

CUSTOMER'S REQUIREMENTS OF MULTI-MODAL TRAVEL INFORMATION SYSTEMS

ABSTRACT

The Government's long term outcomes for transport require network operators increasingly to inform and shape choices their customers make about whether, when and how they use the network. The purpose of this research is two-fold: 1) To provide evidence-based recommendations that identify customers' key information needs, and 2) To provide best practice guidance as to how the NZTA can best offer and "push" delivery of multi-modal travel information. This work will be carried out in three stages: 1) Literature and Best Practice review, 2) Focus Groups/Structured Interview to examine key traveller information needs, and 3) Online Interactive Survey; to provide a quantitative assessment of information to rank the importance of variables for different user groups. This paper covers part of Stage 1 of this work,. It highlights the importance of defining user requirements when developing information systems and identifies a number of Best Practices. Distinct differences were observed for different customer segments (e.g., rural and urban travellers, freight, commuters, emergency situations), demonstrating the need for information to be provided in multiple formats. Further research is needed to test the applicability of the Best Practice guidelines to the NZ environment, but the outputs of this work can already be used to design information specifications and to develop scenarios for usability testing of systems.

Authors and Presenters

Jo Chang (Presenter), Senior Transportation Planner/Human Factors Specialist, Opus International Consultants Ltd. BSc, BA (Hons), MSc (Human Factors),
Joanne.Chang@opus.co.nz.

Henry Pretorius (Presenter), Customer Information Services Manager, NZ Transport Agency.
MEng (Computer Engineering), henry.pretorius@nzta.govt.nz

Grace Rive, Behavioural Scientist, Opus International Consultants Ltd. BA, PgDip, MA
(Psychology), Grace.Rive@opus.co.nz.

Cathy Crooks, Transport Planner, Opus International Consultants Ltd. BA (Hons)(Geog),
cathy.crooks@opus.co.nz

Dr Jared Thomas, Manager, Behavioural Sciences, Opus International Consultants. BSc
(Hons), MSocSci, PhD (Psychology), Jared.Thomas@opus.co.nz.

INTRODUCTION

The NZTA has identified that the provision of both pre and in-journey information relating to the time and cost of alternatives can enable travellers to make better mode choices. This not only supports better use of existing transportation infrastructure, but also increases the mobility, safety and satisfaction of travellers' trips. Such systems, if deployed correctly, therefore have the potential to improve the operation of the entire transport network and raise the perceived quality of the traveller's experience.

This research is aimed at identifying the best ways in which to deliver traveller information to travellers. For the purpose of this research, information provision includes any type of information that can be collected and sent/displayed to travellers that allows travellers to make informed decisions regarding whether to change their: route, mode, departure time and/or destination. Information can include (but is not limited to):

- Traffic delays (e.g. congestion);
- Travel planning tools (public transport websites etc);
- Ridesharing;
- Information on the cost/availability of different modes;
- Traffic incidents and emergency alerts;
- Weather conditions;
- Parking availability;
- Park-and-ride facilities;
- Real-time bus/next bus (or train) information;
- Travel times;
- Emergency alerts;
- Alternative routes;
- Information for those with disabilities (e.g. wheel chair accessibility);
- Walking routes/facilities/travel times; and
- Cycling routes/facilities/travel times.

STUDY OBJECTIVE

The objective of this study was to determine what best practice multi-modal information provision is available in the existing literature that can assist in meeting the two overarching goals of the research:

- Provide evidence-based recommendations that identify the NZTA customers' key information needs to support the use of/move to multi-modal travel; and
- Provide best practice guidance as to how the NZTA can best offer and "push" delivery of multi-modal travel information to individuals.

METHODOLOGY

A document search and review was undertaken of international research relating to multi-

modal information provision. The literature search was performed using the terms “multi-modal information provision”, “public transport information provision”, “transit information provision” and “traveller information”. The search used the following key themes which were agreed by the Steering Group:

- What is available (research and information provision)?;
- Previous research on user requirements;
- Research on behavioural change post implementation; and
- System/Format Specifications/Issues/Opportunities.

The current paper also includes information from Environment Canterbury regarding relevant lessons learned through the Christchurch Earthquakes.

REVIEW OF THE LITERATURE

Key Customer Information Needs

Defining user requirements of a system prior to its development is a widely used method within usability engineering of computer interface and hardware design. This approach has multiple benefits including; products are designed to meet user requirements, there are less changes to systems after they have been released and developed products are more usable and appealing Crosby P., et al (1993). Designing useful, easy to use and appealing systems encourages greater user uptake which is a goal of information provision for multi-modal transport.

It is important to note that group demographics will affect the likely uptake of information. Experience both nationally and internationally suggests that there is a need for information to be provided in a number of formats to make it accessible to the wider population with older people preferring more traditional information sources (such as in-person, on paper and by telephone) and younger people preferring information in digital formats Farag and Lyon (2008), Lyons et al (2007). However, it should be noted that as knowledge of, and access to technologies is rapidly evolving the focus of this report has been restricted to users' information needs rather than technological solutions. Knowing the users' needs also helps to future-proof designs as each new technology can be assessed against how it would meet the users' information needs prior to being adopted.

The provision of relevant information is considered key to influencing the choice of transport mode used by travellers Marks (2008). If accessible information is provided to both drivers and public transport users, there is an opportunity to compare modes and the advantages of public transport usage may become apparent, hence affecting mode choice Marks (2008). Therefore, a significant body of previous work has been conducted exploring traveller preferences and requirements for traveller information provision e.g. Amey et al (2011); Marks (2008); Lyons et al (2007); Zografos et al (2010); Veneziano et al (2010).

User requirements for traveller information systems varies by factors such as; the amount of experience that a user has in undertaking the proposed trip (e.g., geographical knowledge of the area and knowledge of the potential mode choices) and by the purpose of the trip. Previous findings relevant to the current project on this topic are summarised in the following sections.

New versus Experienced Users

User needs for people new to an area (this may include tourists, people making trips to new location and/or people new to an area) will require information to help them orient themselves within the area. Thorndyke (1980) characterises this stage of learning about an environment as “landmark knowledge”, whereby we seek out salient objects such as statues, building or landmarks to navigate. The importance of recognising this stage of knowledge acquisition is that information provision can be provided to support this stage of learning. This can be achieved by providing landmark information on maps for people to identify and orient themselves by (such as hills, buildings and/or major intersections). The Kowloon Motor Bus (KMB) bus operator in Hong Kong provides a good example of providing salient information to users by providing a photo of each bus stop on their website (International Association of Public Transport, 2003). The need to seek landmark knowledge prior to visiting an area can be evidenced in the number of people who use Google Street View in conjunction with bus information. Steinfield A., et al. (2012) also suggests that people with disabilities use Street View to scout the neighbourhood to see if there are accessible paths.

Additionally research suggests that people with less experience will require more information that:

- Supports decision making on what type of mode to choose (for example, information on the cost and time for alternative modes); and
- Provides information on how to link up different segments of the trip (for example, the location of park-and-ride facilities, public transport, stops, public transport timetables, transfer locations, and safe walking and cycling routes).

Higgins L., Weatherby, C. and Koppa, R. (1999) provides an example of the information needs of new bus users broken down into the two stages of pre and in-trip information needs.

“Pre-trip information needs include:

- Location of the nearest bus stop;
- Routes that travel to the desired destination and transfer locations;
- Fare; and
- Time of departure and approximate duration of the trip.

In-trip information needs include:

- At the departure point – identification of the correct bus to board;
- On the bus – identification of bus stops for transfers or disembarking;
- At transfer points – how to transfer to another route, cost, time limits, and restrictions; and
- At the destination – area geography (i.e., location of the final destination in relation to the bus stop) and return trip information (e.g., departure times and changes in route numbers)” (TCRP 1999).

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

Urban Commuter Information Needs

Marks (2008) completed an Australian based review of traveller information research, focussing on the types of information it may be possible to provide, how to transform that information into content and how to deliver this in an accessible manner to a maximised number of drivers and public transport users. This report focussed mainly on commuter trips. Key information types identified by Marks (2008) that are preferred by travellers include:

- All available modes for a journey;
- Various options to complete a journey (e.g. different mixes of modes);
- Alternate routes;
- Park-and-ride facilities;
- Timetables and fares for public transport;
- Comparison trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles);
- Detours/delays;
- Trip time;
- Weather; and
- Parking availability (& parking cost)

The project team also considered parking cost to be a key information type.

Marks (2008) highlights that information needs will vary depending on the trip purpose and mode choice (e.g. public transport users may desire timetable information whereas drivers may desire alternate route information) and traveller characteristics. Travellers may also wish to obtain information at different segments along a journey and there may be different information needs at each of these, for example:

- Pre-trip: Drivers may need information to plan their routes and determine an appropriate departure time. The earlier this information is able to be accessed, the more likely it is that drivers will chose to take an alternate route or change modes (e.g. Su, M., Jones , D. (2006). For public transport users, information prior to a trip assists with planning future trips;
- En-route: Substantial work has been carried out internationally exploring the effect of variable message signs (VMS) on travel behaviour (see, Ton (2005) or Su, M., Jones, D. (2006) for examples of good practice). For public transport users, information arrival times whilst waiting at a station or stop may be desired; and
- In-vehicle: Information provided to drivers whilst travelling (e.g. via smart phone) may influence the route taken. For public transport users, information on the next stop to be reached and the expected time of arrival are key factors.

Note that since the Marks work was undertaken in 2008 there has been a dramatic increase in the use of smart phones to access information. Rive, et al (2012) reports that in 2011 27% of New Zealanders are using a smart phone.

Freight

Veneziano D., et al (2010) characterise freight operations as being driven by “efficient routing of goods in transit, ensuring timely delivery” (p. 11). The authors suggest that for the freight industry information provision user requirements include:

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

Hamilton (2010) suggest that knowledge of severe weather or areas that are heavily congested may be utilised by commercial drivers to decide when to take their breaks so as to use efficiently the hours they are allowed to drive. For this type of information to be useful there may need to be some form of prediction of traffic flows and weather patterns.

It is also noted that the “transportforchristchurch” site set up after the Christchurch earthquakes provides information on weight restricted areas. Height restricted areas could also be of use. Areas that have regular congestion peaks could also be of use so deliveries/routing could avoid peak times.

Communication with the freight industry in New Zealand suggests that knowledge of accurate travel time is a key requirement (Pretorius and McGlinchy, personal communication).

Long Distance Commuters

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

Local Rural Trips

Veneziano D., et al.(2010) characterise local rural travellers as motorists whose trip is over small distances in rural areas. Veneziano D., et al.(2010) suggest that for these trips users may require information such as: planned closures, incidents, and weather and chain requirements. The authors further suggest that these users will be less interested in route planning as they are more likely to be aware of different route/mode options.

International Travellers/Tourists

Zografos D., Androutsopoulos, K. and Nelson, J. (2010) surveyed 25 existing internet-based journey planners from several European countries, Japan and China to ascertain the major features and capabilities of these existing services. Traveller information needs were again separated out based on the segment of a journey, however, the authors focus on international travellers, whose information needs differ from the needs of a commuter. For example:

- Pre-trip: International travellers need additional detailed information and comprehensive planning information to assist the traveller in self-navigating. This is especially important

during transfers. Of the services presently available, the inability to book online constitutes a major limitation;

- During trip: International travellers require an appropriate level of information during a trip to manage any transport disruption. In-car navigation systems can be used to provide some real-time information. However, with the services presently available, there is a lack of information available for real-time pre-planning, and so this is a cause of uncertainty for travellers. Where ever there is a transfer between modes there are also increased navigation information needs Steinfeld A., et al. (2011) notes that this can be impacted negatively by lack of data or expense of the mobile plan in the visited country); and
- Post trip: Ideally, personalised information should be available once an international traveller's destination is reached (e.g. car services, local taxi information).

Additional pre-trip needs could include information on multiday and cross-mode passes for public transport, where to buy tickets and what kinds of payments are accepted. Zografos D., Androutsopoulos, K. and Nelson, J. (2010) also surveyed 50 travellers from Europe and China, as well as experts in journey planning systems, to explore which features were valued in these systems and how satisfied participants were with the current level of information provision. It was found that the following information types were rated as highly preferred but with low satisfaction (and were therefore identified as areas of priority for future information provision): customised detailed description of the parts of the itinerary covering foreign countries, online journey booking and timely notification for managing any disruption of the selected itinerary before commencement of the journey.

The use of travel information at seasonal tourist destinations to manage transport demand has previously received attention. The FHWA report (undated) provides the example of Acadia National Park Maine. Real-time bus departure signs, on-board bus announcements and real-time parking information message boards have been implemented. They report that a 2002 survey found that two-thirds of people said the information provision helped them decide to catch the bus. Furthermore, the real-time parking information allowed one third of visitors to change the time of their trip and a further third to change their destination, reducing peak parking needs excess parking at two of the most popular destination parks.

Civil Defence Emergencies/Planned Evacuations

The FHWA report: Managing Demand through Travel Information Services (undated) notes the use of traveller information systems to provide pre-trip and in-trip information to assist developing emergency events such as hurricanes and other planned evacuations. Information that has been provided in the United States includes: shelter locations, alternative evacuation routes, congestion, incident information, petrol stations and lodging. The report also documents the use in unforeseen catastrophic events such as during the September 11 (2001) terrorist attacks in New York. Information for unforeseen events in the United States has included information on road closures, alternate routes, transit service disruptions, disaster recovery information, and safety information.

Darryl Gay and Clair Nicholls from Environment Canterbury were interviewed by phone to provide information into Environment Canterbury's public transport information provision and lessons learned from the Canterbury Earthquakes. Below is a summary of that interview;

Following the February 22 Christchurch 2011 Earthquake, the Environment Canterbury internal servers went down and could not be accessed. This meant that the Metro info website was accessible to users, but that no information on the website could be changed. Environment Canterbury had to make changes quickly to allow their website to be remotely

updated. Current improvements include upgrading of their journey planner and moving to a “cloud” virtual server which will provide further robustness to the website during emergency/unplanned events. Other lessons learned include:

- For a number of months after the February 2011 earthquakes, when routes were changing daily, Environment Canterbury, at two roadside areas that acted as temporary bus interchanges for all routes, provided people to communicate changes and direct people to the right bus.
- When the central bus exchange was no longer accessible after the earthquakes the PA system that announced buses arrival was also lost. The current temporary outdoor bus exchange cannot support a PA system to make announcements and some passengers with limited sight have reported difficulty in locating their bus. This has been difficult to address. It has been mitigated in part by the provision of people to help passengers at main interchanges.
- When using social media to alert users of changes, such as if buses will be operating, it is important to let users know that a decision has not yet been made, and to indicate a time when a decision will be made. The Environment Canterbury staff recommend that once a time for a decision has been announced that it is important to provide a decision by that time (preferably 10 minutes prior to that time). They further recommend that it is better to provide information before people ask. They now have built in contingences so they can remote access the website so that routes can be updated. They also have a critical alert that freezes a user’s screen so that users must read update information prior to accessing the site.

People with different abilities and minority groups

It is important to ensure the travel information provided via services meets the needs of both those with different abilities (e.g. physical disability) and minority groups Marks (2008); Steinfeld A., et al. (2011); Lyons G., et al (2007). Marks (2008) recommends integrating disability information (e.g. services for passengers with disabilities such as wheelchair-accessible buses and facilities) into the types of traveller information provided to public transport users. An example of this is provided by the Transport for London journey planner, which allows users to select mobility information (see Figure 1 below).

The screenshot shows a user interface for selecting travel preferences. At the top, there are two tabs: "Public transport" (selected) and "Cycling & Walking". Below the tabs is a section titled "I need step free access..." with a wheelchair icon. It contains five radio button options: "From the street to the platform", "From street to the train, bus, etc.", "I can use escalators but not stairs", "I can use stairs but not escalators", and "I have no mobility requirements" (which is selected). Below this is a section titled "I prefer..." with three radio button options: "The fastest routes" (selected), "Routes with the least changes", and "Routes with the least walking". At the bottom is a section titled "I use these modes..." with a grid of checkboxes for various transport modes: Tube, DLR, Bus, Rail, Tram, River, Coach, Emirates Air Line, and London Overground. All checkboxes in this section are checked.

Figure 1. Transport for London journey planner

Source: http://journeyplanner.tfl.gov.uk/user/XSLT_TRIP_REQUEST2?language=en

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

Tiramisu was designed with the aim of fostering a greater sense of community between public transport users and bus service providers while fulfilling the top self-identified information priority for public transport users in the area: knowing the actual arrival time of buses. The system had the secondary benefit of providing a convenient platform to report problem and/or positive experiences, as well as other critical data such as the fullness of buses. With regard to the fullness of the buses, the creators of Tiramisu specifically designed the system to support the provision of information needs for passengers with disabilities to provide these customers with greater independent mobility around the community Steinfeld A., et al. (2011)

Through the system, four levels of fullness are able to be reported: empty, seats available, standing room only or full. The date, time and user location are recorded automatically when the post is made, and additional text description or a picture can be added to provide evidence. A field trial showed that the system was both feasible and viable Steinfeld A., et al. 2011.

The review completed by Lyons G., et al (2007) found that a key issue in the literature on the topic of traveller information provision to date was "meeting significant minority information needs" (p. iii). There is a tendency in the literature and work to date to distinguish between information that is 'nice to have' and 'essential', however, this separation is not straightforward as information needs vary across travellers depending on traveller characteristics. For example, providing information on public transport end-legs and interchanges have been found previously to be 'nice to have', but not 'essential' for the majority. Therefore, if information needs are prioritised at the aggregate population level, significant minorities of travellers could be disadvantaged Lyons G., et al (2007). The cost-benefit-risk-reward of providing additional information, whilst considering the needs of minority travellers, therefore needs to be considered explicitly when making decisions regarding the level and types of information that will be shared via available services. A summary of the above information is depicted in Table 1 below.

Table 1. Summary of Potential Information Need by User Type

User	Summary of potential information need
Urban commuter needs	<ul style="list-style-type: none"> • Ability to compare different modes/option to mix modes • Availability of alternative routes • Where park and ride facilities are and how they can link with other modes • Timetables and fares for public transport • Comparison trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles) • Detours/delays • Trip time • Weather • Parking availability and cost

User	Summary of potential information need
Long Distance Commuters	<ul style="list-style-type: none"> • Ride-share options • Public transport alternatives • Parking
Local Rural Trips	<ul style="list-style-type: none"> • Planned closures • Incidents • Weather • Chain requirements
Tourists/International Travellers	<ul style="list-style-type: none"> • Visual information to help orient them within the environment • Directions and how to use alternative modes • Directions to parking • Knowledge of what to visit and what is the easiest way to get there • Other needs are the same as new users below.
New Users versus Experienced Users	<p>New Users</p> <ul style="list-style-type: none"> • New users require information on what type of mode options there are (including cost and time for alternative modes and advice on how to use each mode (e.g., where to catch a bus and when the destination is reached • They also require information on how to link up different segments of the trip – for example, where they can park and ride, where to catch public transport, public transport timetables and maps, where to transfer, where it is safe to walk and where there are cycle routes. <p>Experienced users</p> <ul style="list-style-type: none"> • In contrast, people who have good knowledge of the geographical area and the “how” of using modes (other than single occupant cars) are characterised as needing information more related to notifications when something has changed (e.g., if there is a traffic delay ahead, a road closed, or the bus is running late, or there is a broken elevator or detour.
People with different abilities	<p>Whilst this group varies greatly in their information needs some identified needs are:</p> <ul style="list-style-type: none"> • Need to know information relating to mobility such as broken lifts/escalators, walking information • May need assistance to identify the correct bus and exit • All Government websites must adhere to New Zealand Government Web Standards 2.0 Web Content Accessibility Guidelines 2.0 (level AA). These provide guidance to help remove many accessibility barriers from websites for people with different impairment.
Freight	<ul style="list-style-type: none"> • 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
Civil Defence Emergencies/Planned Evacuations	<ul style="list-style-type: none"> • Shelter locations • Alternative evacuation routes • Congestion

User	Summary of potential information need
	<ul style="list-style-type: none"> • Incident information • Petrol stations and lodging • Road closures • Alternative routes

How NZTA can best offer and “push” delivery of multi-modal travel information tailored to individuals.

In addition to determining the information needs of different users, this work also involved investigating best practice for multi-modal information provision. Whilst there has previously been a great deal of research on single mode information provision, there is less guidance on multi-modal information provision. A summary of the findings of best practice for how to offer and “push” delivery of multi-modal travel information is provided in Table 2 below.

Table 2. Summary of Information Provision Best Practice

Best Practice Recommendation	Evidence	Reference
System must be robust in an emergency – this includes allowing changes/updates to be made remotely	Lessons learned from the Christchurch Earthquakes and Snow Events	See section on Civil Defence Emergencies/Planned Evacuation in this paper.
Information must be accurate, timely, quick and easy to access	Real-time information must be reliable for users to trust (and use) the system.	Kandapa, R., et al.(2010)
	From the Changeable Message Sign Operation and Messaging Handbook. If information is not accurate and timely users will lose confidence in your system and stop using it.	Federal Highway Administration, 2004
	Passenger information websites should be user-friendly, accessible, consistent and current.*	Currie, G., and Gook, M.,(2010)
	Website information must be quick, easy to access, reliable and have extensive coverage of major roads and modes.	Marks (2008)
	Consistency in message across multiple sources is important to maximise the probability of mode shift	Pathan, A., Bonsall, P. and De Jong, G. (2011)
	Road closure information is the key information sought by inter-urban travellers on State Highways in New Zealand.	Pers Comm, Deidre Hills, NZTA, 2012
	Ensuring printed materials such as maps and timetables are user-friendly can have an impact on both customer satisfaction and has the potential to influence ridership levels. Such printed material can have a	Cain, A., and Lavelle, J.(2010); Guo, Z.(2011)

Best Practice Recommendation	Evidence	Reference
	bigger influence on traveller behaviour than personal experience	
	Lack of awareness is a major reason travellers do not access available travel information	Farag, S., and Lyons, G.(2008); Marks, D.,(2008); Pathan, A., Bonsall, P. and De Jong, G.(2011)
Real-time, location-specific information should be implemented where affordable. This is the most valuable information to users, as demonstrated by its influence on traveller behaviour	In the United States trucking industry dynamic routing around traffic incidents will allow a reduction of lost time from non-recurring congestion. Non-recurring congestion is estimated to cause 40 to 60 % of lost productivity.	Kandarpa, R., et al.(2010)
	Reviews effects on customers of Dynamic at-stop real-time information displays (in Sweden). Notes benefit of providing information is a perceived reduction of waiting time. Reports that when people in Birmingham were asked about what measures would get people to take public transport instead of private car at-stop real-time information was the most important measure.	Dziekan, K., and Kottenhoff, K.(2007)
	Whilst waiting at the station or stop, generally real-time information is preferred to any other form of information (e.g. actual arrival times, delays, and/or location of the vehicle that is being waited on)	Cluett, C., Bregman, S. and Richman, J.(2003)
Integrated planners are more valued than single mode journey Planners	The Washington, DC travel planner RideGuide found that 70 percent of respondents reported that the website assisted them to make a public transport trip they would have otherwise made by car	FHWA, undated
	2004 survey of people who had used the Bay Area 511 travel information service found that 36 percent of people reported changing their travel plans as a result. The survey also found a 92 percent satisfaction rate of the service. The breakdown of information sought was traffic (59%), public transport (39%), carpool or vanpool (2%), and bicycling (less than 1%)	FHWA, undated
	Users need to be able to compare alternative routes/modes without having to use different applications or areas within	Schweiger, C.(,2011)

Best Practice Recommendation	Evidence	Reference
	<p>one application. For example they don't want to go into one part of a website and look up bus information and another for car travel, similarly if they put in a car journey they should be able to find out about parking information from the same page of information.</p>	
	<p>Multi-modal planners generally have higher credibility among the public than single mode planners</p>	<p>Pathan, A., Bonsall, P. and De Jong, G.(2011)</p>
<p>All information should be easy to understand, it should "speak the users language" using common terms for locations directions and landmarks. Users should not have to "guess" what terms mean.</p>	<p>Developed from Jakob Neilson Ten Usability Heuristics for interface design.</p>	<p>Neilson, J.,(1995)</p>
	<p>"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 interests fields. Recommends clear visibility of public transport lines, straight route layouts and good labelling to help aid in people remembering information.</p>	<p>Dziekhan, K., and Kottenhoff, K.(2007)</p>
<p>Information should be targeted at two different levels</p> <ul style="list-style-type: none"> • Novices • Experienced 	<p>Most behavioural change will result in a minor alteration to a trip, such as route or time change, rather than a modal shift</p>	<p>US Department of Transportation; Cats et al, 2011</p>
	<p>A lack of "landmark knowledge" can be supplemented with landmark information. Users in Hong Kong use visual aids, in the forms of photos of bus stops. Others use specific links to existing visual resources, such as Google Street View</p>	<p>International Association of Public Transport, 2003</p>
	<p>"Notification information" is critical to all users, including experienced users. Events that warrant notification can also create the most frustration in existing members due to expectation. Therefore this information is of critical value</p>	<p>Higgins, L., Weatherby, C and Koppa, R .(1999)</p>
<p>Information should be provided in at least two different formats – tech savvy and non-tech savvy</p>	<p>Non-tech savvy will still require a telephone call centre capability. Complementary visual resources, beyond tailored journey alternatives information, can increase opportunities to travel by other modes</p>	<p>Zografos, K., Androuspoulos, K. and Nelson, J.(2010); Marks, (2008) Zhang, L., and Stopher, P.(2011)</p>
	<p>Internet based information provision services are generally preferred and</p>	<p>Khattak, A., et al.(2008); Cluett, C., Bregman, S. and Richman,</p>

Best Practice Recommendation	Evidence	Reference
	enhancing these should receive top priority	J. (2003)
Having people sign-up that they are interested in updates for specific routes provides a powerful way to communicate with users directly when there is a change needed at short notice	Bus Agencies in the US were very positive about the ability to push out dynamic schedule changes at short notice; they cite examples including jumps 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 Feb 2010.	Steinfeld, A., et al(2011)
<p>* Note: although outside the scope for this project for further information on aesthetic qualities for design of information (such as fonts, colour etc., see: Currie, G & Gook, M. 2010, Schaller, 2002 and for static maps and paper information Higgins et al 1999). In addition all Government websites must adhere to New Zealand Government Web Standards 2.0 Web Content Accessibility Guidelines 2.0 (level AA). These provide guidance to help remove many accessibility barriers from websites for people with different impairment.</p>		

DISCUSSION/CONCLUSION

This paper has identified a number of topic areas that have an influence over how successful uptake of information provision is at changing/modifying travellers' choices. These topic areas are:

- The need for a clear understanding of the user's requirements which will vary by person, number of mode options available to make a trip, trip purpose and experience making the particular trip. For the purpose of this project we have investigated the following: novice versus experts at a trip, urban commuters, freight, rural, civil defence emergency, tourists and minority groups;
- Information must be accurate, timely, quick and easy to access, and use terminology that users will understand;
- Previous research highlights the importance of information being of high quality in terms of availability, level of detail and accuracy. Experience after the Canterbury Earthquakes and snow-events reinforces the importance of being able to remotely access/change information on web-sites as events unfold;
- In terms of what is available in New Zealand, this is generally limited to information for a single mode. This means that users have to access a number of sites to, for example, find information that provides a comparison.

The next step of this work is to take the information in this report to assist in determining what information needs New Zealand users require to assist attainment of a more sustainable transport system. The key questions for the next phase are:

- How important are issues such as: data accuracy, timeliness and ease of use in determining if people would access information?
- What information does an NZTA customer need out of: all available modes for a journey/options to complete a journey (e.g., different mix of modes); alternative routes;

park and ride facilities; timetables and fares for public transport; how to use public transport; comparison of trip times for different times and days (with kilometres travelled and fuel consumption data for private vehicles; detours/delays; trip time; weather; parking availability; rest area)?

- What type of trips would people be more likely to access information for - commuter or recreation trips? and how do the following factors play into the decision to use information: time critical trips, longer trips and leisure trips? and would people be willing to pay for information?
- What information sources are currently being accessed and what would they consider using in the future (e.g. social media, telephone, in person)? What is the terminology that people use when seeking information?
- In an emergency situation (earthquake, tsunami, snow event), what are different users' information needs and what protocols/procedures need to be agreed ahead of time so that the required information from the appropriate agencies can be provided swiftly?

The next stage of this work will utilise focus groups and structured interviews to examine key traveller information needs and perform usability testing on the delivery systems both from New Zealand and internationally to provide answers to the above questions. Following the focus groups and structured interviews, an online interactive survey will be conducted to provide a quantitative assessment of information. For instance, the ranked importance of variables such as usability, specificity/relevance of data, timeliness, reliability and trust will be explored. Once user information needs are further refined future work could investigate the benefits and potential safety implications of different technologies/presentation modes.

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