course of the day when weather was bad (ie the status of routes changed from being open to closed several times a day). As a consequence, it was difficult to

ascertain if services were running, the arrival times of services for a specified bus stop, or once in journey whether the status of a service had changed.

> Participant A: *One thing I don't know, is if you are in Dunedin and there is extreme weather how easy is it to find out what buses are running, what parts of the routes are closed. If I had to go out and travel around town for work I would rather just work from home.*
>
> Participant B: *It's usually impossible, because information changes every half hour and the website isn't updated, but I still have to get to work so I usually just start walking. If I see a bus I would hop on it.*
>
> Participant C: *It makes a lot of difference if you have to get the kids to school or yourself to work then it does make quite a difference.*

Road closure information during severe weather situations was important to drivers in the workshop. Participants reported having seen state highway status signage communicating if the road was open or closed, but suggested signage was posted too late to find a viable alternative route. This was particularly so for long-distance journeys, and where alternative routes were not necessarily available. Participants reported pulling over to ensure road closures had not come into effect since beginning their journey.

> Participant A: *Maybe if I was going to central Otago, you might stop halfway before you go up the Lindis and check nothing has changed. That would be road closure information.*
>
> Participant B: *Yeah, for pretty extreme weather on long trips.*

Participants indicated the inconvenience to drivers of unexpected road closures due to severe weather could be significantly reduced if alternative route information was communicated earlier in the trip.

Participants felt there was a lack of information available for carpooling options in Dunedin city, but that such a service would be valued.

One participant provided their account of being able to successfully use public transport as a novice user in another region, highlighting the accuracy and amount of information available at the bus stop.

> *I caught a bus for the first time in Christchurch over the holidays and I feel like Christchurch was actually quite good because it had the maps of the stations its bus stops but in a lot of other centres I feel like it falls too much on bus drivers to help direct people to the correct bus. Often you can be sitting in a bus and the bus driver is having to tell some person who has never caught the bus before that their bus stop is a 100m down the street and that they have to stay on the bus for so many stops and that just holds everyone up. As well as it's not the best way to get information for new people catching the bus.*

The other participants agreed there needed to be better information provision in Dunedin for novice users to plan their trip independently, such as that outlined by the participant as there was currently a reliance on bus drivers by this user group.

6.2.1.6 Regularity of information

Participants at the workshop indicated they preferred verified information for planning their trips, but both unverified and verified information in-trip so they could make a clear decision.

When you're in trip you want to know if it is getting dangerous trip, I guess you need both when in trip so you can choose to stop.

It was further raised that having access to information earlier was important for future decision making, for example, the potential for upcoming road closures. One participant in the workshop voiced they would rather have an indication that a road might be closed due to bad weather before beginning their trip, than find out in trip that the road was definitely closed. This is a useful example of where unverified information can still be useful to customers.

If you're travelling to Central Otago and (the road) might be blocked because of snow, I'd like to know (about) that rather than them waiting till its closed and me find out once I've already left (the house).

Participants also indicated the quality of the information and its source was important.

I think it depends on the source of the information. If the information is from some random person then you don't want to know that but if there police have had a call that there is a crash then that is reasonably solid information and they might just not know how block the road is or how long the delay is. Still, that is reasonable warning to give so someone can choose to re-route.

6.2.1.7 Scenarios for Dunedin

The scenarios in tables 6.5 and 6.6 were individually considered to achieve a better understanding of what information was necessary to navigate the scenario and how such information should be provided.

Table 6.5 Summary of pre- trip scenarios for Dunedin

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
1	Novice user catching the bus who wants to plan their journey	Must have: Printed timetables/route maps, phone calls, person to person communication	Phone call/person to person communication	Printed timetables/ route maps	• Real-time trip time estimates • Cost information • Indicate stops where to board or alight route services for all legs of the journey	Some participants stated that such a journey planner should be a national information resource. *I think it should be national…I should be able to be from Dunedin (visiting Wellington) and able to get from Wellington to Petone (using public transport).*
2	Information for public transport regarding unscheduled delays (eg severe weather) including alternative services to use	Must have: Radio announcements, smartphone apps, website content Nice to have: phone call, text messages	Text messages	Website content	• Routes affected by severe weather • Alternative routes available • Call to identify if a service is delayed • Text messages for delays exceeding a specified time	
3	Information for private vehicle users for unscheduled delays (eg severe weather) including re-routing information	Must have: Radio announcements, smartphone apps, website content Nice to have: phone call, text messages	Text messages	Website content	• Routes affected by severe weather • Alternative routes available • Call to identify if a service is delayed • Text messages for delays exceeding a specified time	
4	Parking information (eg parking zones, prices) for non-routine trips made to	Must have: smartphone apps, website content	Paper-based maps	Website content	• Time limits and costs zones for parking • Nearby parking buildings.	Maps must be adequate for colour blind users to determine parking and payment zones.

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
	town					
5	Drive time information pushed to Google Maps for public transport services	Must have: Google Maps		Google Maps	• Dunedin bus information on Google Maps	

Table 6.6 Priority of in- trip scenarios for Dunedin

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
1	Novice user using public transport needing in-route information of what stop locations look like	Must have: Digital signage Nice to have: smartphone apps	Smartphone apps	In-route digital signage	• Signage could provide image of bus stop • Estimated time of arrival • Nearby attractions • Services that stop at the same location	Participants signalled the importance of customers having certainty in-trip of their capability to reach their destination for the system to be successful. *It's about giving people certainty, because if they feel uncertain and they don't know where to get off they are less likely to catch the bus because you'll already be nervous about using the bus. Pictures of stops or a moving maps or a sign that says the next stop coming up is. Get off here for this attraction*

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
2	Arrival time information for an in-trip bus stop	Must have: Digital signage, Nice to have: QR-code, smartphone apps, sticker at bus stops.	QR code sticker	Digital signage	• Next services arriving at stop • Expected arrival time for the service	Participants stipulated that information must be accurate and in real-time.
3	Road closure/delay information for experience users commuting by car	Must have: Digital signage, radio information Nice to have: Text messages	Text messages	Signage, radio information	• Closure/delay • Alternative route to take • How long closure is in effect for • Where delays are schedule, text message could be pushed out	Experienced users wouldn't seek this information typically so advanced warning would be necessary (ie posting signage/ indicating alternative routes ahead of the delay/closure)
4	Scheduled disruptions for car users	Must have: Signage and radio Nice to have: text messages	Radio	Signage, text messages	• When and where the disruption is schedule to occur • How long it will affect the route you travel • Alternative route to travel	Discussion as to where this information scenario should be prioritised depended on the purpose and distance of the trip the user was making. *If you were just going into the city for work and it's only going to hold you up for a minute, then road works are inconsequential really. If you are going down a harbour or driving somewhere else where the is only one road it could have a bigger impact*

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
5	Parking information for car drivers	Must have: Signage		Signage	Time restrictions Costs	Participants raised that it is important for signage to be posted facing the drivers as often the signage cannot be read in-trip *…often I am driving past and I can't really ascertain (unless it is an area I know) whether it is one of the $1 ones or $3 per hour. I can make a guess based on where I am, and that correlates with how long I can leave it there*

6.2.1.8 How should the success of information provision be measured?

Participants generally agreed that the Transport Agency should utilise end users to evaluate their information systems. The participants suggested this could be achieved either in workshops like the one they attended or via feedback on websites or through questionnaires.

In this workshop, participants suggested if bus drivers kept getting asked for information it was an indication of an information system that had failed to adequately cater to the travel information needs of novice users, as can be seen by the following conversation between participants:

> Participant F: *For in person information, the bus drivers are really knowledgeable, but you don't want to be dependent on this sort of information…*
>
> Participant G: *…if you're talking to the bus driver and taking up his time, then the people on the bus are going to be late, because someone's holding up the bus.*
>
> Participant F: *Bus drivers are good but because Dunedin is so woeful in terms of all the information available you need them there.*
>
> Participant H: *It's not actually the bus driver's job to be sitting there and providing that information…I would sooner be on a bus where we weren't (asking the bus driver).*
>
> Participant G: *but he isn't going to ignore the person that has asked him, so he is going to (help them).*
>
> Participant I: *You need to make it so easy to get the information that you shouldn't have to resort to that.*
>
> Participant J: *That is basically an indication that you have failed.*

6.2.2 Palmerston North

6.2.2.1 Participant demographics

Eight participants (four male and four female), ranging in age from 21 to 79 years took part in this user-centred design workshop. For this group, their primary mode of transport was as a driver of a motor vehicle, with a few participants' primary trips consisting of public or active modes of transport. The primary trip modes are described in table 6.7 below.

Table 6.7 Summary of modes used by participants

Mode of transport	Number of participants who used mode
Car (driver)	7
Bus	3
Cycle	2
Walk	3

The participants identified public transport as consisting of bus services only. The group consisted of participants who regularly used inter- and intra-city bus services (though as stated above for a majority this was not their primary mode). There was a high level of smartphone use in this group.

6.2.2.2 What information do you currently use and how do you seek it?

A limited range of information sources were consulted to meet the pre-trip and in-trip travel needs, for both bus and car modes.

Participants indicated their inter-city transport information needs were much simpler compared with other cities (ie seeking information primarily when intending to travel outside of Palmerston North).

Similar to Dunedin, information about intra-city traffic delays (scheduled or unscheduled) was not actively sought as such delays were not considered disruptive enough to affect typical trips. Participants were of the view that the modest size of Palmerston North meant it was not susceptible to such disruptions in general.

> *Sometimes I find out in trip that there are road works and it would've been good to know about these road works earlier in my trip. It's not enough to make me look up the information but annoying that I didn't know about it.*

Where disruptions were significant enough to delay drivers, participants indicated it would be important to know if they were going to be delayed on the route and if so, for how long. This information need was considered to be more for long-distance trips.

> *If there is a major traffic incident then I would want to know if it was going to delay me. I think this is more for when I am travelling out of town.*

One participant indicated she sought road closure information prior to convening her trip, mostly through the Transport Agency website, as she commuted daily between cities

> *Not when driving unless I'm using desert road. I google to see if the road is open and I'll be directed to the NZTA website. This has worked quite well.*

Another participant indicated the only sought this type of information when travelling along the state highway.

Parking information for inter-city travel was not a major concern in this user-centred design workshop. Participants assumed it would always be possible to park their car, and this would be information they looked for once arriving at their destination.

> Participant A: *If I am going to Wellington from here, I would like to know that information for there, but that isn't information I actively seek here.*
>
> Participant B: *I definitely don't plan where I am going to park here, I assume that there is always a park available.*

One participant also indicated that fuel information for prices of petrol stations en route to a destination would be valuable to know and information they would seek pre-trip.

> *It would be great to know about petrol prices if you're going on a long trip, before you were on the trip. It would be good to know if the price of petrol would be cheaper in different areas so I could plan where I would fuel up.*

Scheduled closure information for special events was agreed as being an information need.

I would like to know the road closures and events happening along the road (road closures, road works, and Christmas events) because I want to know that information before I leave so I can plan my trip around it.

6.2.2.3 How well is information working at the moment?

There was active discussion around the quality of bus service information available. In particular, the ability to easily and accurately read and comprehend the timetable system was questioned, as participants found the use of colours, numbers and letters too convoluted.

I find that the bus timetables are quite difficult to use because there of the route layouts and colours and if you misread the bus timetable then you end up going in the wrong way.

The way they relay in city bus information – the ABC and 123 thing with all the colours they have happening is really confusing.

It was noted that once you become an experienced user for that trip, the only information sought was bus arrival information. However, this information was felt to be predominately unreliable especially during university months due to the increased use of services.

When bussing I look up online to see when the bus is supposed to come. The normal bus is unreliable. I find that the buses run unreliably during the trimester because it is utilised so much, however out of trimester they run more to schedule.

Website content was also used by some participants for pre-trip public transport information. This information channel was described as being no easier to use than the printed schedules discussed above.

I find this website so confusing and there are so many links and tables and pages and eventually you'll find a really confusing pdf that doesn't tell you where you're going or what side of the road to be on and I've actually missed a bus that I mean to catch, just because I wasn't aware of it. I now know what to catch but I didn't at the time. It was really confusing.

Car users suggest they used Google Maps to seek navigation information. This method of receiving navigation information was found to work well for participants.

This is where google maps comes in handy because it gives information around how to get there or not.

Further to this, Google Maps was noted as being able to provide accurate arrival time information. Participants highlighted that this was not a primary information need for them as everything was '10 minutes away'.

Google maps provides this information and it technically isn't an issue because it takes 10 minutes to get anywhere.

6.2.2.4 Prioritising of information

Table 6.8 summarises the pre-trip and in-trip information needs for novice and experienced users, disaggregated by mode.

Table 6.8 Summary of information used by participants

Mode	Bus		Car	
User type	**All users**		**All users**	
Pre-trip information	• Price (variation by time if they exist) • How long until toilet stop and where they are en route • Is the bus running to schedule (ie has the bus arrived early or is the bus delayed)? • Planner (eg what bus options do I have to reach my destination, where does the bus stop, start and finish times)		• Road closures on the state highways • Weather • Planned road works on state highways (not in Palmerston North) • Petrol prices (in different areas and ahead)	
	Novice	**Experienced**	**Novice**	**Experienced**
In-trip information	• Does the bus have WiFi and is it free? (long trips) • Arrival time of bus • Next stop	• Nothing additional to other users	• Nothing additional to other users	• Major delays • Road closures (for longer trips)

6.2.2.5 What are the information gaps?

When considering public transport services, an issue raised by participants was not knowing if the bus service had departed ahead of schedule or delayed en route. This was framed as being an in-trip information need, but could feasibly be a pre-trip information need as well and could influence passengers' travel decisions (eg leaving later, catching an alternative route).

> *If my bus was running early, I would like to know that my bus had already gone even though I had arrived early. Or if it's late or not coming.*

Participants also felt that communicating at bus stops whether services were still to arrive or had departed would be valuable to users. Further to this, providing information indicating the cost of the service from each stop would help users choose a stop and time that would be beneficial to them.

> *If we were going to catch the bus, I think the price is the main thing that influences your trip. So if I could look somewhere and see where and when the bus fare was cheaper along my destination that would be helpful.*

Over the course of the user-centred design workshop members identified scheduled and unscheduled closure information as being the greatest information need for drivers.

> *Sometimes I find out in trip that there are road works and it would've been good to know about these road works earlier in my trip. It's not enough to make me look up the information but annoying that I didn't know about it.*

Where the route was currently being realigned, up-to-date routes or alternative route information should be pushed through to GPS units or mobile phones.

Road realignment work information because you're in trip and there is this work happening and the GPS is wrong and suddenly you don't know where to go.

6.2.2.6 Regularity of information

Participants were asked to indicate if there was a preference toward verified or unverified information when looking for information to address their travel needs.

It was agreed within the workshop that the primary concern was that the information was responsive, thus it was more important that reliable information be shared. Users can always be notified of whether or not the information is confirmed or unconfirmed. One participant noted that the decision to make alternative travel arrangements can be left with the end user, but arrangements to that effect can only be made if one is aware that there is a delay in the first instance.

I think the information needs to be more responsive, having it communicated that there is an unconfirmed report of a delay would be better to know than just the bus not being late…I would rather have something than nothing. If they stated that it is unconfirmed then I can choose to still get to the bus stop on time.

6.2.2.7 Scenarios for Palmerston North

Table 6.9 shows the scenarios that were individually considered to achieve a better understanding of what information was necessary to navigate the scenario and how such information should be provided.

Table 6.9 Summary of pre- trip information scenarios for Palmerston North

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
1	Comprehensive information system for amenities, stops, scheduled delayed for inter-city public transport	Must have: Website content, phone call Nice to have: Text messages, smartphone apps, information centre	Text message, phone calls	Website content, smartphone apps	• System would require input of start and destined location, dates of travel. • Communication travel time • System would relay road work, road closure, events, weather warning information • Highlight information centres, petrol stops, bathroom stops, restaurants, accommodation, etc	The text message channel would work by users subscribing to text specific
1	Journey planning information for intra-city travel by public transport.	Must have: Website content, digital signage (major stops), paper map/timetable, Nice to have: Text message, smartphone apps	Paper based/ timetable	Website content	• Indicate if the bus has arrived/left the stop. • Indicate if the bus is running to schedule • Student price information • Route information for services (where they go)	Discussion as to whether signage was a 'must have' or 'nice-to-have' display method. Participants indicated digital signage should be restricted to major stops or placed only at set distances apart.

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
2	Information for long distance travel for public transport users	Must have: Website content Nice to have: Smartphone apps, information centre	Signage	Website content,, information centre	• Methods of chaining together modes • Local amenities (toilet stops) • Fare information for modes	Participants wanted all the available options presented to them for making a long distance journey but public transport. The information should include public transport modes available at stops in cities/towns on the way (eg trains, ride-sharing, etc.)
			Smartphone apps would have a level of detail greater than signage but potentially less comprehensive than a website or information centre			
3	Cost (both fiscal and time) comparison information for public transport against private vehicle for a specified trip	Nice to have: Text message, website content, smartphone apps, information centre etc.	Signage, text messages	Website content, information centre	• Cost of taking one mode over the other considering fares, petrol, vehicle use etc.	Comparison of car, bus and flying was identified to be feasibly conveyed using a variety of display methods however the need for this type of information was not thought to be great enough. As such to have this information relayed by any method was considered 'nice to have'.

Table 6.10 Summary of in- trip information scenarios for Palmerston North

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
1	Major delay and accident information that affects inter-city private vehicle mode users.	Must have: Signage, radio Nice to have: Text message, website content, GPS	Signage, GPS	Website content, radio	• Information should be in real time	Participants indicated the need for a dedicated radio station (as occurs internationally) or having information pushed out by 'the Transport Agency' to radio stations would be an ideal way of receiving this information in-trip.
			Text messages can have a level of information between signage and website content.			
1	Estimated arrival time for bus service and if it is running to schedule for public transport users.	Must have: Signage, website content Nice to have: Smartphone apps, website content	Signage	On-board digital signage, smartphone apps, website content	• If the service is running to schedule • How long to the next stop • What is the next stop	The information should be displayed to users on-board the bus Pre-trip journey planning would be relevant information in-trip as well.

6.2.2.8 Evaluating information systems

Participants generally agreed that the information system should be evaluated by the end users. It was thought that this could be achieved by observing the trend in downloads or hits for the smartphone trip planning app or website respectively. It was also thought feedback could be given by short surveys or feedback forms available via the website or smartphone app.

6.2.3 Auckland

6.2.3.1 Participant demographics

Eight participants (four male and four female), ranging in age from 21 to 69 years took part in this user-centred design workshop. Participants reported a high use of private vehicle for their primary trips, but most also had recent and relevant experience in catching various modes of public transport for similar trips. The mode use for participants of this user-centred design workshop is summarised in table 6.11 below.

Table 6.11 Summary of modes used by participants from Auckland for primary trips

Mode of transport	Number of participants who used mode
Car (driver)	5
Bus	2
Rail	1
Cycle	1
Walk	2

Participants considered public transport consisted of bus, rail and ferry. The group had a high level of smartphone use.

6.2.3.2 What information do you currently use and how do you seek it?

Participants of the study relied on a broad range of sources for information to adequately address their pre-trip and in-trip information needs. Examples of the sources most used included, but were not limited to:

- phone calls
- signage (dynamic and static)
- smartphone apps
- websites.

Participants reported using website content after being directed to it by roadside signage that advertised scheduled road works. This information was acknowledged to be helpful in allowing drivers to see how they were affected by the road works, as well as identify alternative to use while road works were happening. It was agreed VMS signage worked well in notifying road users of delays in-trip.

Website content, smartphone apps and call centres were all discussed and agreed to be viable methods of relaying expected arrival time information of public transport services to customers. Online information was not considered by participants to be entirely reliable, but was generally sufficient.

One participant shared how text message update information pushed to their mobile phone was valuable and worked well for informing them of delays.

> *For the train I think they have done a great job. You can sign up to a text message system and you subscribe to services times, train you catch and they text you when there is a delay and only the information relevant for your trip*

One participant spoke of observing traffic web cameras online to see if there was congestion on the motorway. They relied on this to estimate their current journey time to work. This process was only undertaken for commuting trips. Other participants indicated they sought similar information but gained information from the television or radio. They agreed they would usually seek congestion information for long-distance trips. Parking information was another need for car drivers travelling journeys they did not generally make.

6.2.3.3 How well is information working at the moment?

Discussion in the workshop revealed members were not confident of the accuracy of information currently available for public transport services.

> Participant A: *For those of you here using public transport, how confident are you that the information you are receiving now is accurate?*
>
> Participant B: *Not very, about 60 percent.*

Participants agreed that when catching public transport it was necessary to have real-time arrival information as well as the stop location to ensure they knew where and when to catch the bus. Having a rough estimate of time delay on services was appreciated so alternative provision could be made.

> *For* [public transport] *I want to know the real time for that mode is going to show up for where I want to catch it.*

Currently participants indicated using the internet, smartphone apps or contacting a call centre as methods for obtaining journey planning information. However, this information lacks real-time updates and users can find themselves at stops unsure if they have missed their service or if the service is running late.

> *It would be nice to know roughly what the delay for the bus is if it is running late.*

When considering public transport information needs, it was suggested that knowing when services were delayed or running to schedule was valuable information to users. One participant noted this would be particularly valuable for areas of Auckland where priority bus infrastructure was not in place as these services were more susceptible to peak-time traffic delays.

> *…There is one way in and one way out and when everyone goes back to school there are massive traffic delays for a significant period of time. It would be good to know if there was also no bus lane because then we know the bus is likely to be stuck in traffic.*

Participants who commuted regularly by car indicated they regularly sought information to ascertain if there were delays on the motorway and if there was a delay to observe the extent of it. Another participant indicated when aware of scheduled road works, he referred to the additional information sources noted on the road signage.

> *I have looked up to find out about road closures, because there have been a number of closure issues and I got caught in it once. I looked up (alternative routes) on the LTSA website,*

which I knew to do because of sign posting done by them (through the site where road works would be having). I know to avoid those routes during those times.

One participant stated that as a novice user, it was useful when in-trip to know where the next stop was. Outer and inner link services were acknowledged to already be doing this.

For car trips it was felt that unexpected delays such as those caused by road crashes should be communicated to drivers. At present drivers indicated that the VMS above the ramps were useful for communicating estimated delay times to drivers.

6.2.3.4 Prioritising of information?

Table 6.12 indicates the pre-trip and in-trip information needs disaggregated by mode and user type.

Table 6.12 Summary of information needs by mode type, user type and trip scenario for Auckland

	Public transport (bus, rail, ferry)		Car	
	Novice	**Experienced**	**Novice**	**Experience**
Pre-trip information	• Where to board the service • If there was bus infrastructure in place on my route (susceptibility of services to congestion) • How to pay for my trip • Wheelchair accessibility • Real time arrival information for the service at the stop I have to use • If the service is delayed, an estimate of how much it is delayed by	• Where can I top up my hop card • Real time arrival information for the service at the stop I have to use • If the service is delayed, an estimate of how much it is delayed by	• Parking information (especially for long distance/ recreational trips)	• Scheduled road closure information • Major delay or crash information prior to leaving for my commute to work
In-trip information			• Radio announcement of crashes because I can adjust my route • Estimated travel times displayed on on-ramps • Parking information (ie if the park is full or not)	• Radio announcement of crashes because I can adjust my route • Estimated travel times displayed on on-ramps • Parking information (ie if the park is full or not)

6.2.3.5 What are the information gaps

One participant raised the inconsistency between the digital and printed train timetables. The contradiction in arrival information displayed was considered to be problematic and participants affirmed that it was critical that these timetables depicted the same information.

> Facilitator: *How critical is it that these times are the same?*
>
> Participant A: *Very, they aren't regular enough that you can afford to miss a bus so even five minutes is too much*

It was stressed that if one service was delayed it was up to the customer to make sure they reached the next stop in time for their chaining service, so they needed to have accurate arrival and delay information once already in-trip.

> *The bus doesn't wait for the train and the train doesn't wait for the bus so I look to see when these are coming so I know if I have to walk or run.*

Participants discussed the challenges with paying for their public transport trips. One participant shared her difficulty of knowing where to top up her fare payment card, despite regularly using public transport

> *One thing for public transport, I always found it ridiculously hard to pay for my trips and having that information on the website or over the net would be better. Particularly for me when I top up. This is something I have to do every week but it is always a struggle.*

Other participants agreed with this experience citing it as the reason why they did not use HOP card[18] services.

Participants agreed adequate public transport service information for special events was lacking. They wanted to know when special events would affect their services (ie if the service was free from the arena or disrupted by the reallocation of buses as a shuttle service). Signs were needed for drivers to advise them to stay away from areas that could be affected by events occurring in the area. Also, changes to a route or works happening along a route should be communicated to users prior to boarding public transport.

In the user-centred design workshop there was a perception of poor communication between the various public transport companies. Participants noted it was crucial for public transport services to communicate effectively among each other to minimise disruption to consumers. Participants discussed an event where drivers were being advised to use ferry services to minimise congestion and significant delays on the motorway after a severe crash; however, the authorities were not aware that ferry services were not running.

> *In that scenario, when that particular accident happened people were being told to take the ferry to down, but there was no communication because the ferry driver was on his way to drive his ferry but he was stuck in traffic and couldn't get to the ferry. So all these people were being told to take the ferry but there was no ferry driver. Communication is key I think.*

Participants indicated they would appreciate information being standardised across the different services and companies.

[18] A reusable prepay smartcard for travel on trains, ferries and buses around Auckland.

6.2.3.6 Regularity of information.

As with the other user-centred design workshops there was a lot of emphasis on real-time data and the need for public transport information, such as expected service arrival/departure times and crash or delay information, to be regularly communicated and updated.

Car users indicated regular updates pushed through to their GPS such as congestion information was the most important.

Text message subscriptions seemed to be valuable and allowed users to receive only those updates on delay times which they had specified.

Participants discussed the merit of whether confirmed or unconfirmed reports of delays were more useful to end users. Estimated delay information was thought to be useful for decision making, users could decide whether or not they would leave on time or make alternative transport arrangements; however, other users valued accurate delay information. This can be seen by the discussion between participants below:

> Participant J: *Personally I think knowing how long the delay is, is more important. I would rather wait two minutes and know it will take me twenty minutes than just know something has happened.*
>
> Participant K: *There is no reason why they can't give an estimate when it is delayed.*

6.2.3.7 Scenarios for Auckland

When it came to prioritising the scenarios the group chose to separate out car travel from public transport information needs as they felt it was not fair to prioritise the needs of the users of one mode over the needs of others. Therefore the results of the prioritisation are presented separately in table 6.13.

Table 6.13 Summary of pre- trip information scenarios for Auckland

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
Public transport						
1	Information about effect of unexpected delays for public transport users about their mode	Must have: Smartphone apps, website content Nice to have: Radio announcements and text messages, real time signage	Radio announcement, text messages	Smartphone apps, website content	• Alternative route options could be relayed by more detailed information channels • Estimate of delay time customer can expect.	Text messages were identified as being a succinct way of relaying delay information to users who did not have access to smartphones or internet prior to beginning their trip.
2	Network map information for public transport users for planning trip	Must have: Timetables, website content, smartphone apps, phone calls, knowledge from bus driver	Time tables, phone calls	Website content, smartphones, bus drivers		
3	Concession and payment information for public transport	Must have: Website content, smartphone apps, printed timetables/maps Nice to have: Phone, radio	Timetables and maps	Websites content, smartphone apps	• How much the fare is (eg peak time/off-peak pricing, concessions available) • Where can I top up my electronic payment card	Participants expected bus drivers and call-centre services to be able to answer queries relating to public transport fares.
4	Accessibility and special services information	Must have: Social media, radio	Smartphone apps, radio	Social media, website content	• What services were running	Participants of the focus group felt that timetables and call-centre capabilities were also 'must haves' for

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
		Nice to have: Website content, smartphone apps			• The route the service was running	this scenario to cater for users who lacked access to other channels for special service information
Car users						
1	Alternative route information for scheduled delays	Must have: Smartphone apps, website content, GPS radio and phone communication, real time signage Nice to have: Social media	Real time signage, phone, radio	Smartphone apps, website content,	• Alternative routes • Where road works or special events are expected to impact	
2	Parking information for a recreational trip	Must have: Smartphone apps, website content, GPS	Real time signage, phone, radio	Smartphone apps, website content	• Where can I park my vehicle • Limits or restrictions on parking there • Cost of parking my vehicle there	It was thought that Google Maps should have this capability but participants were not sure as this is not a primary function of Google Maps.

Table 6.14 Summary of in- trip information scenarios for Auckland

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
Public transport						
1	Real-time information system for public transport outlining connecting stops and routes.	Must have: Signage, text, website content, smartphone apps and phone calls	Signage in bus	Website content, smartphone apps	• Services that are arriving • Alternative services available to take if services are delayed • Next station/stop information	
2	Information about changes to route or stop for public transport users.	Must have: Text messages, website content, smartphone apps, signage, social media and GPS updates	Social media, signage, text messages	Website content, smartphone apps	• Identify which stops are affects • What changes have been made	Was acknowledged that social media would be a good way to have up-to-date information as this is easiest to update. In saying that it was thought, social information would be lacking in detail *You could follow your route on twitter or something, could work on Facebook. The expectation is that this would be more up to date than the website. They could be done in tandem there is no reason why twitter couldn't share to the website or the app.* *Social media is more urgent than websites.*

Priority	Information need scenarios	Preferred method of delivery channels	Level of detail		Information to be conveyed	Notes
			Less detail → More detail			
Car users						
1	Information about unscheduled delays on route	Must have: Radio, signage, GPS	Signage	Radio, GPS	• Estimated arrival time • Where the delays occurred and roads affected.	Information is expected to be across radio stations rather than having a dedicated radio station GPS can tell you the time and show road works in real time.
2	Park availability information in-route	Must have: Signage		Signage	• Whether there was available parking • Parking costs	Participants stipulated that signage would need to be posted both ahead of arriving to parking locations as well as outside. This is to allow users the option to assess parking availability elsewhere if necessary

6.2.3.8 Evaluating information systems

Similar to that of the Palmerston North workshop, participants suggested smartphone apps and website views would be a means of measuring the success of the information system. Auckland participants also suggested feedback could be provided through social media.

> *We would download their apps and there would be hits on their website then they would know about it. We could comment on their social media or have a mechanism to give feedback.*

6.3 Structured interviews with commercial operators

Facilitators met separately with 10 commercial transport operators to gain a better insight to understand:

- What information is used by commercial operators and how is this information obtained by them?
- How do they use this information in their daily operations, what are their constraints?
- What additional information would be useful to know, and what are their preferred delivery channels that would fit in with their business practices?

A set and format of questions and user-centred design techniques were used, similar to those in the user-centred design workshop, with the emphasis changed to reflect commercial operations. The full set of questions can be seen in appendix C. The taxonomy of effective delivery methods and content for traveller information in New Zealand developed in section 5.1 was used as a base for further investigating both the type of information needed, as well as to identify preferred display channels. The commercial operators interviewed were first asked to identify the type of scenarios for which they would like information, in order to identify gaps. They were then shown the full list of potential information from section 5.1 and asked to indicate their priorities for information development.

The following table summarises the operators interviewed. The next section provides a summary of each interview.

Table 6.15 Commercial operators interviewed

Commercial operator types	Companies
Short-haul freight	Gleeson & Cox Transport Ltd (Auckland) Pyramid Trucking Ltd (Auckland)
Long-haul freight	TIL Freight (Nelson) Fonterra (Hamilton)
Inter-city buses (long distance)	InterCity Bus (Auckland) Richie's Bus and Coach Services (Dunedin)
Intra-city buses (short distance)	Auckland Transport (Auckland) Go-Bus (Dunedin)
Taxis/couriers	Auckland Co-operative Taxis (Auckland and Regions) Fastway Couriers (Dunedin)

6.4 Short-haul freight

6.4.1 Gleeson & Cox Transport Ltd

6.4.1.1 Background information

Gleeson & Cox Transport Ltd (Gleeson & Cox) is a bulk transport operator that services the Auckland and Waikato area carrying construction material loads such as aggregate, iron, sand, coal and other road construction materials. Its operations are typically from 5am to 6pm during the week, and 5am till midday on Saturday. Preferred routes are determined by dispatch and are then provided to the driver. The company has a fleet of 90 trucks which includes approximately 40 high productivity motor vehicle (HPMV) trucks of which 30 are 50 tonne plus vehicles. Two main dispatchers and an operational assistant are available to communicate with drivers between 5am and 6pm.

The primary issues affecting ease of operation for the company include failures (delays and road closures) on the main Auckland network and HPMV routes, particularly those to and from quarries (eg State Highway 20). The business tries to minimise the impact of delays by building delay estimates into the pricing structure for jobs.

6.4.1.2 What information do you currently use and how do you seek it?

Gleeson & Cox dispatchers consult a broad range of information sources including motorway cameras, on-board GPS, driver reports, National Road Carriers Association alerts, Google Maps and radio. Information is then fed out to drivers.

Due to the large number of vehicles in the fleet and the relatively limited number of routes on which they operate, the first indication of a delay/stop on the network that dispatchers receive is often from drivers. This prompts them to seek additional information, typically from motorway cameras and the Transport Agency website.

6.4.1.3 How well is information working at the moment?

Motorway cameras work well in providing additional information when combined with other sources of information. Accessing real-time information on any delays on the network (particularly those that may cause a road closure or a long delay) allows the operator to load departing trucks lightly so they are not HPMV or 50+ classification and thus able to use alternative routes. However, this only works for trucks that are yet to leave the depot. HMPV or 50+ vehicles already on the network are required to wait out the incident.

Currently, computers and smartphones are used as part of the communication operations and there are no plans to upgrade or introduce new communication methods to their operations

6.4.1.4 Prioritising of information

Potential information and display channels discussed in the interview were then prioritised into the types of information, and the display methods the operator would want to see developed. The results of these are provided in table 6.16.

Table 6.16 Priority of information needs for Gleeson & Cox

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
1	A navigation system that advises drivers of an appropriate route to their end destination for their permit type.	In-vehicle navigation system that gives turn-by-turn instructions and re-directs a driver if they are off route.	Information to be delivered in real time via a navigation system.
2	Real-time notification of delays on the network. Users should be able to tailor push notifications based on geographical areas, delay times and type of incident. Would like to be able to select the delay time (a one-hour delay is seen as critical to Gleeson & Cox as this is the cut-off point where they might not get in the last trip of the day). Information on the type of incident was also requested (eg fatal on the motorway versus road works, as a fatal crash is likely to shut a road for a longer period). Also of interest were any high wind warnings for the Harbour Bridge (particularly if it is likely to be shut down).	An email subscription service that pushes out information to subscribers. Should include a link to an internet site that provides more detail. Information should also be pushed out via radio.	Email containing less detail with a link to the internet with more detail. Radio messages should provide general alert information from which the listener can look up more detail on a website.

6.4.1.5 Regularity and verification of information

Mornings are the most critical information period for Gleeson & Cox. Trucks are loaded from as early as 5am (departing the depot by 6am) so information that would lead to the light loading of vehicles so they can use alternative routes is needed early. It is important that any information supplied is up to date and accurate.

Gleeson & Cox indicated a preference for confirmed information as its drivers already provide a source of 'real-time' unverified incident information.

6.4.1.6 Priority for development

A navigation system would be the highest priority as such a system would ensure compliance and safety, and was thought to be beneficial to the freight industry. It would also assist Gleeson & Cox as due to a shortage of truck drivers the company often hires drivers new to Auckland who may also be new to New Zealand. They can be excellent drivers but may not have good English and/or knowledge of the area. Such a system would allow them to concentrate on the turn-by-turn navigation. If a driver became 'off route' the system would tell them how to get back 'on route'. In addition it should keep them away from restricted areas and structures (eg Auckland Airport).

Information on incidents and delays exceeding one hour on over-weight vehicle routes was rated as a 'nice to have'. Knowledge of these incidents provides operators and managers with the opportunity to coordinate and authorise lighter vehicle loads to travel alternative routes, mitigating the effect of delays on the fleet and business operations. This information could be relayed via email, radio and internet channels.

6.4.2 Pyramid Trucking Ltd

6.4.2.1 Background information

Pyramid Trucking operates between Northland and Wellington, with the majority of trips being made in the Auckland, Tauranga and Napier triangle. The company specialises in the freight of containers, bulk liquids, palletised loads and bins. Its fleet comprises 28 vehicles and includes both HPMVs and 50MAX rigs. The company operates 24 hours per day, five to six days per week, although this is increased at times due to seasonal variations such as taking animals to the abattoir.

All routes are planned centrally through the Managing Director of Operations, who works with three dispatchers and an additional two drivers who take over dispatch at night.

6.4.2.2 What information do you currently use and how do you seek it?

Currently the dispatchers use WhatsApp alerts to monitor developing situations relating to weather and traffic conditions, along with websites such as the National Road Carriers Associations Facebook page and the Transport Agency website. Dispatchers also monitor TV and radio traffic updates and share information with dispatchers from other companies. All dispatchers have International Telematics GPS dispatch systems on their computers and smartphones.

6.4.2.3 How well is information working at the moment?

Dispatchers felt that, via the combination of methods described above, they were able to get transport information relatively effectively.

6.4.2.4 What are the information gaps?

Many of the improvements dispatchers thought would be useful focused on making information more rapidly available in real time, as well as advance warning of potential disruptions to the traffic system.

Trucks on 50MAX permits can only travel on approved roads, so there are limited options available if one of these roads is blocked or congested for any reason and often these trucks will just have to stop. If drivers have to stop for more than 20 minutes, this time can be used for a driver rest period, so it is useful to know (where possible) how long stoppages will be. Drivers have sleeper cabs and have fatigue management plans, so there is not currently an issue with drivers exceeding their hours; however, knowledge of delay timings would allow rest times to be managed more effectively.

Table 6.17 Priority information needs for Pyramid Trucking

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → More detail
1	Text message alerts of serious incidents that might block the road for more than 20 minutes. This will allow them to schedule breaks, divert trucks on 50MAX permits and update clients on expected delivery times. Congestion information, such as where problems are on metropolitan routes. Weather forecast alert information in order to determine if loads should have tarpaulins on them.	Mobile phones which link to the internet	Text messages … Internet
2	Advance warning of public holidays and one-off events (National Road Carriers already supply some of this information, but more information would be an improvement)	Email	Email … Website
3	Advanced warning of new road layouts, to promote safe driving practices both for truck drivers and the general public. This is particularly an issue when road changes or road works may lead to traffic backing up.	Static and VMS signage	On-road signage and electronic warning signs

6.4.2.5 Regularity and verification of information

Pyramid Trucking would like the option to see unverified information for events that are likely to result in a delay of more than 20 minutes. Unverified data could be useful as it could be verified by Pyramid drivers, or dispatchers from other companies. The 20-minute threshold is because this time period can be used as a driver break.

Pyramid Trucking was keen to see a system implemented that allowed easy printing (or no printing) of amendments for the 50MAX book of maps. Currently this is an 80-page document that needs to be printed for each truck each month (the company can be fined if a truck is stopped and does not contain a printed copy). Suggested solutions for this included; printing the amendments only, making the programme for downloading more user friendly, or having a tablet in the vehicle that links to the document.

6.5 Long-haul freight

6.5.1 Fonterra

6.5.1.1 Background information

Fonterra operates 24 hours a day, with 544 vehicles, four of which are HPMV vehicles. Their load is typically liquid milk, and they are responsible for both the collection from suppliers and delivery to factories across the country. Routes are determined by a scheduling system and relayed to drivers via this system.

6.5.1.2 What information do you currently use and how do you seek it?

Fonterra receives regular email updates from the Transport Agency to assist in its route planning. It also liaises with local councils, the AA and moving companies and uses a scheduling system, Genesis, which identifies the most efficient routes for drivers to travel. The scheduling system forecasts factory requirements and determines an optimal route which is then pushed to drivers. The system permits drivers to input information via radio communication with dispatchers.

6.5.1.3 How well is information working at the moment?

Radio contact with drivers is the primary method of providing drivers with dispatch information. However, Fonterra is investigating better dispatch-driver communication systems. The Genesis scheduling system could benefit from more real time information (eg congestion, road works, weather-affected routes). Fonterra is looking to upgrade to a more web-based information system.

6.5.1.4 What are the information gaps?

Delays have a great cost impact on the business and are recorded and available for analysis. While the business accepts some delays are inevitable, Fonterra would benefit from real-time information on road network delays. The three biggest causes of delays include Auckland traffic congestion, road works and the impacts of weather. Real-time data could mitigate the impact of all of these. Fonterra further indicated better linkage between its scheduling system and the Transport Agency updates would be useful to its operations.

Table 6.18 Priority information needs for Fonterra

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → Most detail
1	More real-time information that can be made available advising of delays on the road network. Ideally would prefer to know about an issue prior to encountering static signage. This issue relates to safety as well, as it is difficult for tankers to turn around.	Channels by which such information could be disseminated include: Website content, real and static signage, person-to-person communication, social media and smartphone apps. Of these, website content was considered to be a 'must have' method of communication. The rest were considered 'nice-to-have' methods. Phone calls would be relevant when important events occurred on the road. Smartphone apps were considered to be an efficient method for making schedulers aware of information affecting the road network. Real-time and static signage was indicated as 'nice-to-have' but information concerning delays would be better utilised prior to encountering the transport issue on the network.	Phone calls Smart-phone app Website
2	Fonterra indicated its pre-trip information needs included advice of road works, as these often caused delays. Changes in speed limits along routes were identified as being valuable information. Speed limits	Phone calls, smartphone apps, website	Phone calls Smart-phone app Website

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → Most detail
	could be input into their Genesis scheduling system advising drivers travelling along that route.		
3	Knowing the activities of moving companies would be practical information to have. This comes from an incident involving a Fonterra tanker making way for a moving vehicle which caused a road slip. In future, Fonterra would like to be aware of moving companies' activities to prevent such an incident happening again.	Phone calls, smartphone app, website	Phone calls Website Smart-phone app
4	In-trip information needs extended to knowing of changes in weather as well as traffic congestion, particularly for Auckland.	Phone calls, smartphone app, website	Phone calls Website Smart-phone app

6.5.1.5 Regularity and verification of information

Fonterra indicated a preference for real-time information, suggesting this could improve its current scheduling information which provided the majority of the information for successfully coordinating the fleet on a daily basis. Currently, certain staff receive automatic Transport Agency notifications. Where necessary, notifications are forwarded to the operation team. While the process is not yet entirely automated, information is regularly collected and evaluated for Fonterra staff.

6.5.2 TIL Freight

6.5.2.1 Background information

TIL Freight operates nationwide with its main headquarters in Nelson. The company has a fleet of 800 vehicles, which includes HPMVs, cart fuel and general freight. Drivers select their own routes, unless they drive an HPMV in which case the routes are specified. TIL has 50 dispatchers working nationally, with an average of one to two dispatchers in each depot.

6.5.2.2 What information do you currently use and how do you seek it?

TIL Freight is principally concerned with identifying road closure information (eg location) ahead of time. This information is generally fed to dispatchers by way of feedback from drivers, or by notification from a Transport Agency consultant of planned or unplanned delays that will significantly affect HPMV routes. Dispatchers attend daily afternoon conference calls to share nightshift road information, in order to determine the best routes for their fleet to travel that evening.

To determine if weather is likely to affect routes negatively, dispatchers monitor the AA website and liaise with staff in Opus Christchurch for route availability along the Lewis Pass and Lindis Pass.

6.5.2.3 How well is information working at the moment?

TIL Freight uses the E-Roads navigation system to track its fleet, but has disabled the navigation capabilities of the system. This system allows dispatchers to determine the travelling speed and location of their vehicles. With this information dispatchers can assist lost drivers and estimate the arrival time of a load.

6.5.2.4 What are the information gaps?

Pre-trip and in-trip information were not felt to be relevant information categories to TIL Freight as dispatchers had continual communication with drivers.

Table 6.19 Priority information for TIL Freight

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → More detail
1	Real-time information on delays over one hour	Phone calls, smartphone app, website	Phone calls; Smart-phone app; Website
2	HPMV route mapping tool	Smartphone app, website	Smart-phone app; Website
3	Road works on HPMV routes (eg mapping)	Smartphone app, website	Smart-phone app; Website
4	TIL currently gets schedules from fuel station but could have better route details to those sites (eg entrances, exits, suitable for size of the rig)	Website	Website

Staff of TIL Freight were not aware of the information the Transport Agency had available for road closure status. The company was interested to know of anything that would delay its fleet by more than one hour, or if significant detours were required, and preferred to have this information communicated by text message, phone call or via a website

TIL would like better route planning information that provided more accurate journey time estimates. This would have to be delivered as a web-based tool.

Information on roads with vehicle height and weight restrictions was determined to be irrelevant as TIL Freight's deliveries occurred along well-known routes. Where commercial deliveries were made from private origins, or to private destinations, issues had previously occurred. Regardless, it was not expected that such information be provided to them.

6.5.2.5 Regularity and verification of information

Information for delays was sought only where delays exceeded one hour. Shorter delays occurred often, so specifying a one-hour time frame meant the information being received could be used effectively. Unconfirmed reports were discussed and TIL Freight staff felt these would be useful to them to initiate re-routing options, but they would want to know that they were not confirmed.

6.6 Inter-city buses

6.6.1 InterCity Buses

6.6.1.1 Background information

InterCity Buses (InterCity) services the North and South Island, coordinating 120 services across the country throughout the day. The network comprises 70 coaches operating 24 hours a day for the entire year.

Routes have been developed and scheduled over a number of years by the company itself. Information is fed out to customers and drivers by two operating staff in Auckland who operate a call centre between 7am and 8pm. Information can also be pushed out by i-SITEs and other ticket sales agents scattered throughout the country.

6.6.1.2 What information do you currently use and how do you seek it?

Weather events are the primary cause of frustration for Intercity. Crashes were seen as less of a frustration as traffic was still able to get through crash sites.

Dispatchers rely on the Transport Agency website for real-time information. Drivers were also identified as being a source of real-time information. InterCity indicated this occurred regularly for routes going from Hamilton into Auckland; the driver would call in about the delay and this information would be passed on to those drivers on the same route as the delay. Information would then be shared with passengers yet to board, as well as those on-board the bus.

6.6.1.3 How well is information working at the moment?

The Transport Agency map-based view of where issues are and how the information is tabled is good, but improvements to the frequency of updates and specificity of messages could be made. It was also thought this information should be pushed out by the Transport Agency, instead of collected by users.

The information dissemination method for Milford Road is working well. Early in the day information is provided to operators. This assists in them in deciding if it is feasible to make the trip on a day-by-day basis. For days where information is unverified, an estimated update time is provided which allows InterCity to put in place a contingency plan. To date, information delivered and the means of delivery have been proficient in ensuring no one has been left stranded.

6.6.1.4 What are the information gaps?

Unlike with Milford Road, the available information and method by which this information is shared has not worked well for the Desert Road. Desert Road presents more challenges, which are complicated by the overnight services that run along the route. Information is not actively sought for road conditions during

night-time services, as there are no dispatchers available and only one on-call operator. This has meant in the past that the knowledge of the road closure only occurs when a driver sees signage.

Intercity indicated information of estimated travel times, particularly for long weekends, would be valuable to know. It was also an information priority to know if snow chains were necessary for drivers. Having a notification pushed out to such an effect was indicated to be valuable information to Intercity.

Table 6.20 Priority information for InterCity

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → Most detail
1	Develop and push out information for Milford Road, Lindis Pass, Burkes Pass, Haast, Desert Road. This would include information regarding the road condition/ status, weather forecasts and if chains are required. Where the status is unknown time-bands indicating when information would be updated to get an idea of how accurate the information is. Instead of using phrases like 'until further notice' use 'engineers are on route and will update at xx:xx time'.	Text Data that InterCity can connect to via API. This could, for example, be imported into the smartphone app that InterCity is currently developing for its drivers. API data could also be imported into other InterCity software programs, such as the reservation system. Website	Text Website Smart-phone app
2	Delay information sent to dispatchers where delays on bus routes are expected to exceed 20 minutes Estimated journey time, congestion and time critical or special event (eg long weekends) information.	Text Data that InterCity can connect to via API. This could, for example, be imported into the smartphone app that InterCity is currently developing for its drivers. API data could also be imported into other InterCity software programs, such as the reservation system. Website	Text Website Smart-phone app
5	Nice to have Notifications from road controlling authorities of planned delays (eg events and road works). It would be 'nice-to-have' the notifications pushed out.	Text Data that InterCity can connect to via API. This could, for example, be imported into the smartphone app that InterCity is currently developing for its drivers. API data could also be imported into other InterCity software programs, such as the reservation system. Website	Text Website Smart-phone app

6.6.1.5 Regularity and verification of information

Between 7.30am and 9.00am are critical operating times for InterCity; for this reason information needs to have been successfully communicated by 6.00am. InterCity indicated 5pm was a cut-off time for services running from 7pm and for the following day.

Delays expected to exceed 20 minutes were necessary to know. InterCity indicated 20 minutes was about the critical point where two coaches might not successfully connect in time. Having text notifications for delays of 20 minutes was therefore indicated as important information to have.

InterCity also indicated it wanted to know when information would be updated and whether it was verified or unverified.

6.6.2 Ritchies Transport Holdings

6.6.2.1 Background information

Ritchies Transport Holdings (Ritchies Transport) runs a passenger bus service for inter- and intra-city travel. The Otago region is serviced by 80 buses transporting passengers to set destinations, and offering tours pre-determined by itineraries set by passenger cruise chips or private hire (eg conferences). Routes and times for inter-city travel are predetermined, while routes and times for tour coach services are delivered according to itineraries and customer requirements.

6.6.2.2 What information do you currently use and how do you seek it?

Currently, radio is the primary channel of communication between dispatchers and bus drivers. Bus drivers are expected to carry personal phones and often rely on their personal GPS for information.

Ritchies Transport relies on road closure information being pushed through by the various city councils for the areas it services. Dunedin City Council pushes through road closure information by text, which is then repeated to the bus driver by dispatchers.

Information channels used by the public are also consulted by Ritchies Transport. For example, the Transport Agency website is consulted for closure information, as are VMS road signs.

6.6.2.3 How well is information working at the moment?

To function well, delay information needs to be accessed as soon as possible to allow for re-routing of services to best meet customer demands. Contingency planning begins from the earliest indication of poor weather.

The relaying of closure information by city councils has varying levels of success, with some councils providing information more readily than others. On-road VMS signage and messages was not considered the most efficient method of communicating delays, as it is challenging to re-route a service once it has begun.

Inadequate updating of road closure status on the Transport Agency website was noted as an issue. The implication often meant costly detours to avoid road closures which were no longer in place.

Unscheduled road closures presented the greatest challenge. The most noted issue expressed was with authorities undermining the capabilities of the bus and drivers to navigate the road or conditions. Consequently, it was felt that services were affected by such closures unnecessarily. The interviewee spoke of a crash event as an example. An unscheduled road closure due to a vehicle crash affected the road

along which one of their services travelled. It was suggested that one lane could have been cleared for traffic and vehicles guided by Police. This event followed flooding which affected services the previous day. Buses were built to navigate high water due to having a high air intake and road markings were still visible through the water on the road. The interviewee suggested the service disruptions were unnecessary and that more knowledgeable authorities could have minimised the effect on their services.

The impacts of such delays were high and were estimated to potentially be as high as $10,000. The company is responsible for the costs of accommodation when overnight stay is required, and compensation claims for failing to meet its duty. The cost of transporting a driver to a delayed service to relieve a driver who had completed their maximum hours was another logistical cost the company carried.

6.6.2.4 What are the information gaps?

Pre-trip information could extend to anything that would mitigate delays or detours of services, particularly for inter-city trips. This information was felt to be particularly important as the sooner information was available, the sooner Ritchies would be able to inform booked passengers of delays. Once passengers are in-trip the service is duty bound. Failure to meet the obligation to deliver a passenger to their destination in the time agreed, can lead to compensation claims.

Text messages, phone calls and website content were all considered as important channels by which staff could receive up-to-date information.

In-trip information needs could be best serviced through phone calls, when experiencing delays. The ability to call on the experience of an individual (eg supervisor of the road maintenance contractor) who knew where exceptions were possible, or who was capable of navigating buses or heavy vehicles through a situation would be valuable.

At present, in-trip information is dispatched to drivers by means of RT radio. Ritchies Transport indicated that social media, smartphone apps or VMS signage could be used for drivers to inform themselves, with dispatchers then contacted if drivers were unsure as to whether they should continue on a specific route.

Civil defence emergency procedure information and protocols were said to be inadequate, particularly in providing information on how to minimise unnecessary service disruptions in an event. It was suggested that a panel consisting of transport industry representatives should discuss such scenarios and provide guidance on to how to navigate such events.

Table 6.21 Ritchies Transport

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail ⟶ Most detail
1	Any scenario that will either stop or delay their trip, in particular, any delay that will prevent them making scheduled inter-city trips on time and/or will cause them to make detours on-route.	Text Phone Web	Text Web Phone Person to person /phone (for road conditions – where need to get a bus through. Would like updates every half an hour for potential road closures.

6.6.2.5 Regularity and verification of information

The representative for Ritchies indicated that the more up-to-date information was, the more useful it was for the company. Half-hourly road status updates indicating road closures would be valuable information.

Access to both verified and unverified information (so long as unverified information was adequately updated) was considered to be of value, as such information provides an opportunity to plan detours to ensure passengers arrive at their destination on time.

Currently, where necessary, unverified information received through informal networks is used to avoid delays and costs to the business. This information is obtained through knowledgeable and experienced contacts and has previously helped navigate buses through delays.

6.7 Intra-city buses

6.7.1 Auckland Transport

6.7.1.1 Background information

Auckland Transport is a local body organisation responsible for the Auckland region's transport services, tasked primarily with the:

- coordination and implementation of road safety
- design, maintenance and building of regional transport infrastructure (eg cycle ways, walkways, ferry wharves)
- operation and planning of the public transport service (bus, rail and ferry).

Each weekday, Auckland Transport is responsible for the coordination, and scheduled and active planning of approximately 8,000 bus trips. This number drops by approximately 50% on weekend days. Customers are able to contact a call centre to request service information from 7am to 9pm on weekdays; however, measures are not currently in place to service after-hours closures or disruptions.

Typically, bus service routes are determined primarily by the individual bus companies, but are guided by a network planning approach. This approach seeks to appropriately service passenger needs and to service major key corridors.

Rail services are operated differently from those of buses in that the infrastructure is owned by Auckland Transport, but the scheduling, maintenance and operation responsibilities fall to the rail provider. Despite this fact, Auckland Transport assists in relaying rail information to customers.

6.7.1.2 What information do you currently use and how do you seek it?

For public transport services, information needs are greatest when unscheduled disruptions occur. Information is channelled to Auckland Transport through a varied network of sources extending from bus drivers to Auckland Transport Operation Centre (ATOC) messages.

Auckland Transport also has in place a 'service disruptions unplanned/emergency diversions' form to collect delay/incident information from bus drivers. Drivers communicate the information regarding the disruption, which is then collated by the operations team at the bus depot. The team identifies the nature

and location of the incident, service stops and routes affected, and provides the information to Auckland Transport for relaying to customers. This information can also be used for planning contingencies.

In the event of major crashes and delays, ATOC messages are pushed through to the appropriate staff at Auckland Transport. These messages are used to determine the affected scheduled services and alternative routes if necessary.

Service disruptions staff work with bus operators regarding diversions to scheduled bus serves and circulate the information to internal and external customers via the call centre.

6.7.1.3 How well is information working at the moment?

Auckland Transport does not consider the information supplied for planning contingencies is sufficient, suggesting that it is often difficult to act decisively on ATOC information. While the information contains details specific to the incident causing delay, it lacks key facts (eg estimated resolution time) to promote earlier relay of the information to clients.

6.7.1.4 What are the information gaps?

A robust social media policy would assist Auckland Transport in communicating service disruptions to clients to minimise disruptions to passengers. Also, a single point of reference should be identified whereby an incident controller could make key decisions based on the facts handed to him/her.

Table 6.22 Priority information for Auckland Transport

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → Most detail
1	When a major delay occurs need to know update/resolution time. This would allow AT to assist in determining the level of response required from AT with regard to diversions for scheduled services and provide an adequate customer response.	Emails were identified as being a must-have channel for communicating incident information and resolution times. It was suggested that phonecalls and text messages are vulnerable to misinterpretation or miscommunication (ie accents for voice and the shortness of a text may lead to ambiguity). Social media is a nice-to-have method but acknowledged as being a go to source of information along with general public. Variable passenger information display signage at bus stops requires better operating processes.	Phone-call, then Text Facebook infor-mation It was also suggested that passengers should be able to follow their route on Twitter and be directed to Facebook or websites for more detailed disruption information.

These mediums were thought to be valuable to achieve a better understanding of how to react to the reported incident, and what delay information or resources were needed to be made available to minimise the impact of the incident on public transport users.

Text messages were considered to be an essential method by which information should be received and is considered to remain the truest and confirmed. Phone calls were also valued as a means of receiving information as it the most practical method of confirming information coming in. Both these information channels were considered 'must-have' methods of receiving information.

The capability of social media for receiving information was discussed. Currently it is relied on heavily, but Auckland Transport decided it would be a 'nice-to-have' means of communicating delays with customers.

For example, customers could follow their route on Twitter to receive low detailed information outlining primarily whether services were running and directing them to Facebook or websites where greater levels of detail could be relayed. Another example would be to have dedicated Twitter accounts for each region, or a disruptions-style Twitter account for people to get real time information regarding disruptions and diversions.

6.7.1.5 Regularity and verification of information

Auckland Transport indicated the importance of ensuring information was relayed to clients as soon as possible. Unverified information (ie on-road notifications from bus drivers of disruptions to services) is already used by Auckland Transport to better meet its information needs. Where this is not possible, the call centre is contacted to obtain some indication of the type and severity of the disruption. Unverified social media information is shared to fulfil information needs of customers and providers alike.

The sooner information is available, the earlier mitigation actions can be implemented to minimise disruptions to travel. Auckland Transport did indicate on-ramp and off-ramp bulletin information arrives too late for them to plan for weekend closures, indicating a minimum of three business days is necessary to ensure adequate warning signage is applied or journey planner type apps are updated.

6.7.2 Go Bus - Dunedin

6.7.2.1 Background information

Go Bus provides local public transport services to passengers travelling within Dunedin city, as well as coach, tour and bus routes to service passengers travelling between Dunedin and Invercargill, Central Otago and the Milford Sounds. The fleet consists of 120 buses which are evenly split between local and inter-city routes. Services operate 24 hours a day, while the call centre is staffed from 4.30am–5.30pm. Communications between drivers and the call centre is by way of cell phone.

6.7.2.2 What information do you currently use and how do you seek it?

Go Bus primarily seeks weather-related, crash and road work delay information. For local services, Go Bus liaises with the Dunedin City Council and Fulton Hogan to determine whether bus services are able to run safely. Fulton Hogan assesses roads in the evening ahead of the day of service to determine which routes may be affected by weather delays. In events where weather is unpredictably more severe, Go Bus sends staff out to assess the roads. This will typically happen early in the morning but can feasibly occur as necessary. In such circumstances, Go Bus will inform the Otago Regional Council of any delays as stipulated by their contract.

Where road works are expected to delay inter-city or intra-city services Fulton Hogan will contact the bus company directly as an affected party.

For inter-city travel, Go Bus managers will consult the Metservice and Transport Agency websites to determine whether roads are open. For airport services, staff may contact local authorities (eg Police) to determine if roads are open. These sites do not have adequate detail for reliably determining the status of roads. Go Bus acknowledged their drivers as being their best source of information, reporting back to dispatchers the conditions they encounter. Decisions to delay, re-route or cancel services are made at the time of contact with the driver.

Go Bus does not currently have any feasible access to crashes and road delays on inter-city routes.

6.7.2.3 How well is information working at the moment?

The primary pre-trip information need is to determine whether Go Bus can feasibly run a service. To meet this need their staff consults the Transport Agency and Metservice websites. Where necessary, staff sometimes conduct personal road assessments to determine if the weather has had an impact on local roads. For longer distances, they rely on their own resources, which include contacting local authorities (eg Police) to determine if roads are open.

The company indicated that in-trip information was not readily available for their services. Drivers often had to call dispatch to determine the best course of action to take.

6.7.2.4 What are the information gaps?

Unplanned delays have an impact on both inter- and intra-city travel. Where delays occur along the local bus route, the Otago Regional Council tends to cover costs; however, the cost of inter-city travel delays is covered by the passenger (ie costs for having to stay overnight).

Delays were also considered to be an in-trip information gap. It was thought that advance VMS signage could be helpful, but this was not seen to be essential.

The company had intentions of supplying on-board GPS systems which could provide real-time delay updates.

6.7.2.5 Prioritising of information

Table 6.23 indicates the priority of information needs for Go Bus Dunedin.

Table 6.23 Priority information needs for Go- Bus Dunedin

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Less detail → Most detail
1	Email updates on weather condition would be really helpful. Route closures	Emails preferred over text messages to ensure that messages are clear and easy to understand. Thought that text messages might 'lose something in translation'. Website (while these already exist Go Bus would like them kept more up-to-date and tailored to informing public transport companies of road or route closures on their routes).	Email Website

Having a number available to call to obtain information about road closures would be a 'nice-to-have' information channel.

6.7.2.6 Regularity and verification of information

The critical information period for Go Bus is in the morning as services run from 4am. By this time it is necessary to have determined whether services can feasibly be run. Go Bus indicated that both verified

and unverified information was useful, so long as verified information was being adequately updated. This information was best supplied by email to Go Bus.

6.8 Taxis and couriers

6.8.1 Fastway Couriers, (Dunedin)

6.8.1.1 Background information

Fastway Couriers services the Dunedin urban and Balclutha urban area by six couriers and one depot van carrying freight up to 25kgs in weight or $2m^3$ in size. Drivers service their own delivery territories which include both residential and business areas, conducting up to 200 deliveries a day (excluding pick ups). While customers determine the destination of the freight, the driver determines the delivery route.

6.8.1.2 What information do you currently use and how do you seek it?

Fastway Couriers does not use the Transport Agency or AA websites to get information. The company report they do get some information from the radio and some drivers may use their personal cell phone to get information; however, these were not supported by the business.

The primary channel for relaying information to drivers is through a radio scanner. This is used for formal communications, such as notifying the driver of orders to pick up and changes throughout the course of the day.

The information needs for the company relate to delays caused by road conditions in poor weather (eg heavy frost, snow), lack of available parking and traffic congestion due to closures. Drivers are often affected by poor road conditions following the reopening of a road affected by ice or snow, as often suburban roads are still icy.

6.8.1.3 How well is information working at the moment?

Fastway Couriers' current methods for communicating with drivers work successfully and the company has no plans to update these in the future.

The company representative indicated the methods by which they obtained information were sufficient, but driver frustration could be mitigated if more information channels were available to them. If information came into the office it could be distributed out to the drivers via their scanner.

Delays affect the drivers as they operate only between the hours of 6am and 6pm. Deliveries have to be reorganised to ensure they meet their obligation to deliver freight as promptly as possible.

For example, a site accessed frequently by couriers was closed during a bomb scare and information was not readily supplied to dispatchers to advise drivers at the earliest opportunity. A system in place to provide that information would have been ideal for advising drivers to use alternative routes for deliveries.

6.8.1.4 What are the information gaps?

Key issues for the business include closure information due to road works, crashes or road closures, lack of available parking and dangerous road conditions due to poor weather.

The company representative indicated pre-trip information such as pre-programmed information about road works or closures was their greatest priority. Such information would offer the drivers the ability to better plan their delivery routes. This was followed by information on what roads were icy after snow or heavy frosts, and road closures due to crashes.

In-trip information would have to come to the dispatcher to relay to drivers via the scanner. The information needed was the same information as that outlined for pre-trip information.

Table 6.24 Fastway Couriers, Dunedin

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail	
			Less detail ⟶	Most detail
1	Pre-programmed road works	Emails Website	Emails	Websites
1	Pre-programmed road closures or other road closures that happen during the day	Emails Website	Emails	Websites
2	Crashes – that close the road	Emails Website	Emails	Websites
2	Information of what roads are icy after snow days or heavy frosts	Website		Website

6.8.1.5 Regularity and verification of information

Verified information was indicated as being the most valuable to Fastway Couriers. The representative used the example of road conditions after poor weather and noted they would like to know definitively the condition of the road and whether or not it was closed.

6.8.2 Auckland Co-operative Taxis

6.8.2.1 Background information

Auckland Co-operative Taxis manages the dispatch for a fleet of 1,700 vehicles. Each taxi is locally owned, with the in-car equipment and call centre owned by Auckland Co-operative; there are also standards that apply across all the taxis (along with internal inspectors and a fine system for drivers not complying). Dispatch is run from Auckland for themselves, as well as for companies in Hamilton, Rotorua, Tauranga, Taupo and New Plymouth. They own the brand 'Blue Bubble Taxis' which comprises the following fleet; Auckland (700 taxis), Western Cabs (35 taxis), Northshore Taxis (35 taxis) and Whangarei A1 (16 taxis). The company operates 24 hours a day for the entire year. Seventy dispatchers are employed in total, with 35 required to operate at peak times. The company has its own dispatch system that allows messages to be sent out to specific fleets, vehicles, drivers, regions and/or offices. The message can be programmed to be delivered at a specific time and will be displayed on the drivers' dispatch screens. Cars are based in most suburbs, so delays pose less of a challenge for Auckland Co-operative Taxis than they would for smaller taxi companies which may have drivers travelling across more suburbs. Routes were negotiated between the driver and the passenger.

In addition to carrying individual passengers the company also has contracts for transporting blood, parcels, baggage, school runs and hospital patients (eg dialysis patients).

6.8.2.2 What information do you currently use and how do you seek it?

Information regarding delays and road closures has the biggest impact on service. However, it was recognised the impact of delays were mostly on the customer, rather than the driver, as the driver collects a greater fare (as the meter is still running) when the vehicle is stuck in traffic than when traffic is free flowing. The company acknowledged that passengers had service expectations (ie that the same trip would always take the same amount of time). Passengers expect drivers to be aware of delays and know the optimal routes to travel. The dispatchers try to minimise the impact of delays on mobility vans because of vulnerable passengers. Dispatchers therefore try to provide passengers with realistic timeframes for trips, which in turn requires knowledge of any delays and diversions on the network.

6.8.2.3 How well is information working at the moment?

Auckland Co-operative Taxis currently gets information feedback from drivers, which where possible can be verified, or more information sought, by looking at the Transport Agency traffic cameras. The company noted the system generally worked well, but improvements could be made.

6.8.2.4 What are the information gaps?

Getting the most up-to-date information regarding delays and diversions on the network is critical for Auckland Co-operative Taxis. While the Transport Agency traffic cameras are a good source of information the following comments were made with respect to improving the system:

- Increase the update time (thought to be 30 seconds) and decrease the number of 'drop-outs' would help to get information quickly. This would allow a dispatcher to judge roadway speed in addition to congestion.
- Improve the consistency in the field of view from the cameras and in some instances provide more cameras in critical areas (eg Greenlane to the City) and views both ways from each location.

For an event, it would be good to know the duration and clearance time, but the company realistically understands that this information could not be supplied in real time.

Auckland Co-operative Taxis had found notifications from the Auckland Council for motorways and main arterials routes to be useful; however, they no longer received these notifications.

Table 6.25 Priority information needs for Auckland Co- operative Taxis

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Amount of detail
1	Anything that impeded the traffic (eg road closures, road works and crashes on arterials). In Auckland this would include airport routes, Southern Motorway, Western Route and Gillies Avenue.	Must have: Push initial alerts out through email. More detail could be provided on a website. Cameras (improve)	Email (less detail) Text messages(less detail) VMS boards (messages displayed on VMS could be pushed out as text messages and/or emails) (less detail) Cameras (less detail)
2	Weather forecasts 12 hours in advance are needed. When it rains in Auckland, dispatch staffing requirements increase by 25% as those who would normally walk choose to taxi.	Nice to have: Emails Website – could display whether warnings come as an alert.	If the message is time-critical then it should come out via email with a link to more detailed information on a website. When the message is less time critical it can just come out on a website.

Priority	Main scenarios want information for	Preferred method of delivery channels	Level of detail
			Amount of detail
3	One-off events (eg Eden Park, Vector Arena) good to know ahead of time. Do not need to know about public holidays as demands drop off over these times as work, school and hospital runs do not occur.	Nice to have: Emails Website	If the message is time-critical then it should come out via email with a link to more detailed information on a website. When the message is less time critical it can just come out on a website.

6.8.2.5 Regularity and verification of data

Auckland Co-operative Taxis indicated they would prefer confirmed event information pushed out. It was better for them to confirm events with drivers than to continuously update them.

If congestion information was to be displayed, it was important that it be clear and easy to understand. Clear colour coding and consistent terms were necessary, especially between systems. For example, the Transport Agency uses green and black to communicate severity of congestion while Google Maps uses green to red. Consistent colour would alleviate errors in comprehension.

6.9 User-centred design workshops and in-depth interviews summary

6.9.1 User-centred design workshops

6.9.1.1 General comments

Participants in both Dunedin and Palmerston North commented they did not think the road network performance presented any major issues that required development of more information provision. The information needs appeared to vary based on the infrastructure in place and the systems supporting it. For example, as Dunedin has a less-comprehensive public transport network than Auckland, information needs were more basic; conversely with fewer systems in place more information needs were not addressed. Participants in these groups also commented that information, such as how long it takes to drive from A to B and route planning, is currently sourced from Google, so there is no need to duplicate this system. Both locations prioritise public transport information development over private car driving. Auckland participants, however, felt it was unfair to prioritise one mode's information needs over another, so undertook separate prioritisation for public transport and private car.

Taken as a whole the information needs of the different locations suggests the Dunedin and Palmerston North priorities relate more to how to catch public transport, with a particular emphasis on real-time information. In comparison, the Auckland priorities involve obtaining more specific information relating to delays in the system. Auckland users also require more information on complex trip chaining due to the more complicated transport infrastructure.

6.9.1.2 Priorities for public transport information provision development include the following scenarios:

Dunedin pre-trip

1 I would like to catch the bus and am a novice user and I need to know how to plan my journey

2 Information for public transport regarding unscheduled delays (eg severe weather, natural disasters) including re-routing information

3 Information for private vehicle users (ie car drivers) for unscheduled delays (eg severe weather, natural disasters) including re-routing information

4 Parking information (parking zones, prices) for non-routine trips made to town

Dunedin in-trip

1 I am a novice user and want to make a bus trip. I would like en-route information about bus stops so I have certainty of where to get off the bus (eg pictures of what the stops look like and attractions near to the stop).

2 When does the next bus arrive at this stop I am waiting at?

3 I am an experienced user and have begun my commuting trip by car. I would like to know of any road closures or delays on my route.

4 My primary mode of transport is driving and I would like to know of schedule disruptions that may affect me.

5 I have made a trip by car and would like to know where I can park

Palmerston North pre-trip

1 I am doing a recreational long-distance trip and would like to know about any delays that are scheduled to occur between the times and days I specify for my trip. This system should be comprehensive highlighting local amenities, toilets, restaurants and accommodation along the route.

2 I want to catch the bus to travel within the city and I need to know the routes that will take me to my destination. For these services I would like to know; where to get on and off the bus, and is it running on-time or ahead/behind of schedule?

3 I need to make an inter-city trip using public transport and would like to know the different modes I can use to make this trip, and if I need to change stops along the way.

4 I would like a comparison of cost and time for making my trip between different modes (eg car versus bus).

Palmerston North in-trip

1 I am travelling by car doing a long-distance trip and there is a major delay on my route.

2 I am travelling on the city bus and would like to know if I am on time and need to know the name of the upcoming stop and how long till I arrive there.

Auckland pre-trip – public transport

1 I am using public transport (eg bus, train) and need real time information to know if my mode of transport is affected by unexpected delays

2 I would like to catch the bus and need to know how to map my route (eg network maps)

3 I would like to use public transport but I don't know how to pay for my trip or how much it will cost me to reach my destination (ie concessions, all-day passes).

4 I would like to know accessibility and special services information.

Auckland in-trip – public transport

1 Real-time information for bus, ferry and train services outlining timing for connecting stops and what the next station is.

2 I am in-route and would like to know if any changes to my route or stop have been made to the bus, train of ferry service.

Auckland pre-trip – private motor vehicle

1 I want to know of alternative routes if delays are scheduled or expected (e.g. road works, long weekends)

2 I am making a recreational trip by car and would like to know about where I can park and how much it would cost me to park my vehicle

Auckland in-trip – private motor vehicle

1 I am travelling by car to my destination and would like to know if my route has any unscheduled delays.

2 I have reached my destination by car and would like to know where I can park my car.

Of importance to all workshop groups was the ability to put in place contingency plans when unscheduled delays occurred. Participants suggested that having information with which they could make decisions was important.

6.9.1.3 Information delivery channel

While the delivery channels varied across the different scenarios and locations, participants noted the importance of providing for people with differing levels of technology available/skill to use. Priorities for development should include making current public transport information in Dunedin, Palmerston North and Auckland more user friendly.

6.9.2 Commercial operators

6.9.2.1 General comments

Taken as a whole the commercial operators interviewed (short-haul freight, long-haul freight, long distance inter-city buses, short distance intra-city buses, taxis/couriers), generally focused on aspects of real-time and advance warnings of conditions or situations that could disrupt, delay or re-route trips. As

all the commercial operators interviewed had some form of dispatch, the distinction between in-trip and pre-trip information was less defined as the dispatch team can push information out to operators in real time, with re-routing decisions being made in real time.

6.9.2.2 Type of information requested

The commercial operators were interested in receiving information on the specific routes they use. Specific information needs by commercial operators include:

1 A real-time information 'push-out' system for delays on the network that allows the user to select roads/areas of interest (these could also include planned delays for events such as road works and moving companies activities and weather alerts).

2 For operations that use road passes there is a need to improve the communication of their status in bad weather conditions.

3 For fleets that have HPMV and 50MAX, an in-vehicle navigation system that kept those on approved routes would be beneficial. This could be beneficial in terms of public safety and would allow automatic compliance monitoring. A variation of the navigation system would be a route-planning system to assist in planning acceptable routes. Speed limits could also be included.

4 Request for greater use of VMS to push out safety messages particularly around road works and new road layouts.

6.9.2.3 Display channels

Key comments on the display channels included:

1 Depending on how the dispatch works, determine how operators would like to receive information. For time-critical messages text is preferred if the operator is not always at their desk, whereas email is preferred by some operators if they have dedicated staff looking at emails. There was general agreement that the text/email messages should be short and sent quickly with updates to a website providing more detail.

2 Some operators noted that some forms of messages (text, in-person and by phone) could be prone to their meaning being changed or diluted as they were passed from one person to another. This suggests the need to ensure messages are not ambiguous, and that if sent by text they are not so short as to lose their full meaning.

3 In terms of communicating incidents, where information is unverified, there is a need to state that it is unverified information and what action is being taken to verify the information, and when an update will be provided.

7 Testing component

The testing component of this project used both online and user-intercept surveys to extend the findings described in the earlier chapters of this report in order to achieve two aims. The first was to provide a further test of the content from travel information sources for a wider pool of users. The second was to provide further investigation into prioritising the development of different information channels.

7.1 User-intercept survey of transport users

7.1.1 Materials

Two versions of the survey were developed using Survey Crafter Professional 4.0, and distributed by trained surveyors: one focused on public transport information needs, and the other on private motor vehicle information needs. Copies of the surveys are included in appendix D.

Both surveys commenced with 10 identical questions examining experience with different mode types and the information sources currently accessed both prior to and during the respondents' travel. This was followed by questions examining the users' perception of how easy it is to access information concerning public transport and private motor vehicle trips in their city, and their level of satisfaction with the current provision of information.

The next section of both surveys examined the pre-trip information needs raised in the design workshops. Images were created summarising the key information needs users may have when making a trip by a particular mode (see appendix E for the four images). Participants were asked to select those they thought were relevant (and suggest any others not included), and then to prioritise their top three information needs and rank these. They were then asked about their preferred delivery channels for their top three needs, and to indicate how often they would use this information if it were available. Finally they were asked to think about the information need they rated highest, and if that information was currently available. If it was available they were asked about the quality of the information, if it was not available, they were asked how often they would access it if it were. Again they were asked to indicate their preferred delivery channel for their top priority.

A similar set of questions was then used with a second image examining in-trip information needs. Both surveys then included four Likert scale items (strongly disagree – strongly agree on a five-point scale) examining opinions on the importance of accuracy and timeliness of information provision, followed by general comments and demographic information (gender, age and main weekly activity). In addition, the public transport survey included an item examining information needs for inter-city bus trips.

7.1.2 Procedure

Trained surveyors approached commuters over two days in central city locations in Auckland and Dunedin, and invited them to participate in a short interview survey, for which they were offered a small incentive in appreciation of their time ($5 coffee voucher). The locations selected had high foot traffic, as well as being near both public transport (in Dunedin near busy bus routes, in Auckland near bus, train and ferry terminals) and car parking facilities.

Participants were randomly assigned to either the public transport or private motor vehicle category, with the exception of those who did not have a licence or access to a motor vehicle (who were always assigned to the public transport category). The number of surveys completed in each location and category is included in table 7.1.

Table 7.1 Sample breakdown by survey location and type for the user- intercept surveys

	Dunedin	Auckland
Public transport information needs survey	35	50
Private motor vehicle information needs survey	35	45
Total	**70**	**95**

7.2 Results

7.2.1 Participant demographics

Table 7.2 shows the basic demographic information of the two sample groups. The gender split across both cities was comparable with around one-third male (Dunedin 37.1%, Auckland 31.6%) and two-thirds female (Dunedin 62.9%, Auckland 68.4%). Both samples had an age range from 16 to over 65, with Auckland showing a slightly younger average age of 32.09 years compared with Dunedin's 42.65 years (calculated by averaging the mid-points of selected age brackets). The Auckland sample was predominantly full-time workers and students, while the Dunedin sample was spread between full-time and part-time work and study.

Table 7.2 Demographic information for the two sample groups (Dunedin and Auckland)

	Dunedin	Auckland
Gender		
Male	26 (37.1%)	30 (31.6%)
Female	44 (62.9%)	65 (68.4%)
Age		
Average	42.65	32.09
Range	16-65+	16-65+
Main weekly activity		
Full-time work	19 (28.4%)	38 (40.0%)
Part-time work	12 (17.9%)	13 (13.7%)
Parent/caregiver	4 (6.0%)	1 (1.1%)
Student	15 (22.4%)	36 (37.9%)
Unemployed/sickness beneficiary	3 (4.5%)	1 (1.1%)
Retired	10 (14.9%)	5 (5.3%)
Other	4 (6.0%)	1 (1.1%)

7.2.2 Sample exposure to different modes

Table 7.3 shows both the previous exposure of participants to different mode types, and the modes they used on the day of surveying. Auckland participants were significantly more likely to have had exposure to bus ($X^2(1, N = 165) = 10.0$, $p < .05$), train ($X^2(1, N = 165) = 55.23$, $p < .05$), ferry ($X^2(1, N = 165) = 28.49$, $p < .05$) and 'other' modes ($X^2(1, N = 165) = 7.83$, $p < .05$), with no significant difference in private motor vehicle exposure (X^2 (1, N = 165) = 3.42, p = .08). However, the majority of both groups had had some exposure to public transport and private motor vehicle use so could be considered experienced users of both transport types. The two groups differed significantly in their mode use on the day of surveying, with Auckland participants more likely to have travelled by public transport modes (bus and train) and Dunedin participants significantly more likely to have travelled by private motor vehicle $X^2(1, N = 154) = 27.4$, $p < .05$)[19].

Table 7.3 Previous and current exposure to mode types (significant differences highlighted in bold)

	Dunedin		Auckland	
	Ever use	**Used today**	**Ever use**	**Used today**
Bus	**49 (70%)**	**17 (24.6%)**	**85 (89.5%)**	**33 (34.7%)**
Train	**6 (8.6%)**	**0 (0.0%)**	**63 (66.3%)**	**19 (20.0%)**
Ferry	**4 (5.7%)**	0 (0.0%)	**41 (43.2%)**	10 (10.5%)
Private motor vehicle	56 (80.0%)	**29 (42.0%**	64 (67.4%)	**16 (16.8%)**
Other	**34 (48.6%)**	23 (33.3%)	**26 (27.4%)**	17 (17.9%)

Only three participants in each of the locations were making their trip by their chosen mode for the first time that day. The vast majority of participants complete this trip by this mode at least a few times a week (Dunedin 86.9%, Auckland 85.7%).

7.2.3 Exposure to different information sources

Table 7.4 shows participant use of different pre-trip information sources both on the day of surveying and over the previous week. On the day of surveying, participants had consulted an average of 0.72 sources (Dunedin = 0.67, Auckland = 0.75), with an average of 1.14 over the last week (Dunedin = 1.04, Auckland = 1.21). Aucklanders were significantly more likely to have used a smartphone app in the last week ($X^2(1, N = 165) = 5.58$, $p < .05$); however, there were no other significant differences between the groups. The most commonly used information sources by both groups were websites and smartphone apps, particularly for GPS navigation.

[19] Ferry was excluded from this analysis, due to expected cell size under 5; also as ferry is not available as a transport option in Dunedin.

Table 7.4 Previous and current exposure to pre- trip information delivery channels (significant differences indicated in bold)

	Dunedin		Auckland	
	Used today	Used this week	Used today	Used this week
Websites	7 (10.0%)	19 (27.1%)	12 (12.6%)	26 (27.4%)
Traffic webcams	0 (0.0%)	0 (0.0%)	2 (2.1%)	3 (3.2%)
GPS navigation	4 (5.7%)	9 (12.9%)	5 (5.3%)	6 (6.3%)
GPS smartphone app	3 (4.3%)	5 (7.1%)	5 (5.3%)	11 (11.6%)
GPS unit in vehicle	2 (2.9%)	2 (2.9%)	0 (0.0%)	2 (2.1%)
GPS website eg Google Maps	3 (4.3%)	7 (10.0%)	2 (2.1%)	5 (5.3%)
Another smartphone app	7 (10.0%)	**8 (11.4%)**	17 (17.9%)	**25 (26.3%)**
A paper timetable or brochure	6 (8.6%)	9 (12.9%)	7 (7.4%)	9 (9.5%)
Telephone information service	0 (0.0%)	0 (0.0%)	1 (1.1%)	2 (2.1%)
TV or radio	3 (4.3%)	4 (5.7%)	0 (0.0%)	2 (2.1%)
Person-to-person	4 (5.7%)	5 (7.1%)	5 (5.3%)	5 (5.3%)
Phone call	2 (2.9%)	1 (1.4%)	2 (2.1%)	4 (4.2%)
Social media	3 (4.3%)	2 (2.9%)	3 (3.2%)	4 (4.2%)
Travel time on main corridors	0 (0.0%)	0 (0.0%)	6 (6.3%)	5 (5.3%)
Other	3 (4.3%)	2 (2.9%)	4 (4.2%)	6 (6.3%)

Table 7.5 shows a similar analysis to the previous table, this time focusing on information sources accessed in-trip. On the day of surveying, participants had consulted an average of 0.38 sources (Dunedin = 0.31, Auckland = 0.43), with an average of 0.75 over the last week (Dunedin = 0.57, Auckland = 0.87). There were significant differences in in-trip information access; however, it should be noted that this was in some cases due to small numbers of respondents for some delivery channels.

Table 7.5 Previous and current exposure to in- trip information delivery channels

	Dunedin		Auckland	
	Used today	Used this week	Used today	Used this week
Websites	0 (0.0%)	4 (5.7%)	4 (4.2%)	12 (12.6%)
GPS navigation	2 (2.9%)	8 (11.4%)	2 (2.1%)	8 (8.4%)
GPS smartphone app	3 (4.3%)	7 (10.0%)	2 (2.1%)	8 (8.4%)
GPS unit in vehicle	0 (0.0%)	6 (8.6%)	1 (1.1%)	5 (5.3%)
GPS website, eg Google Maps	0 (0.0%)	0 (0.0%)	1 (1.1%)	4 (4.2%)
Another smartphone app	6 (8.6%)	5 (7.1%)	9 (9.5%)	11 (11.6%)
A paper timetable or brochure	1 (1.4%)	1 (1.4%)	0 (0.0%)	2 (2.1%)
Telephone information service	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
TV or radio	1 (1.4%)	3 (4.3%)	4 (4.2%)	5 (5.3%)
Person-to-person	5 (7.1%)	2 (2.9%)	3 (3.2%)	7 (7.4%)
Phone call	1 (1.4%)	0 (0.0%)	1 (1.1%)	2 (2.1%)
Social media	1 (1.4%)	1 (1.4%)	0 (0.0%)	4 (4.2%)
Travel time on main corridors	0 (0.0%)	0 (0.0%)	1 (1.1%)	2 (2.1%)

	Dunedin		Auckland	
	Used today	Used this week	Used today	Used this week
Information provided on signs and screens at transport stops	1 (1.4%)	1 (1.4%)	5 (5.3%)	5 (5.3%)
Information provided on signs and screens on public transport	0 (0.0%)	0 (0.0%)	3 (3.2%)	6 (6.3%)
Voice announcements at transport stops	0 (0.0%)	1 (1.4%)	2 (2.1%)	2 (2.1%)
Information provided on VMS	0 (0.0%)	0 (0.0%)	2 (2.1%)	0 (0.0%)
Other	1 (1.4%)	1 (1.4%)	1 (1.1%)	0 (0.0%)

Overall, participants from Dunedin (M=2.51, SD=1.05) rated it significantly harder to find the information they needed to make a trip by public transport than Auckland participants (M=2.17, SD=.88), $t(130.66)=2.18$, $p<.05$. Fifty-eight percent of Dunedin participants rated this 'easy' or 'very easy' compared with 76.8% of Auckland participants. There was no significant difference between the city groups in the ratings of information provided for private motor vehicle travel, or overall satisfaction with travel information quality in their own city. Only 7.2% of Dunedin participants and 8.4% of Auckland participants rated finding private motor vehicle information as 'hard' or 'very hard'. When asked about the quality of all transport information, 17.1% of Dunedin participants and 10.5% of Auckland participants were unhappy ('dissatisfied' or 'very dissatisfied') with the quality.

7.3 Private motor vehicle users

Just under half of all participants were given the survey version that examined private motor vehicle information needs. All participants in this group were required to have at least the ability to drive, even if they did not do so regularly. Therefore it could be assumed they had at least some previous exposure to private motor vehicle information.

7.3.1 Pre-trip information needs

7.3.1.1 Information priorities

Table 7.6 shows the relative importance of information types between the two locations, as well as overall. Participants selected an average of 2.68 information types (Dunedin = 2.49; Auckland = 2.82). Delay information was seen as the most important overall, driven by the popularity of this option in the Auckland sample. The other key difference between the two locations was the degree of interest in route planning and trip duration information, with Auckland participants more interested in this information. Chi-square analyses showed Auckland participants were significantly more likely to select route planning information (X^2 (1, N = 80) = 4.46, $p < .05$). Dunedin participants were significantly more likely to identify another information need (X^2 (1, N = 80) = 5.60, $p < .05$) which included weather information such as snow. There was little interest overall in mode comparison information, both by travel time and cost.

Table 7.6 Pre- trip information needs for private motor vehicle users (significant differences indicated in bold)

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Delays	14	40.0%	28	62.2%	42	52.5%
Detours	19	54.3%	19	42.2%	38	47.5%
Parking	15	42.9%	21	46.7%	36	45.0%
Trip duration	12	34.3%	19	42.2%	31	38.8%
Travel time comparison by mode	4	11.4%	7	15.6%	11	13.8%
Travel cost comparison by mode	5	14.3%	8	17.8%	13	16.3%
Route planning	**9**	**25.7%**	**22**	**48.9%**	31	38.8%
Other	**9**	**25.7%**	**3**	**6.7%**	12	15.0%

7.3.1.2 Top three information needs and rankings

Table 7.7 shows the results when participants were asked to identify their top three information needs and to rank these in order of importance. A weighted average was then computed, where the top three choices from each individual were given a score of 1, 2 or 3, with the unselected options given the average of the remaining scores (eg where there were eight options, the other options were assigned a score of 6). The lower the average score, the more important it was considered by participants. Again, overall across both cities, information on delays and detours was seen as important, as well as parking information. Route planning and trip duration were more important in Auckland, perhaps due to longer commute times and longer distances in a larger city, as well as higher transport network complexity. However, there were no significant differences between the two locations.

Table 7.7 Top three pre- trip information needs for private motor vehicle users

Information need	Dunedin		Auckland		Overall	
	M	SD	M	SD	M	SD
Delays	4.31	2.27	3.60	2.24	3.91	2.27
Detours	4.29	2.16	4.82	1.81	4.59	1.98
Parking	4.23	2.25	4.16	2.25	4.19	2.23
Trip duration	5.14	1.49	4.62	1.92	4.85	1.76
Travel time comparison by mode	5.83	0.71	5.64	1.17	5.73	0.99
Travel cost comparison by mode	5.43	1.46	5.31	1.55	5.36	1.50
Route planning	5.00	1.89	4.36	2.19	4.64	2.08
Other	4.83	2.04	5.67	1.26	5.30	1.69

7.3.1.3 Preferred information delivery channels overall

Table 7.8 shows the preferred delivery channels for pre-trip information overall. Participants selected an average of 1.65 information delivery channels (Dunedin = 1.63; Auckland = 1.67). Websites (although not traffic webcams) and smartphone apps were the most popular across both sites. Dunedin participants were more interested in television and radio information, while Auckland participants were more interested in VMS, perhaps due to greater exposure to VMS technology on the Auckland motorway

network, as well as the slightly older mean age of the Dunedin sample showing a preference for more traditional information delivery channels.

Table 7.8 Preferred information delivery channels for pre- trip information needs for private motor vehicle users

Delivery channel	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	15	42.9%	16	35.6%	31	38.8%
Traffic webcams	1	2.9%	1	2.2%	2	2.5%
GPS navigation	6	17.1%	15	33.3%	21	26.3%
GPS smartphone app	1	2.9%	10	22.2%	11	13.8%
GPS unit in vehicle	3	8.6%	3	6.7%	6	7.5%
Website, eg Google Maps	2	5.7%	2	4.4%	4	5.0%
Another smartphone app	14	40.0%	24	53.3%	38	47.5%
Paper timetable or brochure	1	2.9%	0	0.0%	1	1.3%
Telephone information service	1	2.9%	1	2.2%	2	2.5%
TV or radio	7	20.0%	4	8.9%	11	13.8%
Person to person	1	2.9%	0	0.0%	1	1.3%
Phone call	1	2.9%	1	2.2%	2	2.5%
Social media	2	5.7%	1	2.2%	3	3.8%
Travel time on main corridors	0	0.0%	1	2.2%	1	1.3%
Information provided on VMS on road	2	5.7%	7	15.6%	9	11.3%
Other	4	11.4%	2	4.4%	6	7.5%

The majority of those surveyed in both locations indicated they would use their top three information needs at least a few times a month if they were provided for (Dunedin 75.8%, Auckland 86.3%).

7.3.1.4 Number one information priority

Focusing on the highest priority identified by participants, delays and parking information were the most popular across both cities (see table 7.9). Again, Auckland participants made up a larger proportion of those interested in route planning information, possibly due to the size of the Auckland area.

Table 7.9 Highest priority pre- trip information for private motor vehicles

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Delays	9	27.3%	12	27.3%	21	27.3%
Detours	5	15.2%	2	4.5%	7	9.1%
Parking	8	24.2%	11	25.0%	19	24.7%
Trip duration	0	0.0%	3	6.8%	3	3.9%
Travel time comparison by mode	0	0.0%	1	2.3%	1	1.3%
Travel cost comparison by mode	2	6.1%	3	6.8%	5	6.5%
Route planning	4	12.1%	9	20.5%	13	16.9%
Other	5	15.2%	3	6.8%	8	10.4%

Almost half (48.4%) of Dunedin respondents felt their number one information priority was currently available, while three quarters (75%) felt it was available in Auckland. Of those who believed the information was available, 62.6% of Dunedin participants and 59.4% of Auckland participants rated it as 'good' or 'very good'. Of those who did not believe the information was available, the majority suggested they would use it at least a few times a month if it was provided (Dunedin 75.1%, Auckland 91.7%). Chi-square analyses showed there were no significant differences between the two locations on this measure.

7.3.1.5 Preferred delivery channels for highest priority information needs

Table 7.10 shows the preferred delivery channels for the most popular information types. Participants selected an average of 1.21 delivery channels (Dunedin = 1.11; Auckland = 1.29). Again, websites and smartphone apps were the most popular across both cities. There was no interest at all in phone calls and travel time information for the main corridors.

Table 7.10 Preferred delivery channels for highest priority pre- trip information for private motor vehicles (significant differences indicated in bold)

Delivery channel	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	12	34.3%	15	33.3%	27	33.8%
Traffic webcams	1	2.9%	1	2.2%	2	2.5%
GPS navigation	7	20.0%	11	24.4%	18	22.5%
GPS smartphone app	2	5.7%	6	13.3%	8	10.0%
GPS unit in vehicle	2	5.7%	2	4.4%	4	5.0%
Website, eg Google Maps	3	8.6%	3	6.7%	6	7.5%
Another smartphone app	14	40.0%	30	66.7%	44	55.0%
Paper timetable or brochure	1	2.9%	1	2.2%	2	2.5%
Telephone information service	1	2.9%	0	0.0%	1	1.3%
TV or radio	4	11.4%	4	8.9%	8	10.0%
Person to person	1	2.9%	0	0.0%	1	1.3%
Phone call	0	0.0%	0	0.0%	0	0.0%
Social media	2	5.7%	1	2.2%	3	3.8%
Travel time on main corridors	0	0.0%	0	0.0%	0	0.0%
Information provided on VMS on road	1	2.9%	4	8.9%	5	6.3%
Other	3	8.6%	5	11.1%	8	10.0%

Auckland participants were significantly more likely to prefer a smartphone app as the delivery channel for their first priority information need (X^2 (1, N = 80) = 5.66, $p < .05$); however, no other significant differences were found between the groups.

7.3.2 In-trip information needs

7.3.2.1 Information priorities

Table 7.11 shows the relative importance of information types between the two locations, as well as overall. Participants selected an average of 2.61 information types (Dunedin = 2.34; Auckland = 2.82). Road closure, delay, and detour information were the most popular across the groups. Chi-square

analyses indicated participants from Auckland were significantly more likely to indicate delay information as being important (X^2 (1, N = 80) = 5.46, p < .05), but there were no other significant differences. Overall, at least 40% of those surveyed were interested in each of the in-trip information types suggested.

Table 7.11 In- trip information needs for private motor vehicle users

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Parking	15	42.9	20	44.4	35	43.8
Road closures	22	62.9	27	60.0	49	61.3
Delays	15	42.9	31	68.9	46	57.5
Detours	14	40.0	28	62.2	42	52.5
Navigation	14	40.0	19	42.2	33	41.3
Other	2	5.7	2	4.4	4	5.0

7.3.2.2 Top three information needs and rankings

Table 7.12 shows the results when participants were asked to identify their top three information needs, and to rank these in order of importance. A weighted average was then computed, where the top three choices from each individual were given a score of 1, 2 or 3, with the unselected options given the average of the remaining scores (eg where there were six options, the other options were assigned a score of 5). The lower the average score, the more important it was considered by those who ranked it in their top three. Again, overall across both cities, information on road closures and delays was seen as important. Participants in Auckland ranked delay information significantly higher than participants in Dunedin ($t(78) = 2.59$, $p<0.05$), while Dunedin participants favoured road closure information (although this difference was not significant).

Table 7.12 Top three in- trip information needs for private motor vehicle users (significant differences highlighted in bold)

Information need	Dunedin		Auckland		Overall	
	M	SD	M	SD	M	SD
Parking	3.71	1.76	3.67	1.73	3.69	1.73
Road closures	2.94	1.77	3.47	1.70	3.24	1.74
Delays	**3.86**	**1.52**	**2.93**	**1.63**	3.34	1.64
Detours	4.17	1.29	3.62	1.35	3.86	1.35
Navigation	3.71	1.74	3.78	1.77	3.75	1.75
Other	4.69	1.05	4.84	0.74	4.78	0.89

7.3.2.3 Preferred information delivery channels overall

Table 7.13 shows the preferred delivery channels for in-trip information overall. Participants selected an average of 1.64 information delivery channels (Dunedin = 1.54; Auckland = 1.71). Websites, GPS navigation (including GPS smartphone apps and units in vehicle) and other smartphone apps were the most popular across both sites. TV or radio was also quite popular with Auckland participants. However, there were no significant differences between the groups in their preferred delivery channels.

Table 7.13 Preferred delivery channels for in- trip information for private motor vehicle users

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	7	20.0	7	15.6	14	17.5
GPS navigation	13	37.1	17	37.8	30	37.5
GPS smartphone app	6	17.1	11	24.4	17	21.3
GPS unit in vehicle	5	14.3	5	11.1	10	12.5
Website, eg Google Maps	2	5.7	1	2.2	3	3.8
Another smartphone app	15	42.9	23	51.1	38	47.5
Paper timetable or brochure	0	0.0	2	4.4	2	2.5
Telephone information service	0	0.0	0	0.0	0	0.0
TV or radio	4	11.4	11	24.4	15	18.8
Person to person	1	2.9	2	4.4	3	3.8
Phone call	0	0.0	0	0.0	0	0.0
Social media	1	2.9	1	2.2	2	2.5
Travel time on main corridors	0	0.0	1	2.2	1	1.3
Information provided on VMS on road	5	14.3	8	17.8	13	16.3
Other	1	2.9	1	2.2	2	2.5

The majority of those surveyed in both locations indicated they would use their top three information needs at least a few times a month if they were provided for (Dunedin 78.1%, Auckland 93.0%).

7.3.2.4 Highest information priority

Focusing on the highest priority identified by participants, information on road closures was most popular in Dunedin, with information on delays most popular in Auckland (see table 7.14); however, no significant differences were found. While information on detours was of interest to participants in earlier analyses, it appears this time it was a lower priority as few participants indicated it as a first choice.

Table 7.14 Highest priority in- trip information for private motor vehicles

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Parking	8	25.0	10	23.2	18	24.0
Road closures	10	31.3	10	23.3	20	26.7
Delays	4	12.5	12	27.9	16	21.3
Detours	1	3.1	0	0.0	1	1.3
Navigation	7	21.9	10	23.3	17	22.7
Other	2	6.3	1	2.3	3	4.0

Over half (59.4%) of Dunedin respondents considered their number one information priority was currently available, while over two-thirds (67.4%) considered it was available in Auckland. Of those who believed the information was available, 63.2% of Dunedin participants and 59.3% of Auckland participants rated it as ‘good’ or ‘very good’. However, over 20% of Dunedin participants thought it was ‘poor’ (21.1%) compared

with 11.1% of Auckland participants. Of those who did not believe the information was available, the majority suggested they would use it at least a few times a month if it was provided (Dunedin 92.3%, Auckland 100.0%). Chi-square analyses showed no significant differences between the two locations on this measure.

7.3.2.5 Preferred delivery channels for highest priority information needs

Table 7.15 shows the preferred delivery channels for the most popular types of information. Participants selected an average of 1.59 information delivery channels (Dunedin = 1.60; Auckland = 1.58). Smartphone apps, including GPS smartphone apps were the most popular across both cities. There was no interest at all in phone calls and travel time information for the main corridors.

Table 7.15 Preferred delivery channels for highest priority pre- trip information for private motor vehicles (significant differences highlighted in bold)

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	6	17.1	7	15.6	13	16.3
GPS navigation	14	40.0	16	35.6	30	37.5
GPS smartphone app	8	22.9	10	22.2	18	22.5
GPS unit in vehicle	5	14.3	4	8.9	9	11.3
Website eg Google Maps	1	2.9	2	4.4	3	3.8
Another smartphone app	**11**	**31.4**	**25**	**55.6**	36	45.0
Paper timetable or brochure	0	0.0	1	2.2	1	1.3
Telephone information service	0	0.0	0	0.0	0	0.0
TV or radio	5	14.3	8	17.8	13	16.3
Person to person	1	2.9	2	4.4	3	3.8
Phone call	0	0.0	0	0.0	0	0.0
Social media	1	2.9	2	4.4	3	3.8
Travel time on main corridors	0	0.0	0	0.0	0	0.0
Information provided on VMS on road	6	17.1	6	13.3	12	15.0
Other	3	8.6	2	4.4	5	6.3

Auckland participants were significantly more likely to prefer a smartphone app as the delivery channel for their first priority information need (X^2 (1, N = 80) = 4.63, $p < .05$); however, no other significant differences were found between the groups.

7.4 Public transport users

Just over half of all participants were given the survey version that examined public transport information needs. Any participants were eligible to be put in this category, even if they had no previous experience with public transport use.

7.4.1 Pre-trip information needs

7.4.1.1 Information priorities

Table 7.16 shows the relative importance of information types between the two locations, as well as overall. Participants selected an average of 3.54 types of information (Dunedin = 3.57; Auckland = 3.52). Transport routes, bus stop locations and to a lesser extent ticket and fare information and trip time duration were seen as the most important overall, with little interest in attractions. Demand for trip time durations was driven somewhat by interest from Auckland participants, who were significantly more likely to choose this information as important (X^2 (1, N = 85) = 5.63, p < .05). This result may be explained by more variation in trip times and longer travel times overall in Auckland.

Table 7.16 Pre- trip information needs for public transport users (significant differences indicated in bold)

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Transport routes	30	85.7	37	74.0	67	78.8
Bus stop locations	29	82.9	44	88.0	73	85.9
Connecting services	17	48.6	23	46.0	40	47.1
Ticket and fare information	25	71.4	25	50.0	50	58.8
Attractions near the stop	5	14.3	6	12.0	11	12.9
Trip time duration	**14**	**40.0**	**33**	**66.0**	47	55.3
Other	5	14.3	8	16.0	13	15.3

7.4.1.2 Top three information needs and rankings

Table 7.17 shows the results when participants were asked to identify their top three information needs and to rank these in order of importance. A weighted average was then computed, where the top three choices from each individual were given a score of 1, 2 or 3, with the unselected options given the average of the remaining scores (eg where there were seven options, the other options were assigned a score of 5.5). The lower the average score, the more important it was considered by participants. Overall, across both cities, transport routes and bus stop locations were seen as the most important, and to a lesser extent, ticket and fare information and trip time duration. Transport routes ($t(81.8) = -2.23$, $p < 0.05$) and ticket and fare information ($t(83) = -0.48$, $p < 0.05$) were ranked significantly higher in Dunedin than in Auckland, while trip time duration ($t(82.9) = 3.66$, $p < 0.05$) was ranked significantly higher in Auckland. It should be noted that while trip time duration was selected often by participants as being important in the previous questions, it does not appear to be a top three choice for many participants.

Table 7.17 Top three pre- trip information needs for public transport users (significant differences highlighted in bold)

Information need	Dunedin		Auckland		Overall	
	M	SD	M	SD	M	SD
Transport routes	**2.10**	**1.56**	**2.96**	**1.99**	2.61	1.86
Bus stop locations	2.97	1.75	2.72	1.72	2.82	1.73
Connecting services	4.59	1.51	4.74	1.42	4.68	1.45
Ticket and fare information	**3.44**	**1.74**	**4.21**	**1.60**	3.89	1.69
Attractions near the stop	5.40	0.59	5.41	0.64	5.41	0.62
Trip time duration	**4.96**	**1.23**	**3.76**	**1.79**	4.25	1.68
Other	5.17	1.12	5.00	1.38	5.07	1.28

7.4.1.3 Preferred information delivery channels overall

Table 7.18 shows the preferred delivery channels for pre-trip information overall. Participants selected an average of 1.64 information delivery channels (Dunedin = 1.51; Auckland = 1.72). Websites (although not traffic webcams) and smartphone apps were the most popular across both sites, as well as to a lesser extent paper timetables and brochures. The only significant difference between groups was that Auckland participants were significantly more likely to choose smartphone apps (X^2 (1, N = 85) = 6.78, $p < .05$).

Table 7.18 Preferred delivery channels for pre- trip information needs for public transport users (significant differences indicated in bold)

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	16	45.7	22	44.0	38	44.7
Smartphone app	**17**	**48.6**	**38**	**76.0**	55	64.7
Paper timetable or brochure	13	37.1	12	24.0	25	29.4
Telephone information service	1	2.9	3	6.0	4	4.7
TV or radio	0	0.0	0	0.0	0	0.0
Person-to-person	1	2.9	1	2.0	2	2.4
Phone call	1	2.9	0	0.0	1	1.2
Social media	0	0.0	8	16.7	8	9.4
Other	4	11.4	2	4.0	6	7.1

The majority of those surveyed in both locations indicated they would use their top three information delivery channels at least a few times a month if they were available (Dunedin 85.7%, Auckland 91.9%).

7.4.1.4 Highest information priority

Transport routes were the highest priority identified by participants in both locations, followed by bus stop locations (see table 7.3). Information on attractions near the stop was again not very popular. All participants who selected trip time duration were again from Auckland, suggesting there is a greater need for this information in larger city centres. Chi-square analyses found no significant difference between participants at the two locations; however, this may have been driven by small cell sizes for some information needs. Again, it should be noted that while trip time duration was often selected by participants as being important

in the previous questions when there was no restriction on choices, it does not appear to be a highly ranked choice for many participants, especially outside Auckland.

Table 7.19 Highest priority pre- trip information for public transport users

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Transport routes	18	51.4	17	34.7	35	41.7
Bus stop locations	8	22.9	15	30.6	23	27.4
Connecting services	1	2.9	2	4.1	3	3.6
Ticket and fare information	6	17.1	3	6.1	9	10.7
Attractions near the stop	0	0.0	1	2.0	1	1.2
Trip time duration	0	0.0	7	14.3	7	8.3
Other	2	5.7	4	8.2	6	7.1

The majority of participants in both Dunedin (88.6%) and Auckland (83.7%) considered their first information priority was currently available; of these, half of Dunedin participants and 61% of Auckland participants rated the information as 'good' or 'very good'. However, 37.5% of Dunedin participants compared with 19.5% of Auckland participants rated it as 'poor' or 'very poor'. Of those who did not believe the information was available, all said they would use it, if it were provided, at least a few times a month. Chi-square analyses showed there were no significant differences between the two locations on these measures.

7.4.1.5 Preferred delivery channels for highest priority information needs

Table 7.20 shows the preferred delivery channels for the most popular types of information. Participants selected an average of 1.51 delivery channels (Dunedin = 1.29; Auckland = 1.66). Again, websites and smartphone apps were the most popular across both cities, followed by paper timetables and brochures. There was no interest at all in phone calls. Auckland participants were significantly more likely to prefer a smartphone app as the delivery channel for their first priority (X^2 (1, N = 85) = 9.92, p < .05); however, no other significant differences were found between the groups.

Table 7.20 Preferred delivery channels for highest priority pre- trip information for public transport (significant differences indicated in bold)

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	13	37.1	23	46.0	36	42.4
Smartphone app	**14**	**40.0**	**37**	**74.0**	51	60.0
Paper timetable or brochure	14	40.0	13	26.0	27	31.8
Telephone information service	0	0.0	4	8.0	4	4.7
TV or radio	1	2.9	0	0.0	1	1.2
Person-to-person	2	5.7	0	0.0	2	2.4
Phone call	0	0.0	0	0.0	0	0.0
Social media	0	0.0	5	10.0	5	5.9
Other	1	2.9	1	2.0	2	2.4

7.4.2 In-trip information needs

7.4.2.1 Information priorities

Table 7.21 shows the relative importance of information types between the two locations, as well as overall. Participants selected an average of 2.95 types of information (Dunedin = 2.82; Auckland = 3.04). Delays and information on the next transport stop (eg what it is and when they will arrive) as well as the individual's stop were seen as the most important overall. Demand for all suggested information was high with each receiving support from at least 40% of those surveyed. Demand for information on the next destination was driven somewhat by interest from Auckland participants, who were significantly more likely to choose this information as important (X^2 (1, N = 85) = 7.29, p < .05).

Table 7.21 In- trip information needs for public transport users (significant differences indicated in bold)

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Next destination	**15**	**42.9**	**36**	**72.0**	51	60.0
My stop	18	51.4	33	66.0	51	60.0
Connecting services	16	45.7	20	40.0	36	42.4
Delays	24	68.6	39	78.0	63	74.1
Route changes	21	60.0	22	44.0	43	50.6
Other	5	14.3	2	4.0	7	8.2

7.4.2.2 Top three information needs and rankings

Table 7.22 shows the results when participants were asked to identify their top three information needs and to rank these in order of importance. A weighted average was then computed, where the top three choices from each individual were given a score of 1, 2 or 3, with the unselected options given the average of the remaining scores (eg where there were six options, the other options were assigned a score of 5). The lower the average score, the more important it was considered by participants. Overall across both cities, delay information was most commonly identified. Delay information appears to be important to a lot of people, but not as important to each individual as some other information (i.e. it is more often a third choice than a first). Auckland participants ranked next destination information significantly higher than Dunedin participants ($t(83)=3.00$, $p<0.05$), while Dunedin participants ranked connecting services ($t(58.9)=-2.01$, $p<0.05$) and route changes ($t(59.3)=-2.09$, $p<0.05$) significantly higher.

Table 7.22 Top three in- trip information needs for public transport users (significant differences highlighted in bold)

Information need	Dunedin		Auckland		Overall	
	M	SD	M	SD	M	SD
Next destination	**3.89**	**1.71**	**2.78**	**1.65**	3.24	1.75
My stop	3.43	1.80	2.78	1.75	3.05	1.79
Connecting services	**3.80**	**1.55**	**4.42**	**1.14**	4.16	1.35
Delays	3.11	1.62	2.86	1.49	2.96	1.55
Route changes	**3.69**	**1.62**	**4.36**	**1.21**	4.08	1.42
Other	4.74	0.89	4.92	0.57	4.85	0.72

7.4.2.3 Preferred delivery channels overall

Table 7.23 shows the preferred delivery channels for pre-trip information overall. Participants selected an average of 2.31 delivery channels (Dunedin = 1.66; Auckland = 2.76). Signs on screens on public transport were identified as the most popular across sites, followed by smartphone apps and information signs and screens at public transport stops. Significant differences were found between groups on two options with Auckland participants significantly more likely to choose information on signs and screens at stops (X^2 (1, N = 85) = 15.49, p < .05), and voice announcements at transport stops (X^2 (1, N = 85) = 9.29, p < .05) than participants in Dunedin. This difference may be related to previous exposure to these delivery channels.

Table 7.23 Preferred delivery channels for in- trip information for public transport users (significant differences indicated in bold)

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	5	14.3	14	28.0	19	22.4
Smartphone app	14	40.0	26	52.0	40	47.1
Paper timetable or brochure	6	17.1	4	8.0	10	11.8
Telephone information service	0	0.0	0	0.0	0	0.0
TV or radio	0	0.0	1	2.0	1	1.2
Person-to-person	1	2.9	1	2.0	2	2.4
Phone call	0	0.0	0	0.0	0	0.0
Social media	0	0.0	6	12.0	6	7.1
Information on signs and screens at public transport stops	**6**	**17.1**	**30**	**60.0**	36	42.4
Information on signs and screens on public transport	19	54.3	33	66.0	52	61.2
Voice announcements at transport stops	**3**	**8.6**	**19**	**38.0**	22	25.9
Information provided on VMS	0	0.0	4	8.0	4	4.7
Other	4	11.4	0	0.0	4	4.7

The majority of those surveyed in both locations indicated they would use their top three information choices at least a few times a month if they were available (Dunedin 84.8%, Auckland 93.6%).

7.4.2.4 Highest information priority

Participants identified ‘my stop’, the next destination, and any delays as their highest information priority (see table 7.24). Chi-square analyses found no significant difference between participants at the two locations.

Table 7.24 Number one priority for pre- trip information for public transport users

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Next destination	7	21.2	14	29.2	21	25.9
My stop	9	27.3	17	35.4	26	32.1
Connecting services	3	9.1	1	2.1	4	4.9
Delays	8	24.2	13	27.1	21	25.9
Route changes	5	15.2	2	4.2	7	8.6
Other	1	3.0	1	2.1	2	2.5

When asked if their first information priority was currently available in their city, only 34.4% of Dunedin, and 53.2% of Auckland participants believed it was. Of those who believed the information was available, half of Dunedin participants and 84% of Auckland participants rated it as 'good' or 'very good'. Just over 8% of Dunedin participants, compared with 4% of Auckland participants, rated it 'poor' or 'very poor'. Of those who did not believe the information was available, just under 91% of all participants said they would use it at least a few times a month. Chi-square analyses showed there were no significant differences between the two locations on these measures.

7.4.2.5 Preferred delivery channels for highest priority information

Table 7.25 shows the preferred channels for delivery of the most popular types of information. Participants selected an average of 2.25 delivery channels (Dunedin = 1.66; Auckland = 2.66). Information provided on screens both on public transport and at public transport stops was the most popular, along with smartphone apps and to a lesser extent websites and voice announcements. There was still some interest in paper timetables and brochures. Auckland participants were significantly more likely to prefer information on signs and screens, as well as voice announcements at public transport stops as the delivery channel for their first priority (information at stops (X^2 (1, N = 85) = 12.18, p < .05), voice announcements (X^2 (1, N = 85) = 4.86, p < .05)); however, no other significant differences were found between the groups.

Table 7.25 Preferred delivery channels for highest priority pre- trip information for public transport (significant differences highlighted in bold)

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Website	6	17.1	15	30.0	21	24.7
Smartphone app	14	40.0	26	52.0	40	47.1
Paper timetable or brochure	6	17.1	5	10.0	11	12.9
Telephone information service	0	0.0	1	2.0	1	1.2
TV or radio	0	0.0	1	2.0	1	1.2
Person-to-person	0	0.0	1	2.0	1	1.2
Phone call	0	0.0	1	2.0	1	1.2
Social media	1	2.9	4	8.0	5	5.9
Information on signs and screens at public transport stops	**7**	**20.0**	**29**	**58.0**	36	42.4

Delivery channels	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Information on signs and screens on public transport	17	48.6	31	62.0	48	56.5
Voice announcements at transport stops	3	8.6	14	28.0	17	20.0
Information provided on VMS	0	0.0	5	10.0	5	5.9
Other	4	11.4	0	0.0	4	4.7

7.4.2.6 Inter- city bus services information needs

Participants given the public transport information needs survey were also asked about the information they would need to make an inter-city bus journey. Participants selected an average of 4.02 types of information (Dunedin = 3.86; Auckland = 4.14). This result suggests there are higher information needs associated with inter-city trips, possibly due to the participants having less experience at making these trips. It is also possible that users want more reassurance when making these trips due to the higher risks involved in something going wrong (eg long windows between runs, the possible cost of buying a replacement ticket, and longer distances travelled). The information of most interest was related to trip time duration, routes, and ticket and fare information; these could be considered novice user needs in general, suggesting lower exposure to inter-city bus use, with a focus also on pre-trip planning. However, there was still some interest in the types of information more experienced users would be expected to need (eg delays and in-trip information such as the next destination).

Table 7.26 Inter- city bus information needs

Information need	Dunedin		Auckland		Overall	
	N	%	N	%	N	%
Routes	21	60.0	36	72.0	57	67.1
Bus stop locations	17	48.6	35	70.0	52	61.2
Connecting services	17	48.6	23	46.0	40	47.1
Ticket and fare information	22	62.9	34	68.0	56	65.9
Trip time duration	27	77.1	33	66.0	60	70.6
Delays	17	48.6	24	48.0	41	48.2
Next destination	11	31.4	22	44.0	33	38.8
Other	3	8.6	0	0.0	3	3.5

7.4.2.7 Attitudes to information provision

Participants were asked for their opinions on a series of statements regarding the importance of verification, updating and completeness of travel information released to the public. The results are shown in table 7.27. Higher scores indicate higher agreement with the statement.

Table 7.27 Attitudes to verification, updating and completeness of travel information

Item	Dunedin		Auckland		sig
	M	SD	M	SD	
As long as it is clear it is not verified, I would rather know about a delay early, than wait until it is verified.	4.00	.66	3.96	.73	ns
There is no point releasing half the information about a delay. It is better to wait until everything is known.	2.89	1.04	2.67	.96	ns
I get frustrated when updates to traffic information are not delivered at the time they have been promised.	3.59	.91	3.92	.74	*
All information provided to the public about transport delays should be correct and verified, even if that means it is delivered later.	3.26	.98	3.34	1.08	ns

As can be seen in table 7.27, there was only one significant difference between the groups with Auckland participants more frustrated by delays to updates (independent samples t-test; $t(-2.49)=129.96$, $p<.05$). Overall, both groups tended to agree with the statements with a slight reduction in agreement with the second statement. It would appear the public prefers fast information, even if it is not completely verified; however, it is important to acknowledge the level of confidence in the information released.

7.4.3 Summary

The results of the user-intercept survey showed the public uses current information more often in a pre-trip situation; especially information provided by websites and smartphone apps. Participants in Auckland were more likely to be satisfied with the quality of information and the ease of access than those in Dunedin. Private motor vehicle users were particularly interested in delay information pre-trip, and preferred website or smartphone apps as information channels. Again there was a perception that information needs are currently better provided for in Auckland. Similarly, popular in-trip information content included road closure, delay and detour information, again via websites, smartphone apps and using GPS navigation systems (particularly via smartphone apps). Overall, the differences between Auckland and Dunedin participant interests were that Aucklanders seemed to be seeking to optimise their travel (eg get to their destination the fastest), while Dunedin participants wanted to know about unexpected events (eg weather and road closures).

For public transport users, transport routes, bus stop locations and to a lesser extent ticket and fare information and trip time duration were seen as the most important pre-trip information overall. Websites (although not traffic webcams) and smartphone apps were again the most popular information delivery channels across both sites, as well as to a lesser extent paper timetables and brochures, with a particular interest in smartphone apps in Auckland. As noted in the private motor vehicle survey, Aucklanders were also more concerned with trip time optimisation. There was a greater perception that priority information was currently available for public transport use; however, the quality was rated higher in Auckland than Dunedin. For in-trip passengers, information on delays and the next transport stop (eg what it is and time of arrival), as well as the individual's stop, were seen as the most important overall, with information on signs and screens on public transport identified as the most popular delivery channel across sites (followed by smartphone apps and information signs and screens at public transport stops). It should be noted that Aucklanders were also significantly more likely to choose information on signs and screens at stops, and voice announcements at transport stops than participants in Dunedin, perhaps due to previous exposure to these delivery channels.

The information content of greatest interest for inter-city bus users was related to trip time duration, routes, and ticket and fare information. These could be considered novice user needs in general, suggesting lower exposure to inter-city bus use, with a focus also on pre-trip planning. However, there was still some interest in the types of information more experienced users would be expected to need (eg delays and in-trip information such as the next destination).

Across all sections of the surveys, it was suggested by participants that if their key information needs were provided for via the channels they wanted to use, they would make good use of this information, accessing it at least a few times a month in most cases. Finally, as noted in the user design workshops, the general public has suggested it prefers information to be released quickly and updated regularly, even if there is not complete confidence in the accuracy, as long as there is an acknowledgement of the level of confidence.

7.5 Online survey of commercial operators

7.5.1 Materials

An online survey was developed using Survey Crafter Professional 4.0 (see appendix F). The online survey format allowed the questions to be tailored to the specific business purpose and fleet make up (eg 50MAX, HPMV, both, or neither). The survey included 32 items with the aim of understanding information needs specific to commercial operators including freight companies and passenger transport. The survey began with five items examining the business make up including fleet size and type, and the locations where the respondents operated. They were then asked about the information sources they currently used, and how well they considered their information needs were met. A further two items then examined the types of information they would find useful for their business, the channels by which they would like it delivered, and important features (eg customisability, verification of information) and a prioritisation of this information. Respondents were then asked about their highest priority information requirements and whether these were catered for adequately, as well as how much they would use the information if it was better provided.

Respondents were then presented with a series of images (see appendix G) of the types of information sources that could be of interest to their business including notification of delays, disruption and re-routing and advanced notice warnings, and (where appropriate to their fleet) HPMV and 50MAX route planning and navigation systems. They were also asked how often they would use such information and for their preferred delivery channels. The survey finished with general comments.

7.5.2 Procedure

A link to the survey was circulated via the National Road Carriers, Bus and Coach Association and Taxi Federation. The link was also sent to Opus contacts, and to the Fleet Manager of courier, taxi, freight and public transport companies found in the Yellow Pages.

7.5.3 Results

In total, 72 commercial operators responded to the online survey. General information on the type, size and operating locations of the survey respondents is included in table 7.28. The majority of respondents represented freight companies, with the rest operating in the passenger transport area; this distinction is

used for the following analyses where appropriate. There was a good range of fleet sizes represented, with most operating in an urban environment and in almost 60% of cases within the Auckland region.

Table 7.28 Background information of commercial operators responded to the online survey

	N	%
Business type		
Long-haul freight	19	26.4
Short-haul freight	28	38.9
Both short and long-haul freight	2	2.8
Taxi and courier	14	19.4
Inter-city bus	2	2.8
Intra-city bus	2	2.8
Other[(a)]	5	6.9
Total	72	100.0
Fleet size		
Less than 5 vehicles	19	26.4
5–14 vehicles	15	20.8
15–29 vehicles	10	13.9
30–100 vehicles	14	19.4
Over 100 vehicles	14	19.4
Total	72	100.0
Location		
Auckland	42	58.3
Dunedin	1	1.4
Christchurch	2	2.8
Other North Island	18	25.0
Other South Island	3	4.2
Nationwide	6	8.3
Total	72	100.0
Area		
Urban	42	58.3
Suburban	16	22.2
Rural	14	19.4
Total	72	100.0

[(a)] Other includes bulk fuel, HIAB service and road construction.

Around one-third of operators surveyed used either HPMV (16.7%) or 50MAX vehicles (1.4%), or both (13.9%).

7.5.3.1 Current information use

Table 7.29 shows the information channels currently used by respondents as part of running their business. The main focus at present is on GPS navigation (through both websites and units in vehicles), with a greater focus on interpersonal contact (both in person and by phone) than recorded by the general public.

Table 7.29 Current information channels accessed as part of business operations

Information channel	N	%
Traffic webcams	28	38.9
Google Maps or other GPS navigation websites	59	81.9
Other websites	19	26.4
GPS units in vehicle	55	76.4
Smartphone apps for GPS navigation	30	41.7
Other smartphone apps	15	20.8
Telephone information services	10	13.9
TV or radio	20	27.8
Person-to-person	36	50.0
Phone calls	44	61.1
Social media	7	9.7
Travel time on main corridors	19	26.4
Information provided on VMS on road	32	44.4
Informal networks (such as driver reports)	32	44.4
Other	8	11.1

Over half (55.6%) of respondents considered it was ‘easy’ or ‘very easy’ to find the information they required to make their business run efficiently, with 15.3% indicating this was hard. Approximately half (48.7%) were ‘satisfied’ or ‘very satisfied’ with the quality of this information, with over 20% ‘dissatisfied’ or ‘very dissatisfied’.

7.5.3.2 Preferred information content

Respondents were asked which types of information they would find most beneficial in running their business (see table 7.30). The most commonly selected information types related to delays, disruptions and re-routing, particularly when this information was to be provided in real time. Information for route planning was generally less popular. When freight and passenger transport operations were compared, there were no significant differences in the types of information they required.

Table 7.30 Information content considered beneficial overall to business operations

Information content	N	%
Real-time disruption warnings	57	79.2
Real-time delay warnings	64	88.9
Real-time re-routing warnings	60	83.3
Advanced disruption warnings	55	76.4
Advanced delay warnings	58	80.6
Advanced re-routing warnings	57	79.2
Advanced warnings of new road layouts	39	54.2
Route planning information by permit type	24	33.3
Route planning information for journey time by days and times	30	41.7

Information content	N	%
Points of interest for vehicle type (eg suitable petrol stations)	23	31.9
Locations with height or weight restrictions	29	40.3
Weather forecasts and safety information	32	44.4
Severe weather information	43	59.7
Other	1	1.4

In addition to identifying all the content that would be beneficial to their operations, respondents were asked to rank their top three needs. These are presented in table 7.31 below. A weighted average was then computed, where the top three choices from each individual were given a score of 1, 2 or 3, with the unselected options given the average of the remaining scores (eg where there were 14 options, the other options were assigned a score of 9). The lower the average score, the more important it was considered by participants. Overall, real-time delay warnings were the most popular, followed by real-time re-routing warnings and advanced warnings of the same information. Freight operators also ranked route planning information by permit type ($t(47) = -2.32$, $p < 0.05$) and severe weather information ($t(69.1) = -2.27$, $p < 0.05$) significantly higher than passenger transport operators (although still not very highly overall).

Table 7.31 Top three information needs for commercial operators (significant differences are highlighted in bold)

Information need	Freight		Passenger		Overall	
	M	SD	M	SD	M	SD
Real-time disruption warnings	7.23	2.96	7.58	2.84	7.35	2.90
Real-time delay warnings	4.29	3.73	5.42	3.71	4.67	3.73
Real-time re-routing warnings	5.96	3.52	5.42	3.71	5.78	3.57
Advanced disruption warnings	8.00	2.48	7.04	3.14	7.68	2.73
Advanced delay warnings	6.42	3.40	6.67	3.39	6.50	3.38
Advanced re-routing warnings	6.54	3.40	6.387	3.51	6.49	3.42
Advanced warnings of new road layouts	6.54	3.40	6.38	3.51	8.21	2.27
Route planning information by permit type	**8.29**	**2.11**	**9.00**	**0.00**	8.53	1.75
Route planning information for journey time by days and times	8.60	1.55	8.33	2.26	8.51	1.81
Points of interest for vehicle type (eg suitable petrol stations)	8.73	1.32	8.46	1.84	8.64	1.51
Locations with height or weight restrictions	8.58	1.64	8.46	1.84	8.54	1.69
Weather forecasts and safety information	8.58	1.64	7.25	3.12	8.14	2.31
Severe weather information	**7.67**	**2.82**	**8.75**	**1.22**	8.03	2.46
Other	9.00	0.00	9.00	0.00	9.00	0.00

7.5.3.3 Preferred delivery channels overall

In addition to identifying the information they would find the most useful, respondents were also asked to identify their preferred channels for receiving this information (see table 7.32 below). The most popular delivery channels were via email (either push-out notifications or at regular intervals), followed by push-

out notifications via smartphone app. Businesses with a predominantly freight function were significantly more likely to select push-out notifications via text (X^2 (1, N = 72) = 4.50, p < .05) or in vehicle navigation systems (X^2 (1, N = 72) = 7.55, p < .05) than those with a passenger transport function, but there were no other significant differences.

Table 7.32 Preferred delivery channels for information

Delivery channels	N	%
Website information service	44	61.1
Website planning tool	15	20.8
Webcams	14	19.4
Email updates at regular intervals	35	48.6
Push-out notifications via text	24	33.3
Push-out notifications via email	40	55.6
Push-out notifications via radio	12	16.7
Push-out notifications via smartphone app	29	40.3
Push-out notifications via VMS	14	19.4
VMS or static signage	14	19.4
In-vehicle navigation systems	17	23.6
Other	2	2.8

7.5.3.4 Important characteristics of information provision

Respondents were asked to rate how important various characteristics of any information channels would be to making it useful to their business. Table 7.33 presents the mean ratings of importance of these characteristics, comparing between predominantly freight operators and passenger transport operators. Higher scores indicated more importance. The two groups only differed significantly on one item, with freight operators rating the ability to select only confirmed reports higher than passenger operators (independent samples t-test; $t(34.65)=2.19$, $p<.05$). All features were considered important, in particular journey time impacts, and being able to specify the types of roads of interest (eg state highway versus local roads).

Table 7.33 Mean ratings of information channel characteristics by operator type

Characteristics	Freight		Passenger		sig
	M	SD	M	SD	
Ability to select a specific geographical area or route of interest	3.88	1.14	3.71	1.46	ns
Ability to select a minimum length of delay time	3.96	1.01	3.83	1.44	ns
Ability to select a specific type of incident of interest	3.21	1.09	2.96	1.12	ns
Ability to select only confirmed reports	4.04	0.87	3.42	1.24	*
Indication whether the reports are confirmed or unconfirmed	4.08	1.07	3.54	1.25	ns
Estimated impact on journey times	4.23	1.06	3.96	1.27	ns
Provided links to further information	3.42	1.11	3.42	1.32	ns
Expected times for next information update	3.73	1.28	4.00	1.10	ns
Information specific to state highways	4.17	1.08	4.00	1.14	ns
Information specific to local roads	4.08	0.87	4.08	0.83	ns

7.5.3.5 Highest information priority

Based on respondent rankings of their top three information content needs, a highest priority was determined for each organisation. As shown in table 7.34, the most popular was real-time delay warnings, followed by advanced and real-time warnings for re-routing. There were no significant differences between the different operator types on this measure; however, this may have in part been due to small cell sizes for analysis.

Table 7.34 Number one information content priorities for commercial operators

Information content	N	%
Real-time disruption warnings	2	2.9
Real-time delay warnings	25	36.2
Real-time re-routing warnings	10	14.5
Advanced disruption warnings	4	5.8
Advanced delay warnings	6	8.7
Advanced re-routing warnings	11	15.9
Advanced warnings of new road layouts	3	4.3
Route planning information by permit type	1	1.4
Route planning information for journey time by days and times	2	2.9
Points of interest for vehicle type (eg suitable petrol stations)	0	0.0
Locations with height or weight restrictions	0	0.0
Weather forecasts and safety information	2	2.9
Severe weather information	3	4.3
Other	0	0.0

Almost two-thirds (63.9%) of respondents did not believe their highest priority was currently available. Of those who thought the information was currently available, 61.5% considered it to be 'good' or 'very good', while only 3.8% considered it 'poor'. Of those who said their preferred information was not currently available, 91.3% considered they would use it at least a few times a month if it were available, with over half (56.5%) indicating they would use it multiple times a day.

7.5.3.6 Real- time warnings information channels

Respondents were given an image of various information channels currently in operation and with potential to be implemented, for presenting real-time information for delays, disruptions and re-routing on the roads (see figure G.1 in appendix G). When asked how often they do, or would, use such information in their business, over half said they use it a few times a day (51.4% overall, 54.2% freight, 45.8% passenger transport). Over half of respondents also considered this information was 'good' or 'very good' where it was provided (52.8% overall). There were no significant differences between groups on either measure.

Respondents were asked how they would prefer to receive this type of information, and the results are presented in table 7.35. Freight operators were significantly more likely than passenger transport operators to select in-vehicle navigation systems (X^2 (1, N = 72) = 4.84, $p < .05$). There were no other significant differences, however, with website information services and email communications (both push

out and regular) the preferred options for both groups. Smartphone apps, particularly those with push-out information functions were also popular, particularly with freight operators.

Table 7.35 Preferred information channels for real- time delay, disruption and re- routing warnings (significant differences indicated in bold)

Information channel	Freight		Passenger		Overall	
	N	%	N	%	N	%
Website information service	25	52.1	14	58.3	39	54.2
Website planning tool	7	14.6	6	25.0	13	18.1
Webcams	13	27.1	3	12.5	16	22.2
Email updates at regular intervals	16	33.3	14	58.3	30	41.7
Push out notifications via text message	20	41.7	5	20.8	25	34.7
Push out notifications via email	18	37.5	13	54.2	31	43.1
Push out notifications via radio	12	25.0	5	20.8	17	23.6
Push out notifications via smartphone app	22	45.8	7	29.2	29	40.3
Push out notifications via VMS	12	25.0	3	12.5	15	20.8
Variable message or static signage	15	31.3	3	12.5	18	25.0
In-vehicle navigation systems	**18**	**37.5**	**3**	**12.5**	21	29.2
Other	1	2.1	1	4.2	2	2.8

7.5.3.7 Advanced warning information channels

The second image presented to respondents (see figure G.2 in appendix G) showed an example of a road works programme notification. Around one-third of respondents from both groups indicated they do, or would, use this information a few times a day where it was available (30.6% overall, 29.2% freight, 33.3% passenger transport), with over 60% at least a few times a week. However, when asked about the quality of this information where it is currently available, only 1.4% rated it as ‘good’, with 66.7% of freight operators and 66.6% of passenger transport operators rating it as ‘poor’ or ‘very poor’. There were again no significant differences between the two groups in frequency of use or ratings of quality.

Respondents were asked how they would prefer to receive this type of information, and the results are presented in table 7.36. Website information services followed by email communications (both regular and push-out notifications) were the most popular channels overall. There was more interest from freight operators in push-out notifications via smartphone apps and VMS. The only significant difference between the groups was that freight operators were significantly more likely than passenger transport operators to select push-out notifications via text message (X^2 (1, N = 72) = 4.84, $p < .05$).

Table 7.36 Preferred information channels for advanced delay, disruption and re- routing warnings (significant differences indicated in bold)

Information channel	Freight		Passenger		Overall	
	N	%	N	%	N	%
Website information service	28	58.3	17	70.8	45	62.5
Webcams	10	20.8	3	12.5	13	18.1
Email updates at regular intervals	19	39.6	13	54.2	32	44.4
Push-out notifications via text message	**18**	**37.5**	**3**	**12.5**	21	29.2
Push-out notifications via email	19	39.6	11	45.8	30	41.7
Push-out notifications via radio	8	16.7	5	20.8	13	18.1
Push-out notifications via smartphone app	17	35.4	5	20.8	22	30.6
Push-out notifications via VMS	11	22.9	4	16.7	15	20.8
Variable message or static signage	12	25.0	3	12.5	15	20.8
In-vehicle navigation systems	10	20.8	4	16.7	14	19.4
Other	8	16.7	5	20.8	13	18.1

7.5.3.8 HPMV and 50MAX journey planning information

All respondents who indicated they had HPMVs in their fleet were presented with a third image that showed a mock-up of an HPMV route planner (see figure G.3 in appendix G). Of the 22 respondents who had these vehicles, 18 (81.8%) indicated they would find such a planner useful to their business. Over half (54.5%) indicated they would use such a tool at least a few times a week if it were available.

Where respondents indicated they had 50MAX vehicles in their fleet, they were also presented with an image that showed a mock-up of a 50MAX route planner (see figure G.4 in appendix G). Of the 11 respondents who had these vehicles, 10 (90.9%) indicated they would find such a planner useful to their business, with 81.8% indicating they would use such a tool at least a few times a week if it were available, and over 90% indicating they would use it at least a few times a month. These respondents (50MAX operators) were also asked how well the information they were currently provided met their operating needs, with 81.9% saying the information at least met their needs (45.5% indicated it exceeded). However two of the 11 operators indicated it was not meeting their requirements.

7.5.3.9 HPMV and 50MAX in- vehicle navigation information

As well as presenting operators with the tool for route planning for HPMV or 50MAX vehicles, two further images were presented of mock-ups of an in-vehicle system for real-time navigation (see figures G.5 and G.6 in appendix G). Of the 22 respondents with HPMVs in their fleet, 16 (72.7%) indicated they would find such a tool useful for their operations, with 86.4% indicating they would use it at least a few times a month (72.7% at least a few times a week, and 54.4% a few times a day).

Of the 11 respondents with 50MAX vehicles, nine (81.8%) indicated they would find a tool for these vehicles useful. All indicated they would use it at least a few times a week if it were available, with 72.7% indicating they would use it a few times a day.

7.5.3.10 Attitudes to information provision

Respondents were asked for their opinions on a series of statements regarding the importance of verification, updating and completeness of travel information released to commercial operators. The results are shown in table 7.37. Higher scores indicate higher agreement with the statement. Independent samples t-tests indicated no significant difference between the operator groups.

Table 7.37 Attitudes to verification, updating and completeness of travel information

Item	Freight		Passenger		sig
	M	SD	M	SD	
As long as it is clear it is not verified, I would rather know about a delay early, than wait until it is verified	4.04	0.58	3.92	0.83	ns
There is no point releasing half the information about a delay. It is better to wait until everything is known	2.67	0.93	2.71	1.19	ns
I get frustrated when updates to traffic information are not delivered at the time they have been promised	3.90	0.72	3.92	0.78	ns
All information provided to commercial operators about transport delays should be correct and verified, even if that means it is delivered later	2.75	1.06	2.50	1.22	ns

Overall both groups tended to agree with the statements, with a slight reduction in agreement with the second statement. It would appear that like the general public, commercial operators prefer fast information, even if it is not completely verified; however, they appear to be a little more cautious around verification and it is therefore even more important to acknowledge the level of confidence in the information released.

7.5.3.11 General comments

Operators were also given the opportunity to give any additional feedback in the form of general comments. These comments generally suggested operators wanted the most up-to-date information, and that sometimes this need was not being met. They want the information as soon as possible (with an acknowledgement of the level of verification of the information) and for the situation to be monitored, not just released. One suggested the more information that could be provided the better, and as emphasised in the overall results, smartphone apps and websites were seen as good delivery channels.

There was a mix of opinions on the centralising of information. A number of operators recommended the development of a dedicated commercial operator information service to coordinate travel information for consistent messaging, or the provision of open source data to tools such as Google Maps for processing by third party apps (eg TomTom). However, another was against a central service as they felt they needed a local person closer to the situation. Some considered information was too Auckland-specific, and recommended the development of a smartphone app that would allow operators to receive only relevant information for their location (eg to make it customisable to them).

Another suggested commercial operators were a good source of information as well as recipients, but often could not share this information when there was no cell coverage (suggesting a 24-hour open channel VHF radio). They also highlighted a need for better weather information, particularly around snow on alpine routes. One operator suggested they would be very interested in a route planner that could advise routes based on live traffic conditions.

7.5.4 Summary

In running their operations, commercial respondents indicated they currently use GPS navigation, and had more use of in-person and phone communication (through formal and informal networks) than the general public. Results indicated respondents would like some improvement to the quality and ease of access to the travel information they need. The most commonly selected information needs identified related to delays, disruptions and re-routing, with a particular desire for this to be provided in real time. When asked about specific characteristics of this information, all features examined were considered important, in particular impacts on journey time, and being able to specify the types of roads of interest (eg state highway versus local roads). The most popular information content was real-time delay warnings, followed by advanced and real-time warnings for re-routing of vehicles. The majority see their priority needs as a current information gap, and suggested they would use the information often if it was provided.

Overall, respondents were interested in real-time warning information, particularly if it was delivered by websites and email communication (both push-out and regular). Smartphone apps, particularly those with push-out information functions were also popular, particularly with freight operators. Advanced warning information was seen as particularly poor currently, with websites and email communication again (both push out and regular) seen as the best channels. There was also more interest from freight operators in push-out notifications via smartphone apps and VMS than passenger transport operators.

When given mock-ups of HPMV or 50MAX route planning tools, 81.8% of HPMV and 90.9% of 50MAX operators indicated they would find such a tool useful to their business, with most using it at least a few times a month. In general, 50MAX operators indicated existing information was at least meeting their needs. A similar mock-up was done of a navigation system for HPMV or 50MAX vehicles that was also seen as helpful to these businesses, and would be used if provided.

Finally, it would appear that like the general public, commercial operators prefer fast information, even if it is not completely verified; however, they appear to be a little more cautious around verification, and it is therefore even more important to acknowledge the level of confidence in the information released.

8 Information provision implementation plan

The purpose of this stage was to bring together the findings of the previous stages, which investigated Transport Agency customers' requirements for travel information, best practice and assessment criteria into an implementation plan for the transport sector. To develop the implementation plan an interactive workshop was convened to review information from the previous research stages. The participants in this workshop included:

- Luke Thomas, Christchurch Transport Operations Centre (CTOC)
- Catherine Kim, Ministry of Transport (MoT)
- Tresca Forrester (CTOC)
- Jo Dawkins (Environment Canterbury)
- Lee Wright (Transport Agency).

The workshop was convened by Jo Chang and Courtney Jones of Opus, with Kate Mora participating via a phone link. The purpose of the implementation plan workshop was threefold:

1 To discuss the research findings

2 To discuss 'gaps and overlaps' with current work being undertaken by the Transport Agency

3 To discuss and refine implementation recommendations (to prioritise actions where appropriate).

The outputs of the implementation plan have been divided into four broad areas and are discussed in sections:

1 What are the delivery methods the transport sector should focus on, and in what order should these be prioritised?

2 What recommendations and guidelines of best practice should be used for each of the different delivery methods?

3 How should the traveller information delivery channels be evaluated to compare their benefits and effectiveness?

4 Provide a prioritised list of 'next step' tasks that the transport sector could take to improve the provision of travel information?

8.1 Information needs and delivery methods

To answer the question of which delivery methods the transport sector should focus on, it is important to first recognise what information people are seeking, both before they make a trip and during the trip. Sections 8.1.1 and 8.1.2 outline the different audience information needs.

8.1.1 Information needs by method of transport

Information needs have been broken down by the three trip types used: public transport trips, private car trips and commercial vehicle trips. Note that the public transport information needs for both intra-city and inter-city have been combined as the basic information needs were the same.

Note also that the information needs below are not in any type of priority order; they are indicative only of the type of information that our research has indicated people want to know the answers to.

8.1.1.1 Public transport pre- trip key information needs

- Where do the routes go?
- What bus(es) do I catch to get from where I am now (or where I am going to be) to where I want to go?
- What bus stop(s) do I get on and off at? How will I recognise them?
- When will the next bus I want to catch be at the bus stop?
- How much will it cost and how do I pay?
- What other services stop at the bus stop/s I am going to use?
- How long will my trip take?

8.1.1.2 Public transport in- trip needs

- How will I know when I have reached my destination?
- How much time until the next stop?
- If doing a multi-vehicle trip, when does the next bus/train/ferry leave, and will I be able to make my connection?
- Is there anything happening that will delay my trip (road works, congestion, weather)?
- If there are changes to the route, what are the changes/diversions?
- Is the service still on schedule?

8.1.1.3 Private car pre- trip information needs

- Are there unscheduled delays that I need to know about?
- Are there any scheduled road closures/delay information that I need to know about, and what are the alternative routes?
- How long can I park at a specific location, what will it cost?
- Where can I park that is close to my destination?
- How long would it take me to drive this trip?
- What is the drive time versus how long it would take me to catch a bus?
- How much would it cost me to drive this trip versus taking a bus?

8.1.1.4 Private car in- trip information needs

- Is all the parking taken at my destination?
- How long can I park along here and how much does it cost to park here?
- Are there any road closures or unscheduled delays ahead? How long will the road closure be for, how often will I be able to find out updated information, and what alternative route should I take?
- Are there future scheduled disruptions that I need to know about (eg road works with lane closures)?
- Are there any major delays that will affect my trip?

8.1.1.5 Commercial operator pre- trip information needs

- Are there any unplanned conditions or situations that would disrupt, delay or re-route trips? If there is, what are the details around the disruption, delay or re-routing?
- Are there any planned conditions or situations that would disrupt, delay or re-route trips? If there is, what are the details around the disruption, delay or re-routing?
- In situations of bad weather conditions, what is the most up-to-date information on whether mountain passes are open?
- For operators who have 50MAX vehicles, how can a driver get from their origin to their destination staying on approved 50MAX roads?
- For operators who have HPMV vehicles, what are the potential routes that the vehicle could go on?

8.1.1.6 Commercial operator in- trip information needs

- Are there any unplanned conditions or situations that would disrupt, delay or re-route trips? If there is, what are the details around the disruption, delay or re-routing?
- Are there any planned conditions or situations that would disrupt, delay or re-route trips? If there is, what are the details around the disruption, delay or re-routing?
- In bad weather conditions what is the most up-to-date information on weather and open mountain passes?
- For operators who have 50Max vehicles, how can a driver get from their origin to their destination staying on approved 50Max roads?
- For operators who have HPMV vehicles, what are the potential routes that the vehicle could go on?

8.1.1.7 Similarities between the groups

A number of similarities exist between the information needs of commercial operators and private motorists. The commercial operators want the same information as for the private motorists above, with a particular focus on delay, disruption and re-routing information. The main difference between the commercial operators and private motorists is in the delivery channels by which they want to receive the information. Both prefer smartphone apps and websites, but commercial operators show additional interest in email communications and push-out notifications by a range of sources (eg email and text). Both groups also indicate a preference for fast information even where verification is not possible. However, commercial operators are understandably a little more cautious with this information, desiring

greater monitoring of ongoing situations and for acknowledgement of the level of confidence in the information released.

8.1.2 Information needs by location

Through the user-centred design workshops and user-intercept surveys, the following key themes regarding information needs by location were identified.

8.1.2.1 Information needs in rural areas

Information needs in rural areas related to whether particular routes were open during critical events such as flooding, storms, snow and ice, and were less likely to include public transport due to the limited or non-existent public transport in these areas.

8.1.2.2 Information needs in regional areas (such as those investigated in this project: Dunedin and Palmerston North)

For the regional locations we investigated (Dunedin and Palmerston North), the workshop participants reported they were not greatly affected by congestion. Instead, information needs extended to advanced notice around scheduled delays, parking information, and information relating to the impact of unexpected weather events causing delay particularly for inter-city travel where alternative route options are limited. These differences were reiterated in the survey component, with more interest in information around exceptional events (eg road closures due to snow) in these centres, rather than travel optimisation as in major centres.

8.1.2.3 Large metropolitan major urban centres (such as Auckland city)

Drivers of main urban area locations faced more complicated information needs relating to unscheduled and scheduled delays as they arose (ie congestion, accident information). People in these areas were more likely to be trying to optimise their journey times, a finding reiterated in the user intercept surveys.

8.1.3 Delivery methods to focus on

8.1.3.1 General comments

Feedback at all stages of the research project emphasised the need to provide a range of delivery methods, and to ‘not just focus on one or two’ delivery channels if the intention is to reach a wide range of the population. However, as one of the goals of this project was to prioritise future development, the top three delivery methods are provided below.

The following priorities (see table 8.1) have been identified as common across public transport, private car and commercial potential information users. Each item is listed in the order of priority to be developed further:

Table 8.1 Priorities for information channel development across centres, modes and trip types

	Regional centres		Main metropolitan centres	
	Pre- trip	**In- trip**	**Pre- trip**	**In- trip**
Public transport	Smartphone app Website Paper timetable/ brochure and information on signs and screens at stop	Smartphone app Website Paper timetable/ brochure	Smartphone App Website Paper timetable/ brochure	Information on signs and screens at stop Smartphone app Voice announcements at stops
Private motor-vehicle	Website Smartphone app TV/radio	Smartphone app GPS navigation Website	Smartphone app Website GPS navigation	Smartphone app GPS navigation Radio
	Real- time information		**Advanced warnings**	
Commercial	Websites Email (at regular intervals, eg every Monday morning) Push out notification via email Smartphone apps		Websites Email (at regular intervals, eg every Monday morning) Push out notification via email Smartphone apps VMS	

8.1.3.2 HPMV and 50MAX operators

When given mock-ups of HPMV or 50MAX route planning tools, 81.8% of HPMV and 90.9% of 50MAX operators indicated they would find these useful for their business, with most using them at least a few times a month. In general, 50MAX operators indicated existing information was at least meeting their needs. A similar mock-up was done of a navigation system for HPMV or 50MAX vehicles that was also seen as helpful to these businesses, and would get use if provided. It is recommended that the transport sector consider implementing route planning and/or navigation tools for HPMV and 50MAX operators.

8.2 Best practice for travel information systems

8.2.1 General comments

Using the best practice information from chapters 2 and 4 of this report, key best practice principals have been refined for the implementation of travel information. These principles should be considered both in the design, as well as in the evaluation of a system. It is important to note that not all of these principles will apply equally to all implementations, so the person designing or evaluating the system should consider if they are relevant to the particular application. Best practice recommendations for the delivery methods are broken down into those that are general (ie go across delivery methods), those that are specific to a type of delivery method, and those that are specific to a transport mode (eg public transport).

8.2.2 General travel information best practice

8.2.2.1 Information should be accurate and up to date

As a general rule, travel information should be current and regularly updated, and also should be as accurate and reliable as possible. The reliability of travel information is important, as this is a key determinant of whether or not it is used, how often, and with what level of confidence (Lappin et al 2000a; Chang et al 2013).

Participant feedback in the user-centred design workshops, commercial operator interviews, inputs from New Zealand information provision providers, and the feedback from the participants in the implementation plan workshop, suggested that for a major event (where the impact might affect a lot of people for a long period) where information has not been verified or 'absolute' information is unknown (eg when a road will be re-opened after an incident) it is important to provide:

1 To provide what information is known.

2 To indicate if the information is unconfirmed, and when an update will be available.

3 To provide an update at, or before, the indicated time.

The user-intercept and online survey of commercial operators reiterated these findings; users would prefer to get fast information, and be updated regularly (and when scheduled), even if it is not all verified. However, it is important to acknowledge clearly where information is not verified.

8.2.2.2 Travel information systems should be resilient

Information systems should be designed to ensure they can operate in an emergency or after a disturbance. This includes allowing changes/updates to be made remotely (Chang et al 2013). Consider giving emergency services access to update information channels, for example, access to VMS if the local operation centre is not open 24 hours (FHWA 2004). This should also include ensuring that websites and Apps are resilient to periods of high short-term demand such as occurred with the 14 May 2015 Wellington floods.[20]

8.2.2.3 Travel information should be easy to understand and 'speak the user's language'

All information should be easy to understand and 'speak the user's language' (adapted from Nielsen 1995), using common terms for:

- locations, directions, landmarks, delays, incidents and instructions
- use of a consistent format and style of information across different channels.

Pathan et al (2011) note that consistency in message across multiple channels is important to maximise the probability of mode shift. Participants in both the design workshops and commercial operators interviews wanted information they did not have to 'learn a system to get', and that was consistent with other systems they might use (eg use of a consistent colour to indicate congestion on a map).

[20] B Burdett (Traffic Design Group), pers comm, May 2015.

8.2.2.4 Information should be provided to meet the needs of those who are tech savvy and those who are not tech savvy

If the travel information is intended to reach the widest range of people, then it should be provided in formats that allow for non-tech savvy (or people who have low/no access to technology) as well as for tech savvy people (Zografos et al 2010; Marks 2008).

8.2.2.5 Information should be targeted at two different levels

Novice travellers to the mode or area (eg someone who is catching a bus for the first time) will need different information (eg how much will the trip cost, how long will it take, where do I catch the bus) from those who catch the same bus all the time and just want to know where their bus is.

8.2.2.6 Travellers need to be made aware of the range of, and ways to access, available travel information.

This is important as it has been identified as a major reason why travellers do not access available travel information (Farag and Lyons 2008; Marks 2008; Pathan et al 2011; Hedden et al 2011; Chang et al 2013).

8.2.2.7 Locations that should be prioritised

The best travel information should be available where it is most needed.

Certain types of trips are more likely to attract the use of travel information, and as such these trips appear to have the highest need for travel information. Such trips include those where the trip arrival is time sensitive, or when travel time is uncertain or variable (Peirce et al 2003).

The local travel context can also dictate people's expectations of regularity, as well as customer satisfaction. For example, in Los Angeles, traffic conditions are so volatile that people expect live information, but also feel that it cannot be relied on as conditions could change at any time (Petrella et al 2004).

Dynamic travel information is most useful in situations where there is uncertainty (Pan et al 2008).

Additionally, previous research findings show that areas with higher congestion and delay, as well as places with alternative routes available, experience higher use of travel information (most used is VMS and radio) (Petrella et al 2014). This finding is reinforced in the user intercept surveys in this project, with participants in Auckland accessing more travel information, and having a particular interest in information that will optimise their travel time, compared with participants from smaller centres.

8.2.2.8 Travel time Information

Travel times should be as accurate and current as possible. Travel time information must be reasonably accurate and current to be credible (better not to display than to display highly inaccurate information, otherwise people may stop using it) (Dudek 2004).

- When information is not current or reliable, this should be communicated[21] (Dudek 2004)

[21] Kuhn et al (2013) have developed guidelines for communicating travel time information to describe its reliability, such as how best to describe: 95th percentile trip time, arrival time, average travel time, buffer time, departure time, recommended departure time and recommended route.

- Travel times should be as accurate as possible and change with conditions. Uncertainty should be treated conservatively (FHWA 2004).
- Real time travel information error should be less than 20% to ensure most users gain the benefit of on time reliability (Park 2009).
- Public transport travel time should be conservative (ie it is better to say it is coming earlier than it actually does, rather than later than it does, to avoid people missing it) (Steinfeld 2014).
- Travel times should be displayed to meet the needs of new and experienced travellers. If distance is included beside the variable travel times, this will meet the needs of experienced and novice travellers (FHWA 2004).
- Travel time displays should be useful, simple and easy to understand quickly. For example, including travel times for different lane types (such as general traffic and bus or HOV lanes) on the same sign is too complicated. Use separate signs where possible, or give the difference in travel times between lanes (FHWA 2004).
- Providing travel times to destinations is more easily understood than providing speeds or congestion descriptions (Lerner 2009).

8.2.3 Channel-specific travel information best practice

In addition to the above general 'best practice' recommendations the following channel specific recommendations are also provided

8.2.3.1 Best practice: VMS

VMS should:

- be quick to read. Consideration should be given to road and environmental conditions which may limit the length of time travellers can view the message, and therefore the number of words which can be used. Factors include weather, obstacles and travel speeds (Dudek 2004)
- be timely, accurate and useful. To ensure VMS messages are trusted and retain credibility, information must be reliable, directly relevant and updated as soon as it is available (Dudek 2004)
- ensure travel time messages are readily distinguishable from other VMS information (FHWA 2004)
- follow standard guidelines with respect to the use of consistent terminology and design, and the rules of displaying information. FHWA (2004) notes that travellers are more likely to comply if they are told *why* there is a problem and *what* to do (eg traffic incident, right lane closed)
- only be used when necessary. Information which is trivial, obvious, or repetitive (such as routine congestion) can reduce the effectiveness of VMS, as travellers may stop paying attention to them. (Dudek 2004). Limit the use of VMS to emergencies which affect the road users, rather than providing general emergency information (FHWA 2004).

VMS public awareness campaigns should be implemented to encourage a positive reception, ensure motorists can read the sign easily, and understand where the information comes from (FHWA 2004).

Note that guidelines for VMS display in New Zealand were developed by Chang (2008a) based on driver comprehension testing (Chang 2008b). These guidelines were subsequently developed into draft NZ

Transport Agency operating policy and procedures documents P34 and P35 (NZ Transport Agency 2011a and 2011b). These guidelines cover message construction, use of consistent terminology and design, and the rules of displaying information.

8.2.3.2 Best practice: websites

Website information should be:

- accurate, timely, quick and easy to access. Public transport information websites should be user-friendly, accessible, consistent and current (Currie and Gook 2009). Website information must be quick, easy to access, reliable and have extensive coverage of major roads and modes (Marks 2008). The report *TCRP synthesis 43* (TCRP 2002) provides guidelines for public transport information websites; this information has been included in this section as many of the recommendations can equally apply to other travel information websites. The recommendations ensure a consistent approach is taken for:
  - site content (easily printable maps, fare information and schedules)
  - audience needs (design for different users, experienced users, new users, tech savvy and non-tech savvy)
  - marketing and promotion (use of an easy to remember domain name, then put it on everything, advertise and target particular audiences)
  - design parameters (design for client-side technology, so that data rates and download speeds are compatible with the technologies the end user might have)
  - home page design (links for schedules, maps and fares should be prominent), design for people with disabilities
  - design of inside pages (use consistent links, make information available for download with html)
  - providing route maps for each schedule
  - avoiding pages that require extensive scrolling.

The information must be displayed in a format accessible to people with different abilities. The New Zealand Office for Disability Issues has developed a list of accessibility barriers and which impairment types they have an impact on. Solutions for these are provided in the New Zealand Government Web Standards and Recommendations[22].

If a user's first experience with a website is not easy, they are unlikely to return to the website again (Kenyon et al 2001).

8.2.3.3 Best practice: smartphone apps

Best practice guidelines for smartphone apps are starting to be developed; however, little could be found regarding best practice for travel information apps specifically. We have therefore provided more general recommendations for smartphone apps.

[22] www.odi.govt.nz/resources/publications/going-beyond-compliance/survey/appendix-5-accessibility-barriers-solutions.html

Smartphone apps should provide information content that is useful, quick, simple and easy to use. MobiForge (2013) suggests that user experience of an app is a key factor associated with use. User experience is shaped by how well, how easily and how quickly the app meets their needs by providing them with their desired information. Specific considerations for app-based information include:

- prioritising important information that can be accessed with fewer clicks
- using designs that are quick to load and not data intensive
- incorporating mobile phone features such as GPS where appropriate
- ensuring content is suitable for viewing on a small screen.

Smartphone apps should also be:

- universally accessible. They should support accessibility features of the operating system, like VoiceOver and TalkBack (Steinfeld et al 2011)
- able to be used safely. In-vehicle travel information should be accessed in a manner which is both safe and legal for a driver to use (such as voice activated, docks into central column) (Robinson et al 2012).

8.2.3.4 Best practice: social media

Before implementing social media an agency should have policies and guidelines in place regarding the use of social media by staff, including basic principles of use and codes of conduct to ensure that all interactions reflect the public image the provider would like to convey (Bregman 2012).

Use of social media in public transport has been categorised by Bregman (2012) into the following uses for different social media:

- Twitter – best for distributing short, focused and time-sensitive messages
- Facebook – best for engaging users and encouraging sharing with longer, informative posts
- YouTube – best for engaging and informing customers through entertaining and/or instructional videos (for example, the Interislander utilises video clips on its website to show drivers how to get to the ferry).
- Instagram/Flickr – best for sharing photos of news and events with public and media
- Blogs – best for publishing longer and more detailed updates about agency policies and events.

8.2.3.5 Best practice: radio/TV

As no best practice was found for radio and TV in the literature, best practice was sourced from New Zealand providers. Best practice should:

- not only focus on the routes that have delays but also let people know if there are 'no problems' on the main routes
- provide regular updates during the peak traffic flow times

- provide main arterial information first and advise alternative routes if there are delays and alternative routes are available. Generally give the same routes in the same order, but modify if an incident occurs. Also, advise incidents as they happen, as this adds to the credibility of the information (credibility is very important)
- not tell people information they already know (eg it is raining). Also do not provide information that is only specific to a small number of people
- provide information with wording like:
  - It is quicker than yesterday (which provides context).
  - Slow in the usual places.

8.2.3.6 Best practice: traffic cameras

The following best practice recommendations were provided by commercial operators whose dispatch uses traffic cameras to feed information out to their drivers. The view from the camera should allow the user to:

- be able to see in both directions on the motorway, and see far enough so that they are aware (where possible) of how far the traffic is backed up
- have regular updates to camera feeds and they should not 'freeze up' so users can judge traffic speeds as well as congestion.

8.2.4 Best practice for public transport information provision

Internationally a number of best practice guidelines have been developed for public transport. Best practice for public transport websites has been put under the website table in section 8.2.3.2 above; the remaining recommendations are below:

8.2.4.1 Bus stop recommendations

- Information provision at bus stops should allow potential users to identify where the stop is within a route or routes, communicate time of departure and return, and confirm which bus stop it is to people on the bus.
- *TCRP report 45* (Higgins et al 1999) suggests the following information should also be displayed:
  - bus system logo/name
  - information telephone number
  - route number/s of the services that use the stop
  - names of street and landmark where the bus stops
  - the bus system logo and the route number should be viewable at nine metres by someone with low vision (20/200) in general daylight. The street name should be visible half a block away or across the intersection whichever is further away.

8.2.4.2 System map

- Specifications for a system map (Higgins et al 1999) include:
  - display of information (layout, font size etc)
  - wording
  - route diagrams/maps/use of landmarks/transfer points
  - legends

New South Wales Ageing and Disability Department (2000) provides specification for indicating route labelling, symbols, scales, font size, legends, colours and codes and timing points (these should be universally accessible).

8.2.4.3 Timetables

- New South Wales Ageing and Disability Department (2000) provides specifications for people of different abilities including:
  - font type and size
  - use of contrast, spacing, layout, language
  - paper type.
- Viewing format is also important for blind people using a screen reader (eg web format rather than pdf) (Steinfeld 2014).

8.2.4.4 Wayfinding signs

- Transport New South Wales (2002) suggest guidelines around:
  - consistency (being able to see the next sign, location and appearance of signs)
  - clarity (messages should be unambiguous)
  - simplicity (shortest simplest path)
  - access (placement of signs).

8.3 Monitoring recommendations via each delivery method

8.3.1.1 General comments

While the scope for this project related to the monitoring of systems that were already in place, the project research also noted the importance of fully testing information systems prior to their deployment. Feedback from participants in the user-centred design workshops and the commercial operator interviews recommended end users provide feedback on the delivery methods. Discussion in the implementation plan workshop indicated the current level of monitoring varied greatly and was dependent on whether a part of an information system was being evaluated, or the whole system. For example, Environment Canterbury undertakes approximately 2,500 ‘face-to-face, on bus’ interviews each year to investigate

community satisfaction with the bus system. Some of the questions used are standard questions that the Transport Agency provides as part of their key performance indicator evaluation of Environment Canterbury.

It is important to note that some methods of delivery lend themselves more easily to monitoring than others. For example for provision of online information, online monitoring can be cheaply achieved as each person accesses the information source; whereas provision of paper materials or signage information will require more costly processes such as human contact, or email distribution to obtain feedback. Experience from Environment Canterbury and the wider literature indicates that careful wording of 'stated-preference' questions is also needed, due to regularly observed differences between what people say they will do and what they actually do.

8.3.1.2 Recommendations

The following assessment system should be used for current and future information provision:

- A heuristic (rule-based evaluation) review as part of the pre-release work should be undertaken as part of a low-cost review of existing information. The heuristics can be taken directly from the best practice principles developed in sections 8.1 and 8.2. This goes across different delivery methods as the reviewer would use the best practice principles for the type of delivery method being reviewed.
- Customer feedback with standard questions (to ensure consistency) should be undertaken on an annual basis (we understand this is already happening within public transport). In addition, the traveller satisfaction data already collected by local and regional authorities could be collated on a national level. Customer feedback could also be captured through online feedback channels such as Facebook, webpages and Twitter. However, it should be noted that these approaches tend to oversample people comfortable with the technology. Therefore they should be done in parallel with complementary methods.
- Customer feedback should also seek to monitor changing customer preferences for information delivery over time, so that continual improvements can be made.

8.3.1.3 Standardised questions should include the following areas:

1 Level of satisfaction with travel information systems/channels/content. Use of, access to, perception of and need for channel/content

2 Standardised demographic information: eg age, gender, access to other modes, level of mobility

3 Level of satisfaction with information: timeliness, accuracy, availability, accessibility

4 The effect of travel information on trip comfort/reduced frustration (ie simply knowing why they are 'stuck')

5 Ease of use of channel, for example, how quickly and simply can a user access the primary information they need (ie how many 'clicks' or how much 'clutter')?

6 Effect of travel information systems/channels/content on individual travel behaviours. Behavioural measures include changes to route, mode, departure time, destination, or an avoided trip, where such changes may result in, for example:

   a improved arrival time reliability

b travel time reductions

c increased travel predictability.

A usability study should be undertaken for any areas presenting poor customer feedback so that issues can be further investigated to ensure solutions do not create more problems. The usability study should take into account the different types of users the information is designed for.

For key corridors in main centres where travel time information is/could be provided, evaluations using modelling and/or simulation to investigate the effect travel information provision has/may have on the transport network performance could be conducted.

8.4 Recommended prioritised list of tasks

Building on the findings from this report it is recommended that the following work streams be undertaken.

8.4.1 Step 1: Agree priorities and get 'buy-in' within the wider transport industry

We recommend the formation of a working group to agree on the purpose and priorities and get 'buy in' for an improved information provision system. Development of this system will require ongoing inputs from a wide range of groups from within the transport sector, including from local and regional councils. Necessary inputs from other groups will include improvements in the collection, analysis and updating of data. In conjunction with improving the information provision system, it would be timely to also agree with other groups how the information provision may feed into other Transport Agency key performance indicators, eg congestion. Information from this implementation plan should be used to generate discussion with the understanding that this report contains priorities from a user-centred approach. We recommend that a good starting point for this work would be the Transport Agency website and the 'on-the move' information, so these are able to push out the information wanted by motor vehicle and commercial operators. Public transport information needs should be discussed further with public transport information providers in step 3 below.

This stage should also seek to get a national understanding of the information provision trials currently being undertaken to ensure new developments are progressed in a consistent way, and that any learnings are captured nationwide.

Not obtaining accurate information is currently the biggest barrier to implementing a useful travel information provision system.

8.4.2 Step 2: Take a look at the available data

Once priorities for an improved information provision system are agreed, a review of the available data used for information provision should be undertaken. Currently, the Transport Agency and partners collect and analyse a wide range of data for a multitude of purposes. Some of this data may be re-purposed to provide information to the transport sector and the public in general. This review should be undertaken in conjunction with developers and information specialists and should contain the following actions:

- Agree to normalise data sources.

- Identify which data is available to third party developers in an open and free form, as well as which data should be converted to this form where it is not already. For example, agencies may share their data with Google Maps, but not make the same feed available for free to third party developers. Open and free is ideal since it allows third parties to make tools and apps specific to their own needs without the added cost of buying the feed.
- Agree on the standards for simplifying data exchange. This would enable developers to take a look at what is available, as well as ensure a consistent approach is taken. It would also allow commercial operators to integrate the data into their existing programmes/apps so that operators could have all information contained within one app/system.
- Agree on standards regarding data accuracy and validation when using data from different sources. As an example, one external developer provided the following comment; 'at the moment there is a wide range of data being collected from different sources. As this data gets measured differently, eg blue tooth, magnetic loops, radar detection, density of traffic, it can lead to customer confusion over terms like journey times, resulting in the whole system appearing inaccurate'.
- Agree to improve the quality of geo-data incident information that currently goes through the TREIS system. The quality of this data is one of the main reasons private developers are less interested in taking this source of information.
- Set standards for improving notification of planned events.
- Continue the Transport Agency's 'one network approach' to provide more information on key routes as opposed to state highways. In conjunction with this, it is understood that a business case has been completed[23] with respect to providing a 'centrally managed road speed limit map for New Zealand'[24]. We recommend that this action be progressed through to the next safer journeys action plan

Provision of data that is accurate and easy to use will encourage external developers to develop and push out travel information. There should also be ongoing monitoring efforts undertaken with respect to new developments in technologies (eg vehicle to vehicle, vehicle infrastructure, crowdsourced information and other community-based information exchanges) to ensure that information provision efforts are in line with current technologies and the way they are utilised[25].

8.4.3 Step 3: Develop operating procedures

Operating procedures should be developed in conjunction with the people who will be operating the system. Development of operating procedures for public transport should include participants from local and regional councils.

These guidelines should include usability best practice for making information easy to understand including the use of:

- common terms for locations, directions, landmarks, delays, incidents and instructions

[23] B Burdett (Traffic Design Group), pers comm, May 2015

[24] Action 21 of the Intelligent Transport Systems Technology Action Plan 2014–18, Transport in the digital age. May 2014

[25] C Kim (Ministry of Transport), pers comm, May 2015

- a consistent format and style of information across different channels
- a consistent approach for verified and unverified information (note: the approach may be to let the user select either option).

The best practice guidelines for these standards can be taken from section 8.2 of this report and further developed to be location specific. The priority areas on which to concentrate the development of such guidelines would be public transport and real-time information.

Policies and procedures for the use of social media should be developed, including staff codes of conduct.

The development of such guidelines is supported by best practice recommendations regarding consistency. It is also supported by the general public and commercial operators who have asked for consistency across implementations. Development of consistent operating procedures will remove the barrier New Zealanders currently face of having to 're-learn' information systems when they go to different towns, and will encourage a more frequent use of travel information.

Once the guidelines have been developed, training of staff putting out information should also take place.

8.4.4 Step 4: Formalise incident management communication between agencies

Agencies in the transport sector should work together to develop and formalise incident management communication. The goal of this work should be to provide a coordinated information response to incidents so that one single message goes out; for example, if there is a major delay on the network but buses and trains are able to bypass the hold-up, then all agencies responsible for pushing out information should advise people to take public transport. This will increase the credibility of all agencies involved.

8.4.5 Step 5: Apply the developed standards to existing trials or implementations

Once the above steps have been taken, current implementations, apps etc should be evaluated using the best practice criteria. Areas for improvement should be identified and the appropriate actions taken. User-testing should be undertaken to ensure that the 'end users' find the systems useful and easy to use.

8.4.6 Step 6: Undertake ongoing monitoring

Using the agreed purpose and priorities of an improved information provision system, standard questions should be developed for assessing different aspects of the system. Ongoing monitoring of the system should be undertaken in accordance with the recommendations in section 8.3.

8.5 Addressing barriers to implementing the plan

The following barriers to implementing the recommendations have been identified:

Getting 'buy-in' from all the transport sector agencies to implement changes may be difficult. Input from other parties will be required to improve the information provision, but it is noted that each stage will incur costs and may change people's work priorities. For example, improving the accuracy and increasing the number of updates received when an incident occurs will involve a cost and a change in priority for the

contractor or person on site. Similarly, sharing information between organisations will also incur a cost for the parties involved and may change the priorities of action for the person involved in the communication. It will be therefore necessary to get buy-in at a high level within each organisation.

There may be resistance to developing nationwide operating procedures for information provision as each organisation has been undertaking development of their own information provision which is often tied into other marketing initiatives and campaigns. A working group should be set up to try to ensure that best practice is captured, the standards do not become too onerous and local authorities maintain the ability to push their own information out.

9 Conclusion and recommendations

9.1 Conclusion

This project has achieved all the objectives of the project brief, which included providing guidance in the following four broad areas:

1 What are the delivery methods the transport sector should focus its efforts on, and in what order should these be prioritised?

2 What recommendations and guidelines for best practice should be used for each of the different delivery methods?

3 How should the traveller information delivery methods be evaluated to compare their benefits and effectiveness?

4 What prioritised tasks should the transport sector take to improve the provision of travel information.

In general, the research found a need for accurate, timely information delivered in a user-friendly manner, with websites, smartphone apps, radio and navigation systems priorities for private motor vehicle users and commercial operators. Public transport users prioritised smartphone apps, websites, paper timetables/brochures and voice announcements at stops.

While delivery channels did not vary greatly across locations, information content needs were varied. For example, main metropolitan areas faced more complicated information needs (eg scheduled and unscheduled delays and congestion) and were interested in optimising their journey times, while in regional locations, needs related to delays and detours, particularly relating to unexpected weather events. In rural areas, needs related to road closures in critical events, and public transport information was a low priority given the limited levels of service in these areas.

9.2 Recommendations

The prioritised list of recommended tasks from chapter 8 includes:

- agreeing priorities and getting ‘buy-in’ within the wider transport industry
- improving the data quality and ease with which it can be exchanged
- developing operating procedures for people putting out information to ensure consistency
- formalising incident management communication between agencies involved in distributing information
- applying the developed standards to existing trials and implementations
- undertaking ongoing monitoring.

In addition, while provision of information for people who have different needs (either in their ability to access information, transport options, or to physically navigate public transport systems) was outside the scope of this project, it is recommended that travel information accessibility be further investigated and progressed in the future. This could include the integration of cycling and walking information provision.

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Appendix A. Secondary analysis supplementary tables

Table A.1 Baseline access to different travel information service types by area lived

	Urban		Suburban		Rural		Sig.
	N	%	N	%	N	%	
Websites	402	94.1	675	94.6	132	96.8	
Paper-based information (eg maps, timetables)	263	61.5	475	66.5	98	71.7	
Real-time information at public transport stops	252	59.1	419	58.7	62	45.4	*
Variable message signs (VMS)	215	50.3	407	57.0	77	56.1	
Signage at public transport stops	241	56.4	397	55.5	52	38.3	***
GPS navigation systems	205	47.9	332	46.5	60	44.1	
Radio	166	38.8	297	41.6	58	42.8	
Mobile phone apps	170	39.9	265	37.1	39	28.7	
In person with a staff member	122	28.6	137	19.1	33	24.3	***
Voice announcements at public transport stops	76	17.8	127	17.7	24	17.5	
Telephone services (eg call centres)	65	15.3	102	14.3	24	17.3	
Total	427	–	714	–	136	–	

* p<.05, *** p<.001

Table A.2 Baseline access to different travel information service types by age group

	16–34 years		35–64 years		65+ years		Sig.
	N	%	N	%	N	%	
Websites	288	95.7	764	95.1	157	91.0	
Paper-based information (eg maps, timetables)	178	59.1	533	66.3	125	72.6	**
Real-time information at public transport stops	213	70.9	436	54.3	84	48.5	***
Variable message signs (VMS)	126	41.9	469	58.4	103	59.6	***
Signage at public transport stops	198	65.9	415	51.7	76	44.2	***
GPS navigation systems	150	49.9	376	46.8	71	41.1	
Radio	92	30.6	355	44.1	75	43.3	***
Mobile phone apps	163	54.3	283	35.2	28	16.2	***
In person with a staff member	67	22.2	181	22.6	44	25.3	
Voice announcements at public transport stops	58	19.3	141	17.5	28	16.0	
Telephone services (eg call centres)	24	8.1	145	18.1	21	12.3	***
Total	301	–	804	–	173	–	

** p<.01, *** p<.001

Table A.3 Current level of access to, and mean helpfulness rating of, mode comparison travel information types (ordered by most frequently accessed to least and split by area type)

	Urban (N=427)				Suburban (N=714)				Rural (N=136)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Public transport timetables	4.2	1.0	383	89.8	4.2	0.9	649	90.8	4.4	0.7	110	81.0
Travel time by different modes	4.0	0.9	343	80.5	4.0	0.9	543	76.0	3.8	1.0	101	74.3
What modes are available for a journey	3.9	0.8	319	74.8	3.8	1.0	505	70.7	3.8	0.7	98	71.8%
Travel costs by different modes	3.8	1.0	323	75.7	3.8	1.0	477	66.8	3.6	1.1	93	68.4
Ridesharing information	2.9	1.0	161	37.7	2.9	1.1	222	31.0	2.6	1.0	42	1.7

Table A.4 Current level of access to, and mean helpfulness rating of, route- specific travel information types (ordered by most frequently accessed to least and split by area type)

	Urban (N=427)				Suburban (N=714)				Rural (N=136)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Directions	4.1	0.9	393	92.0	4.2	0.9	625	87.6	4.1	1.0	116	85.3
Alternative routes	4.0	0.8	377	88.3	4.0	0.9	588	82.4	3.8	1.1	121	89.0
Pictures/names of key route landmarks	3.9	0.9	339	79.4	3.9	0.9	507	70.9	3.6	1.2	98	72.1
Comparison trip times for different travel times/days	4.0	0.9	322	75.5	3.9	0.9	505	70.7	3.7	1.1	103	75.9

Table A.5 Current level of access to, and mean helpfulness rating of, provision of facilities travel information types (ordered by most frequently accessed to least and split by area type)

	Urban (N=427)				Suburban (N=714)				Rural (N=136)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Route maps	4.3	0.9	415	97.3	4.2	0.8	645	90.3	4.1	0.8	126	92.3
Location of points of interest	3.9	1.0	333	78.0	4.0	0.9	499	69.9	3.7	0.9	95	69.5
Location of parking	3.8	1.0	292	68.4	3.7	1.1	484	67.8	3.5	1.1	100	73.7
Walking routes/journey times	3.9	1.0	334	78.2	4.0	0.8	451	63.1	3.8	0.8	90	66.3
Location of public toilets and rest areas	3.9	1.1	299	70.1	3.9	1.1	476	66.6	3.6	1.1	91	66.7
Location of park-and-ride facilities	3.6	1.1	223	52.2	3.5	1.1	344	48.2	3.1	1.1	60	44.1
Cycling routes/journey times	3.6	1.1	225	52.8	3.7	1.0	306	42.8	3.4	1.0	52	38.4
Presence of steep hills/slopes	3.4	1.1	215	50.4	3.4	1.1	310	43.4	3.2	1.1	57	42.0
Location of unlit roads	3.0	1.0	161	37.8	3.0	1.2	225	31.5	2.7	1.2	35	26.0
Disability information	3.0	1.0	120	28.1	3.3	1.0	186	26.1	3.7	1.0	25	18.5

Table A.6 Current level of access to, and mean helpfulness rating of, real- time travel information types (ordered by most frequently accessed to least and split by area type)

	Urban (N=427)				Suburban (N=714)				Rural (N=136)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Next bus information	4.3	0.8	360	84.3	4.2	0.9	563	78.8	4.4	0.7	89	65.4
Weather conditions	4.0	0.9	340	79.8	4.2	0.8	538	75.3	3.9	1.2	109	80.1
Location of road closures	3.8	1.2	336	78.6	4.0	1.2	528	73.9	3.9	1.1	110	80.6
Location of road works	3.8	1.2	318	74.5	3.9	1.1	502	70.3	3.7	1.2	98	72.0
On-board public transport (eg next stop information)	3.9	1.1	311	72.8	4.0	1.0	487	68.3	3.7	1.3	79	57.6
Roading conditions (eg presence of ice/snow)	4.0	1.0	307	72.0	4.1	0.9	445	62.3	4.0	1.1	116	85.0
Location of traffic incidents	3.7	1.1	282	66.2	3.8	1.1	434	60.7	3.6	1.3	91	66.4
Anticipated travel times based on real-time updates	3.8	1.1	281	65.8	4.0	1.0	441	61.8	3.9	1.2	74	54.2
In-vehicle navigation information (eg GPS system)	4.2	0.9	280	65.7	4.3	0.9	430	60.2	4.5	0.8	80	58.6
Parking availability information	3.9	1.0	257	60.3	3.8	1.1	416	58.2	4.0	1.0	81	59.1
Congestion information	3.6	1.2	272	63.7	3.7	1.2	397	55.6	3.5	1.3	80	58.9
Traffic cameras (in real-time)	3.5	1.1	206	48.3	3.6	1.1	344	48.1	3.2	1.3	61	44.8
Information gathered from other travellers (eg crowdsourced information)	3.7	1.0	204	47.8	3.8	0.9	294	41.2	3.6	0.9	65	47.7
Next train information	4.1	0.9	185	43.4	4.1	0.9	242	33.9	4.6	0.6	41	30.1
Next ferry information	4.1	0.9	161	37.8	4.1	0.8	221	30.9	4.6	0.6	55	40.5

Table A.7 Current level of access to, and mean helpfulness rating of, mode comparison travel information types (ordered by most frequently accessed to least and split by age group)

	16–34 years (N=301)				35–64 years (N=804)				65+ years (N=173)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Public transport timetables	4.3	0.9	285	94.9	4.2	0.9	723	90.0	4.2	0.9	134	77.6
Travel time by different modes	4.1	0.9	261	86.6	4.0	0.9	618	76.9	3.8	0.9	109	63.2
What modes are available for a journey	3.9	0.9	248	82.4	3.9	0.9	553	68.7	3.8	0.9	122	70.4
Travel costs by different modes	3.8	1.0	233	77.5	3.8	1.0	567	70.6	3.4	1.0	93	54.1
Ridesharing information	3.0	1.0	139	46.3	2.8	1.1	266	33.0	2.4	0.6	20	11.3

Table A.8 Current level of access to, and mean helpfulness rating of, route- specific travel information types (ordered by most frequently accessed to least and split by age group)

	16–34 years (N=301)				35–64 years (N=804)				65+ years (N=173)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Directions	4.2	0.9	283	94.0	4.2	0.9	705	87.7	4.0	1.0	147	85.1
Alternative routes	4.0	0.9	268	89.1	4.0	0.9	682	84.8	4.0	0.8	137	79.5
Pictures/names of key route landmarks	3.8	1.0	251	83.6	3.9	1.0	574	71.3	3.9	0.9	119	68.8
Comparison trip times for different travel times/days	4.0	1.0	249	82.8	3.9	0.9	580	72.2	3.8	0.9	101	58.8

Table A.9 Current level of access to, and mean helpfulness rating of, provision of facilities travel information types (ordered by most frequently accessed to least and split by age group)

	16–34 years (N=301)				35–64 years (N=804)				65+ years (N=173)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Route maps	4.2	0.8	285	94.7	4.2	0.8	753	93.6	4.2	0.9	149	86.2
Location of points of interest	3.8	1.0	234	78.0	4.0	0.9	575	71.5	4.0	0.8	118	68.2
Location of parking	3.5	1.1	217	72.0	3.8	1.0	560	69.6	3.8	1.2	100	57.8
Walking routes/journey times	3.9	1.0	239	79.5	3.9	0.9	564	70.1	3.9	0.7	72	41.7
Location of public toilets and rest areas	3.7	1.1	215	71.6	3.9	1.1	524	65.2	3.9	1.0	126	73.2
Location of park-and-ride facilities	3.4	1.1	174	58.0	3.6	1.1	385	47.8	3.5	1.1	69	39.7
Cycling routes/journey times	3.6	1.1	185	61.7	3.7	1.0	358	44.5	3.1	1.2	41	23.5
Presence of steep hills/slopes	3.3	1.1	171	56.8	3.4	1.1	358	44.5	3.4	1.2	54	31.4
Location of unlit roads	3.1	1.1	138	46.0	3.0	1.2	258	32.0	2.3	1.2	26	15.1
Disability information	3.1	1.0	96	32.0	3.3	0.9	215	26.8	3.0	1.4	20	11.3

Table A.10 Current level of access to, and mean helpfulness rating of, real- time travel information types (ordered by most frequently accessed to least and split by age group)

	16–34 years (N=301)				35–64 years (N=804)				65+ years (N=173)			
	Mean	SD	N accessed	%	Mean	SD	N accessed	%	Mean	SD	N accessed	%
Next bus information	4.2	0.9	272	90.4	4.3	0.8	621	77.3	4.1	0.9	119	68.7
Weather conditions	3.8	0.9	226	75.3	4.2	0.9	629	78.2	4.1	0.9	132	76.6
Location of road closures	3.7	1.2	244	81.1	4.0	1.2	603	75.0	4.0	1.1	127	73.5
Location of road works	3.7	1.2	237	78.8	3.9	1.1	565	70.2	3.8	1.2	116	67.5
On-board public transport (eg next stop information)	3.9	1.2	241	80.1	4.0	1.1	537	66.8	4.2	0.8	98	57.0
Roading conditions (eg presence of ice/snow)	3.9	1.0	196	65.2	4.1	0.9	560	69.7	4.2	0.9	111	64.6
Location of traffic incidents	3.5	1.1	206	68.6	3.8	1.1	500	62.2	4.0	1.0	100	58.0
Anticipated travel times based on real-time updates	3.8	1.2	212	70.4	3.9	1.0	487	60.6	4.1	1.0	97	56.2
In-vehicle navigation information (eg GPS system)	4.2	0.9	201	66.9	4.3	0.9	498	62.0	4.3	0.9	91	52.7
Parking availability information	3.7	1.0	179	59.4	3.9	1.0	483	60.1	4.0	1.2	92	53.4
Congestion information	3.4	1.3	191	63.5	3.7	1.2	490	60.9	4.0	1.0	68	39.6
Traffic cameras (in real-time)	3.4	1.1	146	48.6	3.5	1.1	383	47.6	3.7	1.1	82	47.7
Information gathered from other travellers (eg crowdsourced information)	3.7	1.1	142	47.2	3.8	0.9	348	43.3	3.7	0.9	73	42.5
Next train information	3.9	1.0	124	41.1	4.2	0.9	279	34.6	4.3	0.5	66	38.3
Next ferry information	3.9	0.9	110	36.5	4.2	0.8	271	33.7	4.4	0.5	57	32.8

Table A.11 Quality of traveller information services accessed scale item statistics by age group (arranged highest mean to lowest)

	16–34 years (N=301)			35–64 years (N=804)			65+ years (N=173)		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
In general, the traveller information services I have used in the past 12 months…									
Are easy to use and understand	297	3.8	0.8	792	3.9	0.6	173	3.7	0.9
Generally come from trustworthy sources	282	3.9	0.8	727	3.8	0.7	164	3.9	0.5
Provide very helpful information	297	3.8	0.8	796	3.8	0.6	173	3.7	0.7
Provide me with route-specific information	284	3.7	0.9	750	3.7	0.7	158	3.7	0.7
Provide value for money	266	3.4	1.0	687	3.5	0.8	149	3.3	0.8
Provide reliable and accurate information	295	3.5	0.8	784	3.5	0.7	161	3.5	0.7
Are highly customisable	268	3.2	1.0	660	3.1	1.0	142	3.4	1.0
Provide consistent information between sources	266	2.8	1.0	692	2.9	0.9	144	2.9	0.7
Are updated regularly (and so provide up-to-date information)	289	3.2	1.1	743	3.1	0.9	151	3.1	0.8
Provide comprehensive information	287	3.0	1.1	754	3.1	0.9	151	3.0	0.8
Cover multiple modes in one tool (eg I can compare car, public transport, cycling and walking options on one site)	263	3.0	1.0	617	2.9	1.0	118	2.7	1.0

Table A.12 Information provision technologies available in freight vehicles (arranged highest to lowest)

	N	%
Cell 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	–

[(a)] 'Other' technologies available specified included: internet/3G data connection, map books, pilot, and general knowledge.

Table A.13 Baseline access to traveller information service types/sources for freight drivers (arranged highest to lowest)

	N	%
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 apps	29	43.9
Total	66	–

Table A.14 Current level of access to and mean helpfulness rating of traveller information types for freight drivers (arranged most helpful to least)

	Mean	SD	N	%
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	53	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 road works	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 [(a)]	3.0	1.0	16	29.6

[(a)] 'Other' information types specified included: local knowledge and traffic reports.

Table A.15 Quality of traveller information services accessed item means for freight drivers (arranged highest mean to lowest)

	Mean	Standard deviation
In general, the traveller information services I have used in the past 12 months…		
Are easy to use and understand	4.0	0.7
Provide very helpful information	3.8	0.7
Generally come from trustworthy sources	3.8	0.6
Provide reliable and accurate information	3.7	0.7
Provide me with route-specific information	3.6	0.8
Provide value for money	3.5	0.8
Are highly customisable	3.2	0.8
Provide consistent information between sources	3.0	0.9
Provide comprehensive information	2.8	1.0
Are updated regularly (and so provide up-to-date information)	2.7	0.9

Appendix B: Script for user- centred design workshop

B1 Detailed customer requirements of current and future travel information

B1.1 Project purpose

The purpose of this design workshop is to investigate what transport/traffic information would be useful to you and to determine how it could be best presented it to you.

This work is sponsored by the NZ Transport Agency with the intention 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.

The outputs of this work will be shared with the NZ Transport Agency and published in a report.

B1.2 Introductions/design workshop etiquette:

- Each person to introduce self and talk about how they currently travel around (Jo to start)
- Courtney to record demographic and current travel behaviour information
- Toilet breaks, emergency exit information and request cell phones 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 NZ 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-tapped to allow us to analyse information after the session.

B1.3 Discuss scenarios that would want info for and how that info might differ according to the following:

- Driving vs taking the bus
- New to area or mode (or just new trip) vs know trip and know the mode
- Reason for trip (work, commute, holiday)
- Pre-trip and after having started trip.

What's already working well and where are there gaps

Prompts.....

- 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
- Public transport information
- Travel times.

Decide a set of scenarios from the above information

- Sort the scenarios by importance using cards (need to have both personal car travel as well as public transport).
- Run through scenarios one at a time. Determine what different display mechanisms (see sheets) people expect/want to see where? For each mechanism fill out:
  - what message you want (include wording if appropriate)
  - any rules for displaying (prompt eg only for main corridors, only if delay is going to more than 10 minutes)
  - discuss expert vs novice and reason for trip – if needed may create new cards for differences here.
- Take cards and get participants to sort into the order for priority to develop/have information provided by:
  - Indicate which items are must have and which are nice to have (give a priority)
  - Fix cards back onto the large sheets.

Closing questions

- Collect comments/discussion re: information regularity/unverified info/certainty.

Appendix C: Script for structured interview with commercial operators

Project purpose

The purpose of this design workshop is to investigate what transport/traffic information would be useful to you and to determine how it could be best presented it to you.

This work is sponsored by the NZ Transport Agency with the intention 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.

Information to note:

The information collected today with be shared with the NZ Transport Agency, findings will be published in a NZ Transport Agency report.

Background information

Question	Answer
Number of vehicles	
Geographical area covered	
Load type(s)	
Own business deliveries or commercial deliveries for others	
Hours of operation (per day)	
HPMVs (Yes, No)	
Who determines the routes and how are they determined?	

Question 1

What's already working well and where are there gaps?

Scenario development

We are interested to better understand the scenarios that you would like the NZ Transport Agency to prioritise providing travel information about.

Don't break these down at the beginning…….

Pre-trip

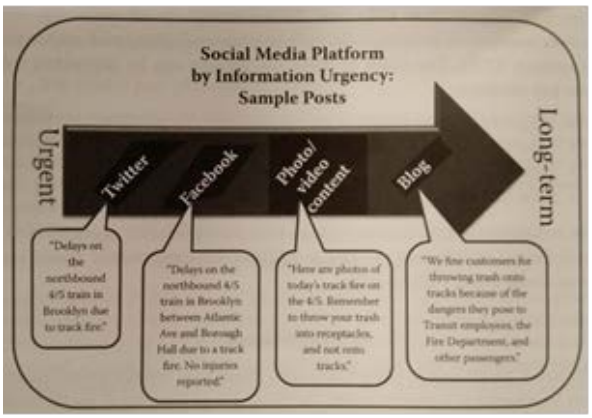
- Route-planning information that provides accurate journey times for different days/times
- Points of interest (rest areas, petrol stations) suitable for your types of vehicle
- Weather forecasts/safety information
- Locations that have height or weight restrictions

In-trip

- Travel time information
- Updates on conditions that might cause delays and re-routing (eg weather/incidents/congestion) targeted to your 'type' of vehicle
- Forecasts/safety information

Prompts

- Planned events (road works) vs unplanned events (accidents)
- Experience level (in job or in area)
- Timeline of the event



From: Bregman and Watkins (2013).

Display method prioritisation

- Pre-trip information needs vs in-trip
- Level of detail and timeline of event

1 Sort info from above into the different display mechanisms (see sheets)

2 For each display mechanisms note:

a the message you want (include wording if appropriate)

b any rules for displaying (prompt eg only for main corridors, only if delay is going to more than 10 minutes)

3 Indicate which items are must have and which are nice to have (give a priority)

4 Overall questions

a Comment on the regularity of information/unverified info/certainty

b How does this fit in with level of detail, timing of the information coming out.

Ask participants to picture how/what information they would like and how might this change when making different types of trips?

- 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 consider alternatives for/how often do you take these trips?
- What access to technology (computer/smartphone) do you currently have and what do you plan to buy within the next year?
- Other comments.

User	Summary of potential information need
Freight	• Pre-trip – route planning information that provides accurate journey time • Road works • 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

Thank you!

Appendix D: User- intercept surveys

User-intercept survey – private motor vehicle needs

1.	Please indicate which of the following transport modes you EVER use to make any trips (tick all that apply)		
	☐	Bus	
	☐	Train	
	☐	Ferry	
	☐	Private motor vehicle	
	☐	Other	_____

2.	What is the MAIN transport mode you used to get here today?	
	☐	Bus
	☐	Train
	☐	Ferry
	☐	Private motor vehicle
	☐	Other _____

3.	How often do you make this trip, using this mode?				
	First time today	A few times a year	A few times a month	A few times a week	Daily
	☐	☐	☐	☐	☐

4.	Did you consult any of the following information sources before you commenced this trip today? (tick all that apply)	
	☐	A website
	☐	*Traffic webcams*
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Other _____

5.	Over the past week, have you consulted any of the following information sources before you commenced a trip? (tick all that apply)		
	☐	A website	
	☐	*Traffic webcams*	
	☐	GPS navigation	
	☐	*A smartphone application*	
	☐	*GPS unit in vehicle*	
	☐	*Website eg Google Maps*	
	☐	Another smartphone application	
	☐	A paper timetable or brochure	
	☐	A telephone information service	
	☐	TV or radio	
	☐	Person-to-person	
	☐	Phone call	
	☐	Social media	
	☐	Travel time on main corridors	
	☐	Other	_____

6.	Did you consult any of the following information sources DURING your trip today? (tick all that apply)		
	☐	A website	
	☐	GPS navigation	
	☐	*A smartphone application*	
	☐	*GPS unit in the vehicle*	
	☐	*Website eg Google Maps*	
	☐	Another smartphone application	
	☐	A paper timetable or brochure	
	☐	A telephone information service	
	☐	TV or radio	
	☐	Person-to-person	
	☐	Phone call	
	☐	Social media	
	☐	Travel time on main corridors	
	☐	Information provided on signs and screens at transport stops	
	☐	Information provided on signs and screens on public transport	
	☐	Voice announcements at transport stops	
	☐	Information provided on variable message signs on road (eg on the motorway)	
	☐	Other	_____

7.	Over the past week, have you consulted any of the following information sources during any trip? (tick all that apply)	
	☐	A website
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in the vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Information provided on signs and screens at transport stops
	☐	Information provided on signs and screens on public transport
	☐	Voice announcements at transport stops
	☐	Information provided on variable message signs on road (eg on the motorway)
	☐	Other _____

8.	How easy do you think it is to find the information you need to make a trip by public transport in your city?				
	Very easy	Easy	Not sure/neutral	Hard	Very hard
	☐	☐	☐	☐	☐

9.	How easy do you think it is to find the information you need to make a trip by private motor vehicle in your city?				
	Very easy	Easy	Not sure/neutral	Hard	Very hard
	☐	☐	☐	☐	☐

10.	Overall, how satisfied are you with the quality of the travel information you can access in your city?				
	Very dissatisfied	Dissatisfied	Not sure/neutral	Satisfied	Very satisfied
	☐	☐	☐	☐	☐

Figure D.1 Pre- trip information needs (private motor vehicle)

11.	There are a number of things someone may need to know when making a trip by private motor vehicle. Looking at those listed in the image, and any others you can think of, what information do you think you would find useful in making a trip by private motor vehicle? (tick all that apply)		
	☐	Delays (eg are there any unscheduled delays I need to know about, for example, weather?)	
	☐	Detours (eg scheduled road closures and alternative routes)	
	☐	Parking (eg where and how long can I park that's close to my destination, and how much will it cost?)	
	☐	Trip duration (eg how long will it take me to drive this trip?)	
	☐	Travel time comparison by mode (eg how long would the same trip take by public transport?)	
	☐	Travel cost comparison by mode (eg how much would it cost to drive vs taking public transport?)	
	☐	Route planning	
	☐	Other	_____

12.	Of the information needs you selected above, please select which you think should be the **top three** priorities (in order from 1 being most important to 3 being least important)	
	Delays (eg are there any unscheduled delays I need to know about, for example, weather?)	__
	Detours (eg scheduled road closures and alternative routes)	__
	Parking (eg where and how long can I park that's close to my destination, and how much will it cost?)	__
	Trip duration (eg how long will it take me to drive this trip?)	__
	Travel time comparison by mode (eg how long would the same trip take by public transport?)	__
	Travel cost comparison by mode (eg how much would it cost to drive vs taking public transport?)	__
	Route planning	__
	Other	__

13.	Still thinking about your **top three** information priorities and how this information might be delivered, how would you want to access this information? (tick all that apply)	
	☐	A website
	☐	*Traffic webcams*
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Information provided on variable message signs on road (eg on the motorway)
	☐	Other _____

14.	Still thinking about your **top three** information priorities, how often would you use this information?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

15.	Now thinking about your **number one** priority, is this information currently available (as far as you are aware?)	☐	Yes	☐	No

16.	If yes, how would you rate the quality of this information as it is currently provided?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

17.	If no, if this information were more easily available, how often do you think you would access it?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

18.	How would you most like to receive this information? (tick all that apply)	
	☐	A website
	☐	*Traffic webcams*
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*

18.	How would you most like to receive this information? (tick all that apply)		
	☐	Another smartphone application	
	☐	A paper timetable or brochure	
	☐	A telephone information service	
	☐	TV or radio	
	☐	Person-to-person	
	☐	Phone call	
	☐	Social media	
	☐	Travel time on main corridors	
	☐	Information provided on variable message signs on road (eg on the motorway)	
	☐	Other	_____

Figure D.2 In- trip information needs (private motor vehicle)

19.	There are a number of things someone may need to know during a trip by private motor vehicle. Looking at those listed in the image, and any others you can think of, what information do you think you would find useful when making a trip by private motor vehicle? (tick all that apply)	
	☐	Parking (eg parking availability at my destination, duration and costs)
	☐	Road closures (eg where, and how long is the road closed for, frequency of updates)
	☐	Delays (eg congestion, weather, roadworks)
	☐	Detours (eg alternative routes, impact on travel time)
	☐	Navigation
	☐	Other _____

20.	Of the information needs you selected above, please select which you think should be the **top three** priorities (in order from 1 being most important to 3 being least important)	
	Parking (eg parking availability at my destination, duration and costs)	__
	Road closures (eg where, and how long is the road closed for, frequency of updates)	__
	Delays (eg congestion, weather, roadworks)	__
	Detours (eg alternative routes, impact on travel time)	__
	Navigation	__
	Other	__

21.	Still thinking about your **top three** information priorities and how this information might be delivered, how would you want to access this information? (tick all that apply)	
	☐	A website
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Information provided on variable message signs on road (eg on the motorway)
	☐	Other _____

22.	Still thinking about your **top three** information priorities, how often would you use this information?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

23.	Now thinking about your **number one** priority, is this information currently available (as far as you are aware?)	☐	Yes	☐	No

24.	If yes, how would you rate the quality of this information as it is currently provided?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

25.	If no, if this information were more easily available, how often do you think you would access it?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

26.	How would you most like to receive this information? (tick all that apply)	
	☐	A website
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Information provided on variable message signs on road (eg on the motorway)
	☐	Other _____

27.	Please indicate your level of agreement with the following statements					
		Strongly disagree	Disagree	Not sure/ neutral	Agree	Strongly agree
	As long as it is clear it is not verified, I would rather know about a delay early, than wait until it is verified.	☐	☐	☐	☐	☐
	There is no point in releasing half the information about a delay. It is better to wait until everything is known.	☐	☐	☐	☐	☐
	I get frustrated when updates to traffic information are not delivered at the time they have been promised.	☐	☐	☐	☐	☐
	All information provided to the public about transport delays should be correct and verified, even if that means it is delivered later.	☐	☐	☐	☐	☐

28.	Do you have any general comments about travel information in your city? For example what is good, what is not, what you would like more of, and how you would like it delivered.	
	_____ _____ _____ _____ _____	

29.	Gender	☐	Male	☐	Female

30.	Please indicate your age group					
	16–24	25–34	35–44	45–54	55–64	65+
	☐	☐	☐	☐	☐	☐

31.	Please indicate your main weekly activity	
	☐	Full time work
	☐	Part time work
	☐	Parent/caregiver
	☐	Student
	☐	Unemployed/sickness beneficiary
	☐	Retired
	☐	Other _____

User-intercept survey – public transport needs

1.	Please indicate which of the following transport modes you EVER use to make any trips (tick all that apply)	
	☐	Bus
	☐	Train
	☐	Ferry
	☐	Private motor vehicle
	☐	Other _____

2.	What is the MAIN transport mode you used to get here today?	
	☐	Bus
	☐	Train
	☐	Ferry
	☐	Private motor vehicle
	☐	Other _____

3.	How often do you make this trip, using this mode?				
	First time today	A few times a year	A few times a month	A few times a week	Daily
	☐	☐	☐	☐	☐

4.	Did you consult any of the following information sources before you commenced this trip today? (tick all that apply)	
	☐	A website
	☐	*Traffic webcams*
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio

4.	Did you consult any of the following information sources before you commenced this trip today? (tick all that apply)	
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Other _____

5.	Over the past week, have you consulted any of the following information sources before you commenced a trip? (tick all that apply)	
	☐	A website
	☐	*Traffic webcams*
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Other _____

6.	Did you consult any of the following information sources DURING your trip today? (tick all that apply)
	☐ A website
	☐ GPS navigation
	☐ *A smartphone application*
	☐ *GPS unit in vehicle*
	☐ *Website eg Google Maps*
	☐ Another smartphone application
	☐ A paper timetable or brochure
	☐ A telephone information service
	☐ TV or radio
	☐ Person-to-person
	☐ Phone call
	☐ Social media
	☐ Travel time on main corridors
	☐ Information provided on signs and screens at transport stops

6.	Did you consult any of the following information sources DURING your trip today? (tick all that apply)	
	☐	Information provided on signs and screens on public transport
	☐	Voice announcements at transport stops
	☐	Information provided on variable message signs on road (e.g. on the motorway)
	☐	Other _____

7.	Over the past week, have you consulted any of the following information sources during any trip? (tick all that apply)	
	☐	A website
	☐	GPS navigation
	☐	*A smartphone application*
	☐	*GPS unit in vehicle*
	☐	*Website eg Google Maps*
	☐	Another smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Travel time on main corridors
	☐	Information provided on signs and screens at transport stops
	☐	Information provided on signs and screens on public transport
	☐	Voice announcements at transport stops
	☐	Information provided on variable message signs on road (e.g. on the motorway)
	☐	Other _____

8.	How easy do you think it is to find the information you need to make a trip by public transport in your city?				
	Very easy	Easy	Not sure/neutral	Hard	Very hard
	☐	☐	☐	☐	☐

9.	How easy do you think it is to find the information you need to make a trip by private motor vehicle in your city?				
	Very easy	Easy	Not sure/neutral	Hard	Very hard
	☐	☐	☐	☐	☐

10.	Overall, how satisfied are you with the quality of the travel information you can access in your city?				
	Very dissatisfied	Dissatisfied	Not sure/neutral	Satisfied	Very satisfied
	☐	☐	☐	☐	☐

Figure D.3 Pre- trip information needs (public transport)

11.	There are a number of things someone may need to know when making a trip by public transport. Looking at those listed in the image, and any others you can think of, what information do you think you would find useful in making a trip by public transport? (tick all that apply)		
	☐	Transport routes	
	☐	Bus stop locations (eg how will I recognise where to get off?)	
	☐	Connecting services (eg when the next service I want to take will arrive)	
	☐	Ticket and fare information	
	☐	Attractions near the stop	
	☐	Trip time duration	
	☐	Other	_____

12.	Of the information needs you selected above, please select which you think should be the **top three** priorities (in order from 1 being most important to 3 being least important)	
	Transport routes	__
	Bus stop locations (eg how will I recognise where to get off?)	__
	Connecting services (eg when the next service I want to take will arrive)	__
	Ticket and fare information	__
	Attractions near the stop	__
	Trip time duration	__
	Other	__

13.	Still thinking about your **top three** information priorities and how this information might be delivered, how would you want to access this information? (tick all that apply)	
	☐	A website
	☐	A smartphone application
	☐	A paper timetable or brochure

13.	Still thinking about your **top three** information priorities and how this information might be delivered, how would you want to access this information? (tick all that apply)		
	☐	A telephone information service	
	☐	TV or radio	
	☐	Person-to-person	
	☐	Phone call	
	☐	Social media	
	☐	Other	_____

14.	Still thinking about your **top three** information priorities, how often would you use this information?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

15.	Now thinking about your **number one** priority, is this information currently available (as far as you are aware?)	☐	Yes	☐	No

16.	If yes, how would you rate the quality of this information as it is currently provided?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

17.	If no, if this information were more easily available, how often do you think you would access it?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

18.	How would you most like to receive this information? (tick all that apply)		
	☐	A website	
	☐	A smartphone application	
	☐	A paper timetable or brochure	
	☐	A telephone information service	
	☐	TV or radio	
	☐	Person-to-person	
	☐	Phone call	
	☐	Social media	
	☐	Other	_____

Figure D.4 In- trip information needs (public transport)

19.	There are a number of things someone may need to know during a trip by public transport. Looking at those listed in the image, and any others you can think of, what information do you think you would find useful when making a trip by public transport? (tick all that apply)		
	☐	Next destination (eg what is the next stop, and when will we get there?)	
	☐	My stop (eg how will I recognise my stop, and when will we get there?)	
	☐	Connecting services (eg when does the next service I need leave, including other modes?)	
	☐	Delays (eg congestion, weather, roadworks, or is the service still on schedule?)	
	☐	Route changes (eg diversions)	
	☐	Other	_____

20.	Of the information needs you selected above, please select which you think should be the **top three** priorities (in order from 1 being most important to 3 being least important)	
	Next destination (eg what is the next stop, and when will we get there?)	__
	My stop (eg how will I recognise my stop, and when will we get there?)	__
	Connecting services (eg when does the next service I need leave, including other modes?)	__
	Delays (eg congestion, weather, roadworks, or is the service still on schedule?)	__
	Route changes (eg diversions)	__
	Other	__

21.	Still thinking about your **top three** information priorities and how this information might be delivered, how would you want to access this information? (tick all that apply)	
	☐	A website
	☐	A smartphone application
	☐	A paper timetable or brochure

21.	Still thinking about your **top three** information priorities and how this information might be delivered, how would you want to access this information? (tick all that apply)	
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Information provided on signs and screens at public transport stops
	☐	Information provided on signs and screens on public transport
	☐	Voice announcements at transport stops
	☐	Information provided on variable message signs on road (e.g. on the motorway)
	☐	Other _____

22.	Still thinking about your **top three** information priorities, how often would you use this information?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

23.	Now thinking about your **number one** priority, is this information currently available (as far as you are aware?)	☐	Yes	☐	No

24.	If yes, how would you rate the quality of this information as it is currently provided?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

25.	If no, if this information were more easily available, how often do you think you would access it?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

26.	How would you most like to receive this information? (tick all that apply)	
	☐	A website
	☐	A smartphone application
	☐	A paper timetable or brochure
	☐	A telephone information service
	☐	TV or radio
	☐	Person-to-person
	☐	Phone call
	☐	Social media
	☐	Information provided on signs and screens at transport stops
	☐	Information provided on signs and screens on public transport
	☐	Voice announcements at transport stops
	☐	Information provided on variable message signs on road (eg on the motorway)
	☐	Other _____

27.	Please indicate your level of agreement with the following statements					
		Strongly disagree	Disagree	Not sure/ neutral	Agree	Strongly agree
	As long as it is clear it is not verified, I would rather know about a delay early, than wait until it is verified	☐	☐	☐	☐	☐
	There is no point in releasing half the information about a delay. It is better to wait until everything is known.	☐	☐	☐	☐	☐
	I get frustrated when updates to traffic information are not delivered at the time they have been promised.	☐	☐	☐	☐	☐
	All information provided to the public about transport delays should be correct and verified, even if that means it is delivered later.	☐	☐	☐	☐	☐

28.	As well as public transport within your city, we are interested in the information you would need if you were to, for example, take a bus to another city. Which of the following would you find useful in making an **intercity trip** by public transport, both before, and during your trip? (tick all that apply)	
	☐	Routes
	☐	Bus stop locations (eg how will I recognise where to get off?)
	☐	Connecting services (eg when the next service I want to take will arrive)
	☐	Ticket and fare information
	☐	Trip time duration
	☐	Delays (eg congestion, weather, roadworks, or is the service on schedule)
	☐	Next destination (eg what is the next stop, and when will we get there?)
	☐	Other _____

29.	Do you have any general comments about travel information in your city? For example what is good, what is not, what you would like more of, and how you would like it delivered.
	_____ _____ _____ _____ _____ _____

30.	Gender	☐	Male	☐	Female

31.	Please indicate your age group					
	16–24	25–34	35–44	45–54	55–64	65+
	☐	☐	☐	☐	☐	☐

32.	Please indicate your main weekly activity	
	☐	Full time work
	☐	Part time work

32.	Please indicate your main weekly activity		
	☐	Parent/caregiver	
	☐	Student	
	☐	Unemployed/sickness beneficiary	
	☐	Retired	
	☐	Other	_____

Appendix E: User- intercept survey images

Figure E.1 Private motor vehicle pre- trip information needs

Figure E.2 Private motor vehicle in- trip information needs

Appendix F: Commercial operators online survey

Commercial operator information needs survey

1.	Which of the following terms BEST describes your business?		
	☐	Long-haul freight service	
	☐	Short-haul freight service (across town)	
	☐	Courier service	
	☐	Taxi service	
	☐	Inter-city bus service	
	☐	Intra-city bus service (across town)	
	☐	Other	_____

2.	Approximately how many vehicles do you have in your fleet?				
	Less than 5	5–14	15–29	30–100	Over 100
	☐	☐	☐	☐	☐

3.	Please indicate where your business is primarily based		
	☐	Auckland	
	☐	Dunedin	
	☐	Other	_____

4.	How would you BEST describe the area in which you operate?	
	☐	Urban area
	☐	Suburban area
	☐	Rural area

5.	Does your fleet include HPMV and/or 50MAX vehicles?	
	☐	HPMV only
	☐	50MAX only
	☐	Both HPMV and 50MAX
	☐	Neither

6.	Do you currently use any of the following travel information sources within your business? (select all that apply)	
	☐	Traffic webcams
	☐	Google Maps or other GPS navigation websites
	☐	Other websites
	☐	GPS units in vehicle
	☐	Smartphone applications for GPS navigation
	☐	Other smartphone applications
	☐	Telephone information services

6.	Do you currently use any of the following travel information sources within your business? (select all that apply)	
	☐	TV or radio
	☐	Person-to-person
	☐	Phone calls
	☐	Social media
	☐	Travel time on main corridors
	☐	Information provided on variable message signs on road (eg on the motorway)
	☐	Informal networks (such as driver reports)
	☐	Other _____

7.	How easy do you think it is to find the travel information you need to make your business run efficiently?				
	Very easy	Easy	Not sure/neutral	Hard	Very hard
	☐	☐	☐	☐	☐

8.	Overall, how satisfied are you with the quality of the travel information you can access?				
	Very dissatisfied	Dissatisfied	Not sure/neutral	Satisfied	Very satisfied
	☐	☐	☐	☐	☐

9.	There are a number of types of travel information that could be helpful to a commercial transport operation. Looking at the list below, and any others you can think of, what information do you believe would be beneficial to the running of your business? (select all that apply)	
	☐	Real-time warnings of conditions or situations that would disrupt trips (eg public events)
	☐	Real-time warnings of conditions or situations that would delay trips (eg roadworks, congestion)
	☐	Real-time warnings of conditions or situations that would re-route trips (eg road closures)
	☐	Advanced warnings of conditions or situations that would disrupt trips (eg public events)
	☐	Advanced warnings of conditions or situations that would delay trips (eg roadworks)
	☐	Advanced warnings of conditions or situations that would re-route trips (eg road closures)
	☐	Advanced warnings of new road layouts
	☐	Route planning information by permit type (eg HPMV or 50MAX)
	☐	Route planning information that provides accurate journey times for different days and times
	☐	Points of interest (eg rest areas, petrol stations) that are suitable for your types of vehicles
	☐	Locations that have height or weight restrictions
	☐	Weather forecasts and safety information
	☐	Severe weather information
	☐	Other _____

10.	Of the information needs you selected in the last question, please select which you think should be the **top three** priorities (in order from 1 being most important to 3 being least important).	
	Real-time warnings of conditions or situations that would disrupt trips (eg public events)	___
	Real-time warnings of conditions or situations that would delay trips (eg roadworks, congestion)	___
	Real-time warnings of conditions or situations that would re-route trips (eg road closures)	___
	Advanced warnings of conditions or situations that would disrupt trips (eg public events)	___

10.	Of the information needs you selected in the last question, please select which you think should be the **top three** priorities (in order from 1 being most important to 3 being least important).	
	Advanced warnings of conditions or situations that would delay trips (eg roadworks)	___
	Advanced warnings of conditions or situations that would re-route trips (eg road closures)	___
	Advanced warnings of new road layouts	___
	Route planning information by permit type (eg HPMV or 50MAX)	___
	Route planning information that provides accurate journey times for different days and times	___
	Points of interest (eg rest areas, petrol stations) that are suitable for your types of vehicles	___
	Locations that have height or weight restrictions	___
	Weather forecasts and safety information	___
	Severe weather information	___
	Other	___

11.	Still thinking about your **top three** information priorities from the last question and how this information might be delivered, how would you want to access this information? (select all that apply)	
	☐	Website information service
	☐	Website planning tool
	☐	Webcams
	☐	Email updates at regular intervals (eg every Monday morning)
	☐	Push out notifications via text message
	☐	Push out notifications via email
	☐	Push out notifications via radio
	☐	Push out notifications via smartphone application
	☐	Push out notifications via variable message signs
	☐	Variable message signs or static signage
	☐	In vehicle navigation systems
	☐	Other _____

12.	Again thinking about your **top three** priorities, please indicate how important each of the following characteristics of these services would be.					
		Not at all important	Low importance	Not sure/ neutral	Moderate importance	Very important
	Ability to select a specific geographical area or route of interest	☐	☐	☐	☐	☐
	Ability to select a minimum length of delay time	☐	☐	☐	☐	☐
	Ability to select a specific type of incident of interest	☐	☐	☐	☐	☐
	Ability to select only confirmed reports	☐	☐	☐	☐	☐
	Indication whether the reports are confirmed or unconfirmed	☐	☐	☐	☐	☐
	Estimated impact on journey times	☐	☐	☐	☐	☐
	Provided links to further information	☐	☐	☐	☐	☐

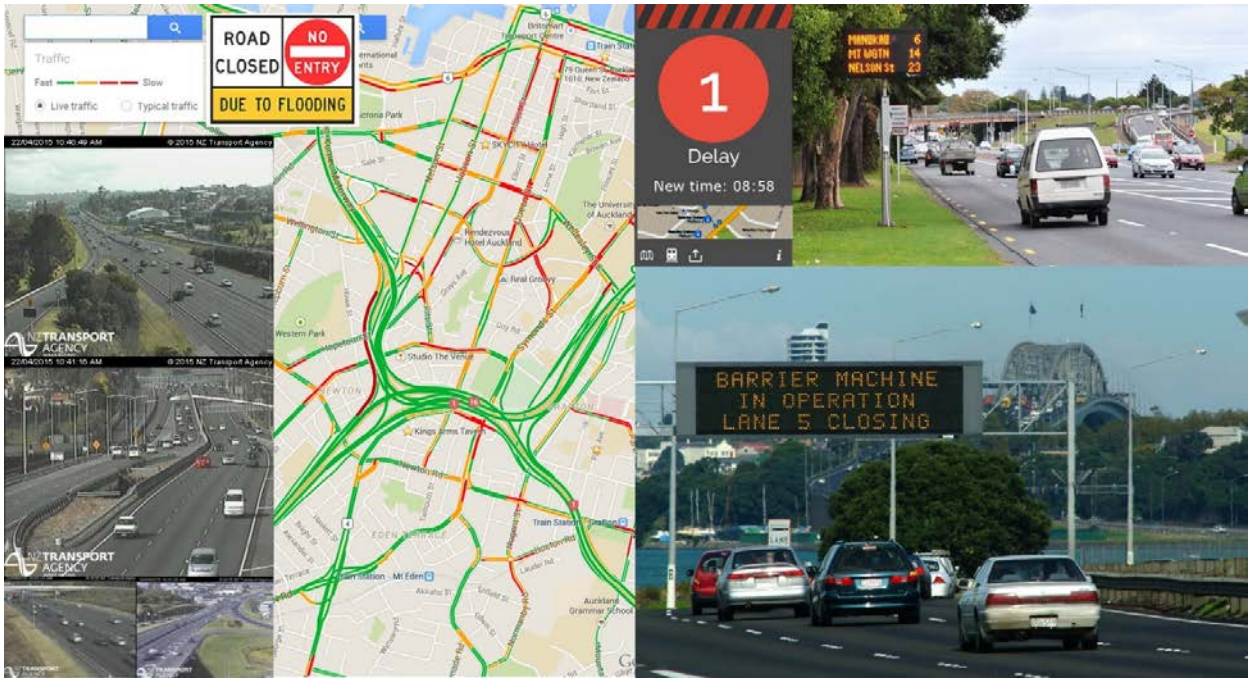
12.	Again thinking about your **top three** priorities, please indicate how important each of the following characteristics of these services would be.					
		Not at all important	Low importance	Not sure/ neutral	Moderate importance	Very important
	Expected times for next information update (eg will be updated in an hour)	☐	☐	☐	☐	☐
	Information specific to state highways	☐	☐	☐	☐	☐
	Information specific to local roads (non-state highways)	☐	☐	☐	☐	☐

13.	Now, thinking about your **number one** priority, is this information currently available (as far as you are aware)?	☐	Yes	☐	No

14.	How would you rate the quality of this information as it is currently provided?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

15.	If this information were more easily available, how often do you think you would access it?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

Over the next few pages, we have a selection of travel information services that could be of benefit to commercial transport operators. We are interested in your opinion of these types of information, what features you would prioritise, and how often you would use these services.

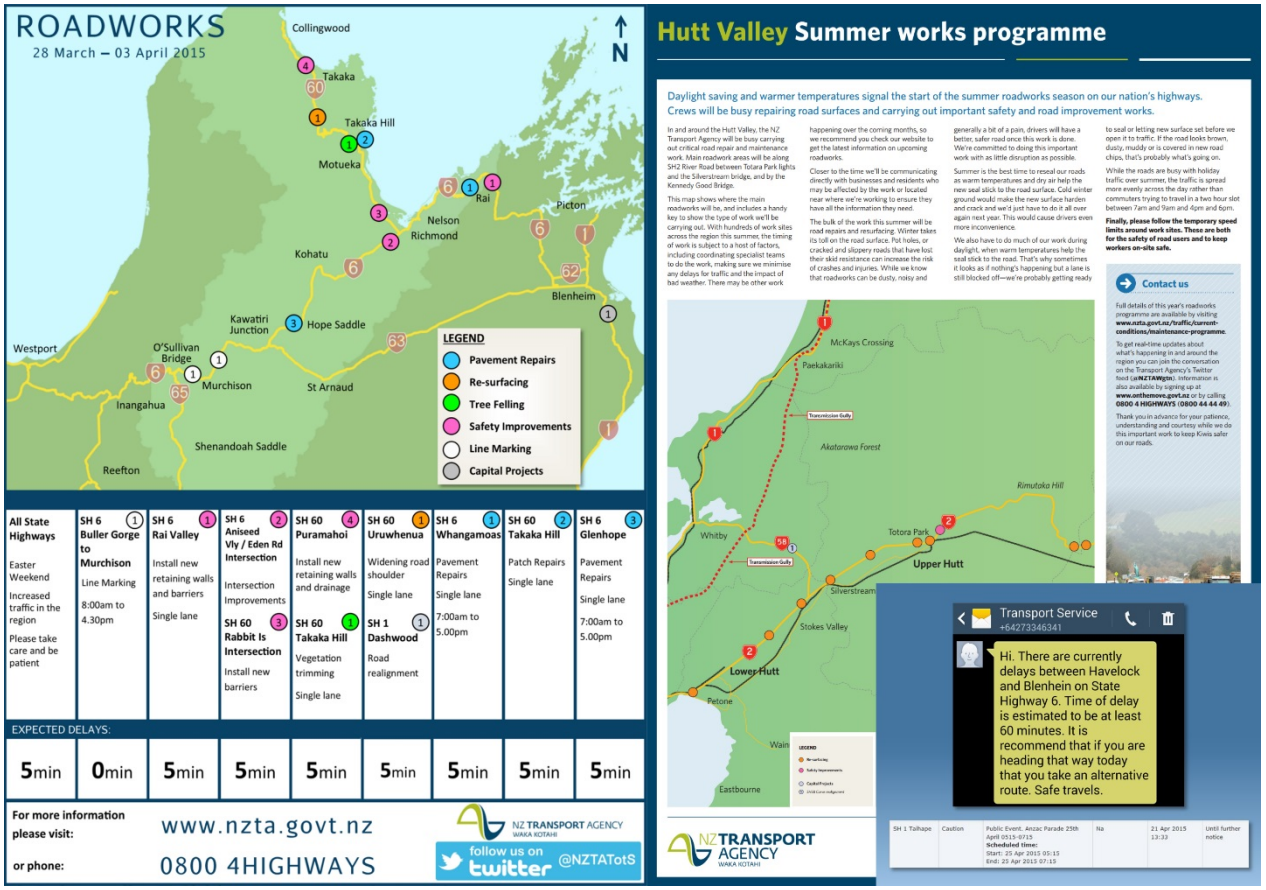


In the above image, there are some examples of the types of information that is, or could be available regarding real- time warnings of conditions that could disrupt, delay, or re- route trips.

16.	How often do you, or would you, use these types of information?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

17.	Where this information is already currently available, how would you rate the quality of this information?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

18.	How would you most like to receive this information? (select all that apply)	
	☐	Website information service
	☐	Website planning tool
	☐	Webcams
	☐	Email updates at regular intervals (eg every Monday morning)
	☐	Push out notifications via text message
	☐	Push out notifications via email
	☐	Push out notifications via radio
	☐	Push out notifications via smartphone application
	☐	Push out notifications via variable message signs
	☐	Variable message signs or static signage
	☐	In-vehicle navigation systems
	☐	Other _____



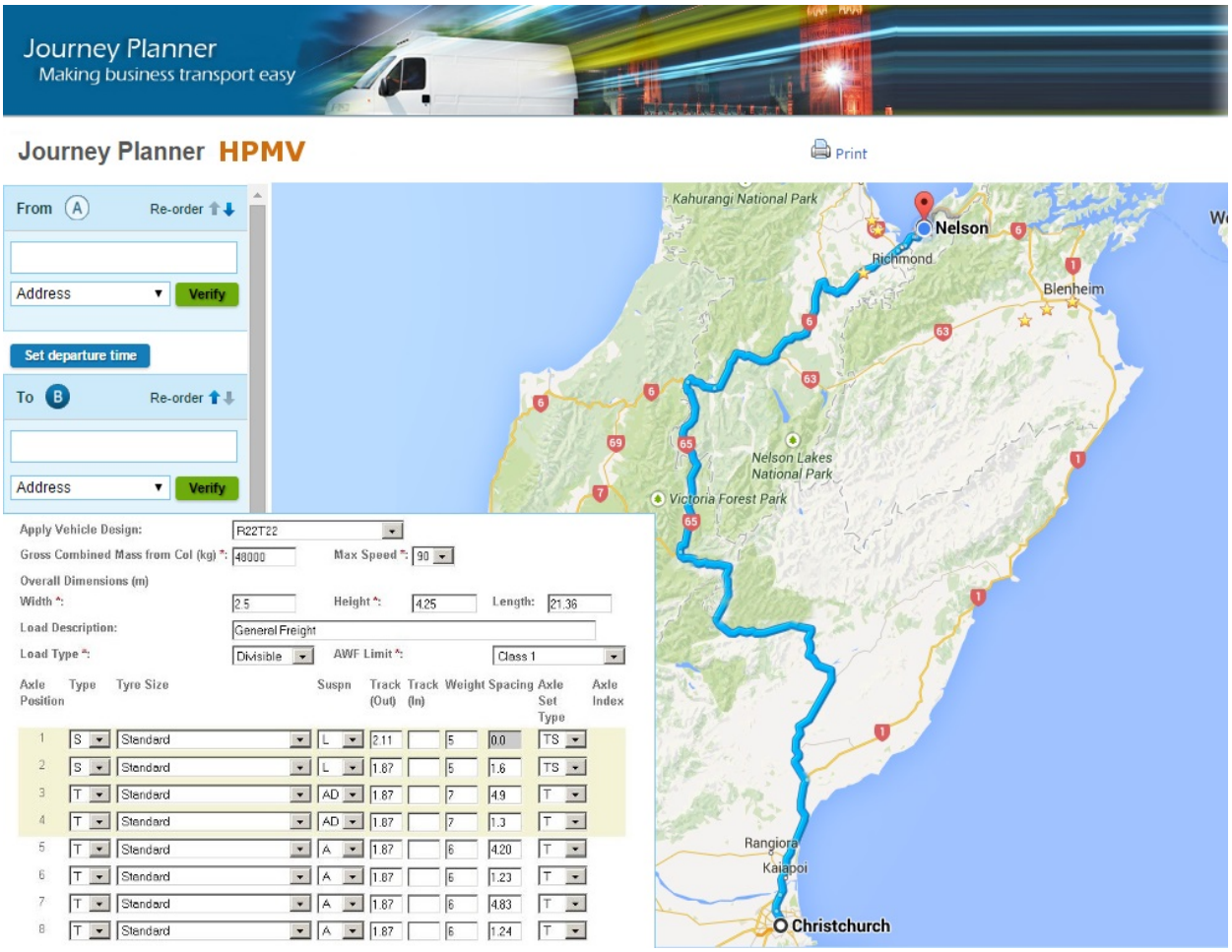
In the above image, there are some examples of the types of information that is, or could be available regarding advanced warnings of conditions that could disrupt, delay, or re- route trips.

19.	How often do you, or would you, use these types of information?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

20.	Where this information is already currently available, how would you rate the quality of this information?				
	Very good	Good	Not sure/neutral	Poor	Very poor
	☐	☐	☐	☐	☐

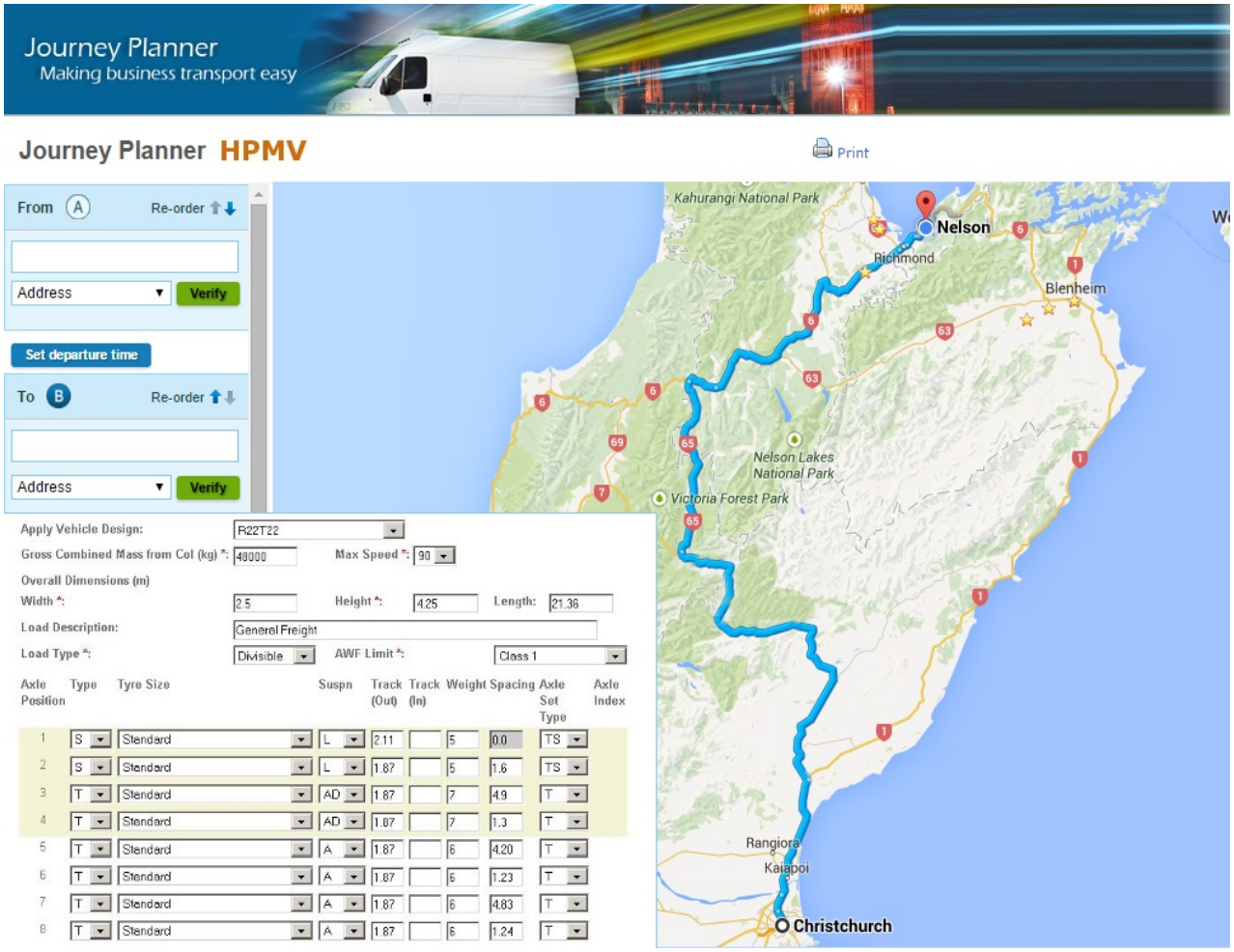
21.	How would you most like to receive this information? (select all that apply)
	☐ Website information service
	☐ Webcams
	☐ Email updates at regular intervals (eg every Monday morning)
	☐ Push out notifications via text message
	☐ Push out notifications via email
	☐ Push out notifications via radio
	☐ Push out notifications via smartphone application
	☐ Push-out notifications via variable message signs

21.	How would you most like to receive this information? (select all that apply)		
	☐	Variable message signs or static signage	
	☐	In-vehicle navigation systems	
	☐	Other	_____



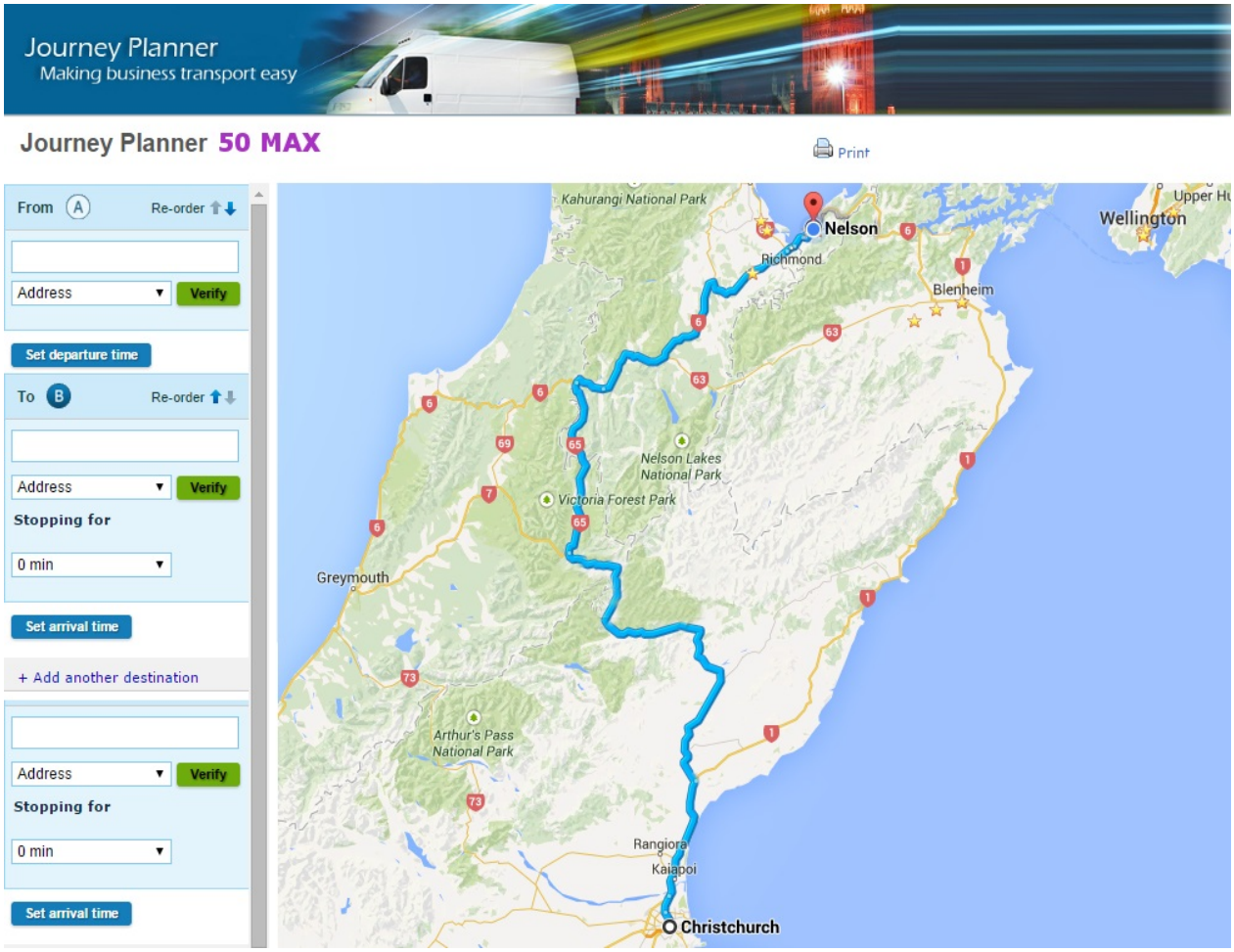
The above image shows an example of how a journey planner for developing HPMV routes could look. By entering 'from' and 'to' addresses and providing information about your vehicle configuration it could be used to determine an indicative route to go with an HPMV application.

22.	Would an HPMV route planning application be useful for your business?	☐	Yes	☐	No



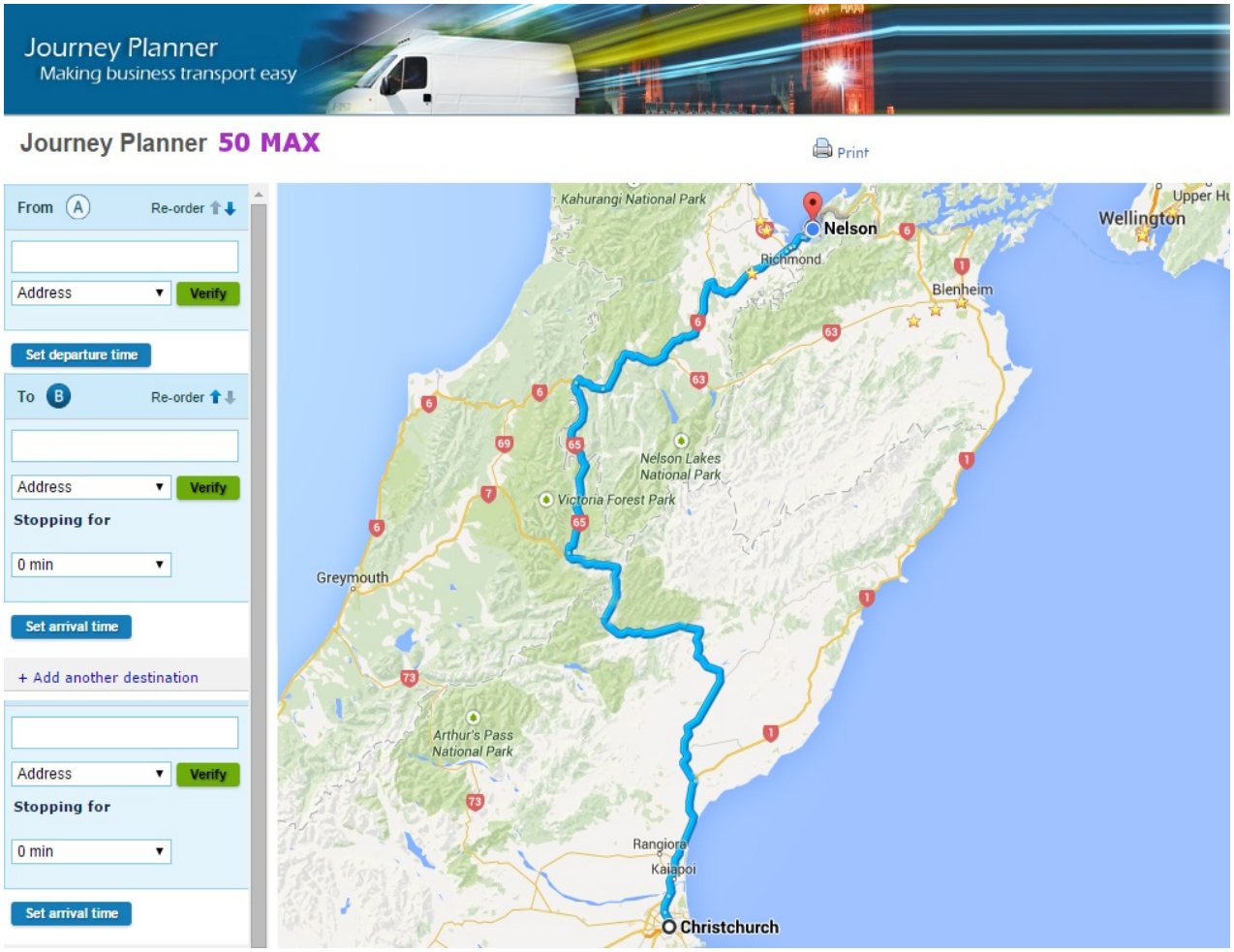
The above image shows an example of how a journey planner for developing HPMV routes could look. By entering 'from' and 'to' addresses and providing information about your vehicle configuration it could be used to determine an indicative route to go with an HPMV application.

23.	How often would you use this type of information if it were available?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐



The above image shows an example of how a journey planner for developing a 50MAX vehicle route could look. By entering 'from' and 'to' addresses it would provide a route for a 50MAX vehicle.

24.	Would a 50MAX route planning application be useful for your business?	☐	Yes	☐	No



The above image shows an example of how a journey planner for developing a 50MAX vehicle route could look. By entering 'from' and 'to' addresses it would provide a route for a 50MAX vehicle.

25.	How often would you use this type of information if it were available?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

26.	To what degree does the information you currently receive meet your organisation's requirements for route planning?				
	Much less than we require	Less than we require	Meets our requirements	More than we require	Much more than we require
	☐	☐	☐	☐	☐

The above image shows an example of how an in- vehicle system for providing navigation information for drivers of HPMVs could look, with the ability to enter a permit number, destination, and routes suggested that suit your vehicle

27.	Would an HPMV in-vehicle navigation system be useful for your business?	☐	Yes	☐	No

The above image shows an example of how an in- vehicle system for providing navigation information for drivers of HPMVs could look, with the ability to enter a permit number, destination, and routes suggested that suit your vehicle

28.	How often would you use this type of information if it were available?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

The above image shows an example of how an in- vehicle system for providing navigation information for drivers of 50MAX vehicles could look, with the ability to enter a destination, and routes suggested that suit your vehicle

29.	Would a 50MAX in-vehicle navigation system be useful for your business?	☐	Yes	☐	No

The above image shows an example of how an in- vehicle system for providing navigation information for drivers of 50MAX vehicles could look, with the ability to enter a destination, and routes suggested that suit your vehicle

30.	How often would you use this type of information if it were available?				
	A few times a day	A few times a week	A few times a month	A few times a year	Less than once a year
	☐	☐	☐	☐	☐

31.	Please indicate your level of agreement with the following statements					
		Strongly disagree	Disagree	Not sure/ neutral	Agree	Strongly agree
	As long as it is clear it is not verified, I would rather know about a delay early, than wait until it is verified	☐	☐	☐	☐	☐
	There is no point in releasing half the information about a delay. It is better to wait until everything is known	☐	☐	☐	☐	☐
	I get frustrated when updates to traffic information are not delivered at the time they have been promised	☐	☐	☐	☐	☐

31.	Please indicate your level of agreement with the following statements					
		Strongly disagree	Disagree	Not sure/ neutral	Agree	Strongly agree
	All information provided to commercial operators about transport delays should be correct and verified, even if that means it is delivered later	☐	☐	☐	☐	☐

32.	If you have any general comments about travel information for commercial operators, please include these below. For example, what is good, what is not, what you would like more of, and how you would like it delivered.
	_____ _____ _____ _____ _____ _____

Appendix G: Commercial operators survey images

Figure G.1 Real- time warnings information image

Figure G.2 Advanced warnings information image

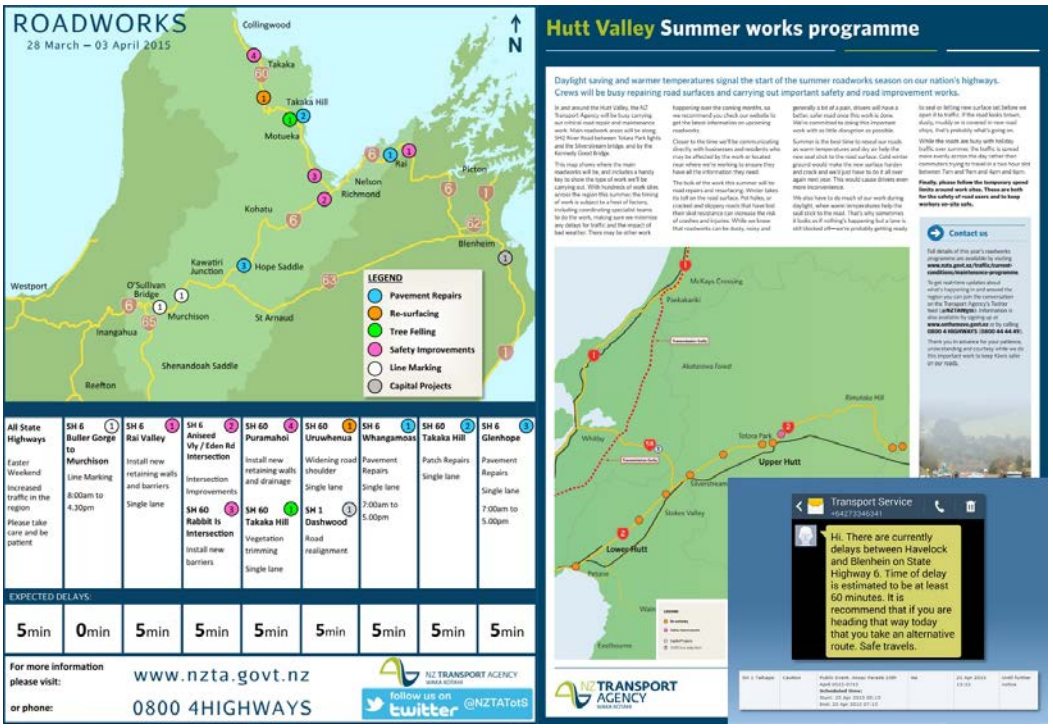


Figure G.3 HPMV journey planner image

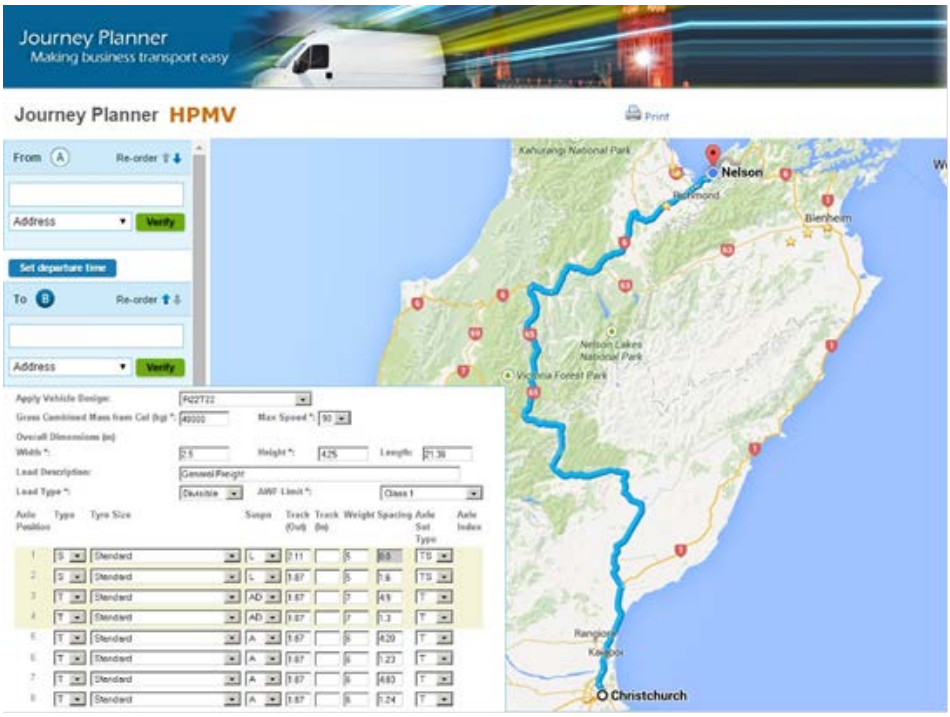


Figure G.4 50MAX journey planner image

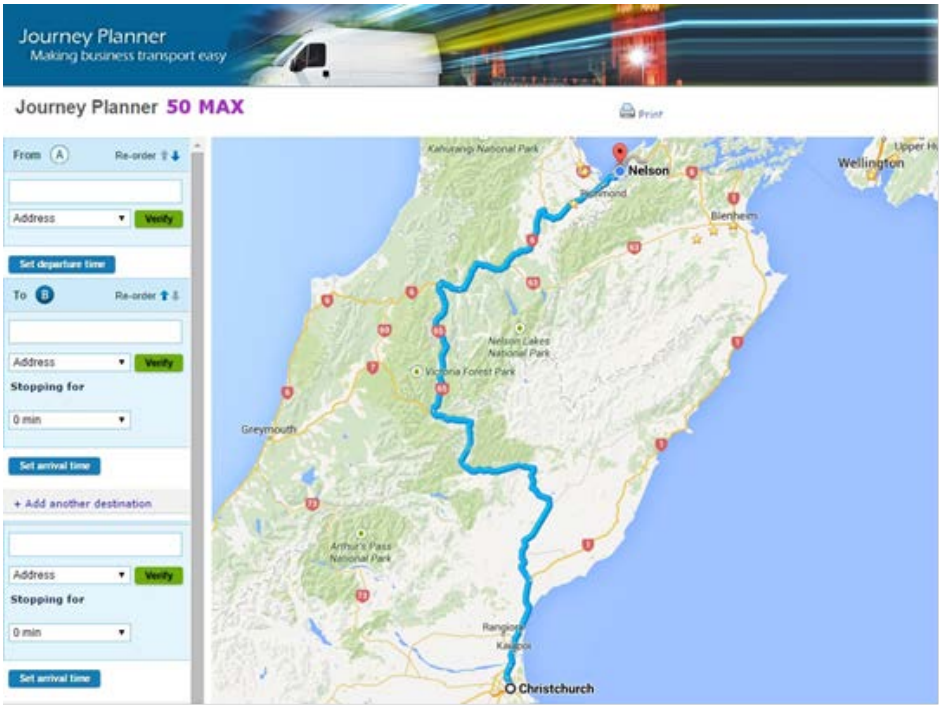


Figure G.5 HPMV navigation tool image

Figure G.6 50MAX navigation tool image

Appendix H: Glossary

50MAX	Trucks that are slightly longer than standard 44 tonne vehicles and have an additional axle (9 in total) in order to operate at 50 tonnes maximum total weight.
ANOVA	analysis of variance
API	application programming interface
app	application for smartphone, tablet
ATOC	Auckland Transport Operation Centre
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
FHWA	Federal Highway Administration (US)
GPS	global positioning system
HPMV	high productivity motor vehicle
Opus	Opus International Consultants Limited
REST	web technique for transmitting dynamic and on-demand data to mobile clients
RR 540	Chang et al (2013) Customers' requirements of multimodal travel information systems. *NZ Transport Agency research report 540*.
SCIRT	Stronger Christchurch Infrastructure Rebuild Team
SQL	database look-up technique for transmitting dynamic and on-demand data to mobile clients
TCRP	Transit Cooperative Research Program
Transport Agency	New Zealand Transport Agency
TREIS	Traffic Road Event Information System
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, commercial drivers and rural 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.