

A TRAVEL DEMAND MANAGEMENT DIGITAL SAFARI

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ABSTRACT

Recent advances in online mapping and GPS technologies are opening doors for travel demand management (TDM) professionals. This decade's travel plans, transport management associations, public transport network planning and travel behaviour change programmes are starting to look significantly different to those delivered in previous decades.

The potential to make trips more efficient is significant, particularly since the launch of location-based application programming interfaces (APIs) by Google Maps, Apple Maps and OpenStreetMap. These APIs, combined with maturing social networks, new ways of understanding data and increasing access to smart phones are providing TDM professionals with more efficient ways to effect travel behaviour change.

This paper presents current applications and seeks to inspire TDM professionals to embrace digital technology and collaborate with the digital development community. It will answer the following questions: How can online mapping and GPS technologies influence travel choices? How can we support innovation in New Zealand?

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1 INTRODUCTION

“The trick to having good ideas is not to sit around in glorious isolation and try to think big thoughts. The trick is to get more parts on the table.” (Johnson, 2010)

Recent advances in the digital realm such as location-based application programming interfaces (APIs), improvements in positioning system accuracy and the continuing expansion and maturation of social media are changing the landscape of transport planning. This paper takes the reader on a ‘safari’ of location-based applications, ponders the relevance of these and social media to travel demand management (TDM) professionals and points out a few tools that allow us to make sense of the big data¹ being generated by the digital realm.

This paper does *not* present the findings of an exhaustive review of location-based applications, nor does it propose a fully-formed digital strategy or address issues of the digital divide, rather its intention is to:

- Put ‘parts on the table’ that generate good ideas among TDM professionals;
- Inspire more NZ-based TDM professionals to embark on a journey of digital discovery, engage with social media to listen and react to the crowd, and to share their professional knowledge so that needs-based innovation is fostered where order is unlikely to emerge from the crowd, up; and
- Encourage greater collaboration between TDM professionals and developers (contributing to building a more realistic digital economy in New Zealand).

2 A DIGITAL SAFARI: ONLINE MAPS & TRANSPORT APPS

This section presents a range of websites powered by location-based applications. The screenshots in this section have been hyperlinked to the originating website. Apps and websites are focused on sustainable modes. Note: the majority of the tools showcased here are powered by Google Maps; TDM professionals might like to consider whether in NZ we might be able to guide development so that it becomes an NZ asset or part of the global commons e.g. by encouraging development that uses open source code and is powered by free mapping tools like OpenStreetMap.

2.1 Online journey planners, animated maps and real time information

The 90’s saw significant effort directed towards developing personalised journey plans; now travellers are able to find that information themselves using various online tools, making the process of informing people about their travel choices vastly more efficient.

In addition to established sites powered by government that provide users with trip planning tools, maps, timetables, ticketing data, real-time information and updates, Google Transit, launched in 2009 ,(Techpluto Staff, 2009) allows travellers to plan trips by public transport (PT), walking, cycling or car. Google Transit relies on data released to it by governments and transport providers. Auckland Transport recently released its cycle network data to Google (but at the time of writing that data was not available as open data via <http://data.govt.nz/> or <http://data.linz.govt.nz/>). A screenshot of Auckland’s online journey planning tool is shown in Figure 2-1 (in addition to accessing information on the website, users can sign up for text alerts about particular services) and Google Transit directions by bicycle are shown in Figure 2-2.

¹ *“In information technology, **big data** refers to a collection of data so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications. The challenges include capture, curation, storage, search, sharing, analysis, and visualization. The trend to larger data sets is due to the additional information derivable from analysis of a single large set of related data, as compared to separate smaller sets with the same total amount of data, allowing correlations to be found to "spot business trends, determine quality of research, prevent diseases, link legal citations, combat crime, and determine real-time roadway traffic conditions.” (Wikipedia, 2013)*

Figure 2-3 shows a 'Travel Dashboard' which was made by an NZ developer and won an award at the 2011 [Mix & Mash²](#) competition. It's a good example of how innovation can come about when developers are given free access to data. Travel dashboard highlighted a desire to simplify and personalise public transport data. Figure 2-4 is a screenshot from an app website called Tiramisu, this app allows users to use GPS to find local bus services and broadcasts to users crowd-sourced information about service performance.

Figure 2-5 is a screenshot of a video showing Auckland's public transport network, it stimulated a lot of discussion on the [Auckland Transport blog](#) when it was released in January 2011, (staff within Auckland Transport are able to view similar animations using their PT models, but this video was the first opportunity for the wider public to view the Auckland PT network in this way). A movie providing detail at a more local level in London can be found on the [Vicinitee](#) website, the movies hosted here allow the user to watch where buses travel to from a particular location (Figure 2-6).

Also of interest is [Mapnificent](#) (Figure 2-7) which is a website that allows users to set a travel time and then view on a map how far they can travel using public transport in that time. Auckland and Wellington were added to this map in 2011. Mapnificent is coded in open source, is powered by Google Maps and was inspired by MySociety's Mapumental (which is in private Beta code). In late 2012, [Mapumental](#) added a feature to allow users to find property for rent or sale within a specified non-car commute time of a particular location, at the time of writing this feature is only available in the UK (see Figure 2-8).

A number of cities are now using the data behind their real time information systems to generate maps that show where their PT vehicles are in real time, Cairns in Australia provides a real-time map showing the location of its buses (see Figure 2-9).

The screenshot shows the Auckland Transport MAXX website interface. At the top, there's a navigation bar with links for Auckland Transport, AT Public Transport, AT HOP, MyHOP, and Careers. Below this is a search bar and a main menu with options like Journey Planner, Timetables, Service Updates, Events, and Info. The central part of the page is dominated by a large search form titled 'Where do you want to go to in Auckland?'. This form includes input fields for 'From' and 'To' (both labeled 'address or location'), a 'Time' selector (set to 11:50 AM), and a 'Date' selector (set to Today). There are also radio buttons for 'Leave After' and 'Arrive Before', and a 'GO' button. To the right of the search form is a 'Real Time Board' for route 7180, showing a table of destinations and scheduled times. Below the search form, there are two promotional banners: one for a 10% discount on HOP card fares and another titled 'Fair for everyone.' To the right of these banners are sections for 'Quick Links' and 'Regional Guides'.

ROUTE	DESTINATION	SCHED DUE
502	OIAHUHU	11:43
326	MANUKAU	11:53
312	ONEHUNGA	11:53 02
INN	LNK PARNELL	11:57 05
500	MISSION HTS	11:57 03

Figure 2-1 Auckland Transport's online journey planner, MAXX (Auckland Transport, 2013)

² "Mix and Mash is run by [DigitalNZ](#) and the [National Library of New Zealand](#) (which is part of [Department of Internal Affairs](#)), and [Creative Commons Aotearoa New Zealand](#). Mix and Mash encourages innovative use and reuse of New Zealand content and data. We aim to show what is possible [when] content and data is opened up so people can be creative with it. DigitalNZ ran two large competitions in 2010 and 2011 and there were some fantastic entries and winners." (Digital NZ, 2012).

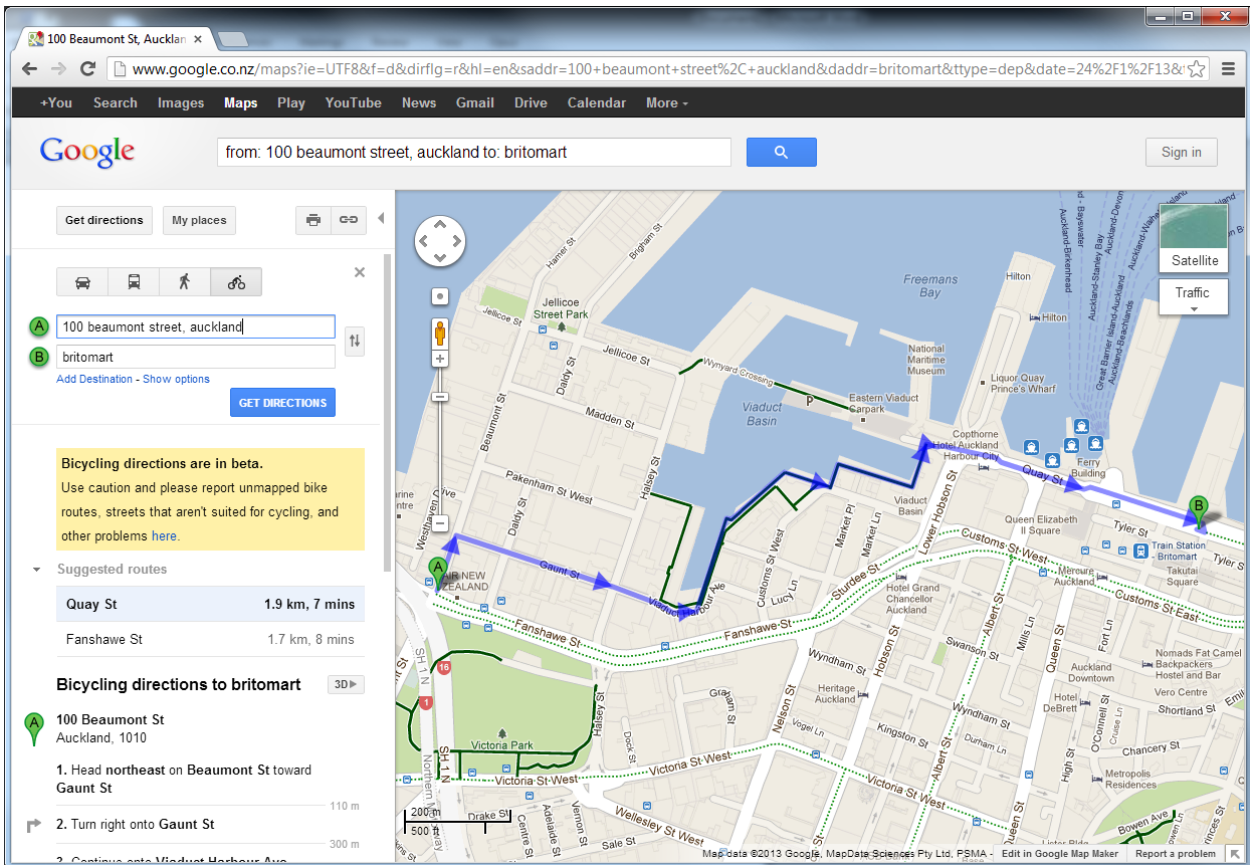


Figure 2-2 Google Transit- Cycle directions using Auckland Transport’s cycle network data (Google, 2013)

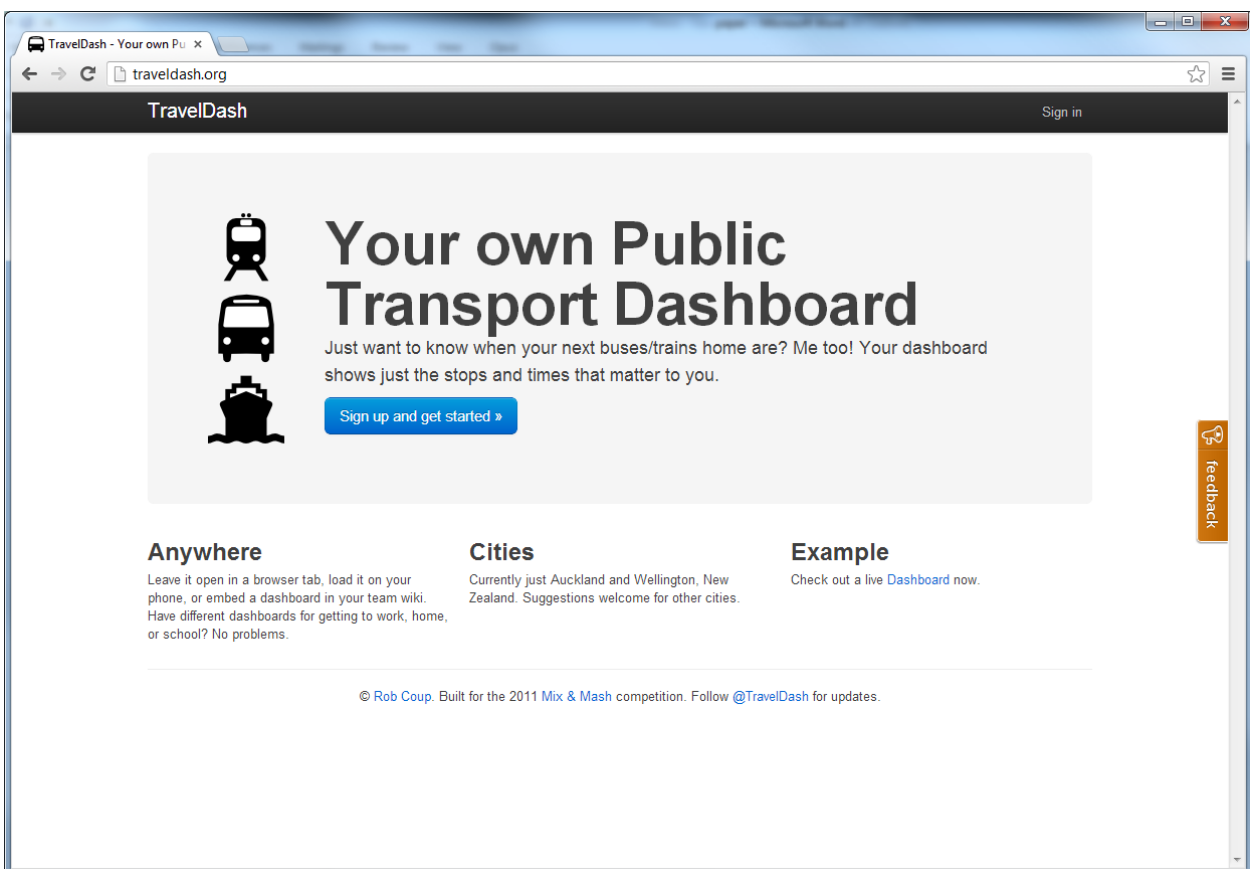


Figure 2-3 ‘TravelDash’– A Simple Public Transport Dashboard (Coup, 2011)

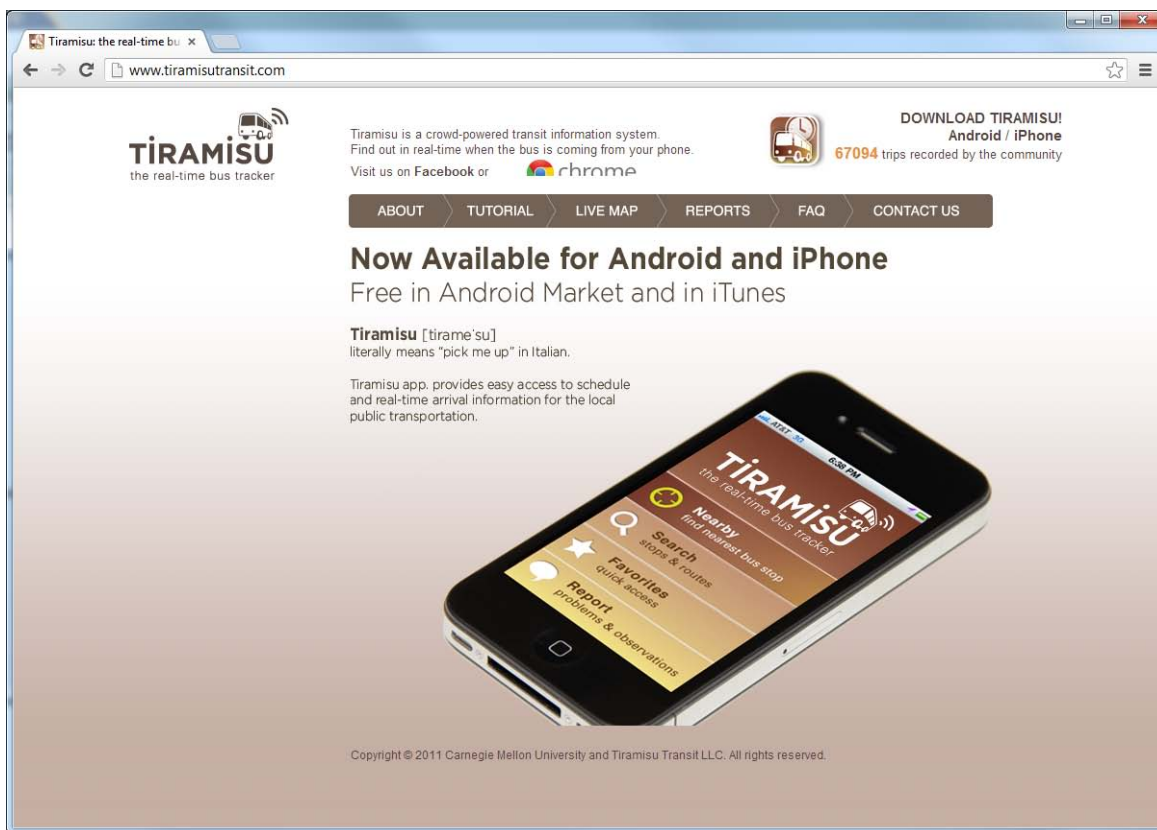


Figure 2-4 'Tiramisu'— A real time bus tracker app that offers crowd-sourced service performance data (Carnegie Mellon University and Tiramisu Transit LLC, 2013)

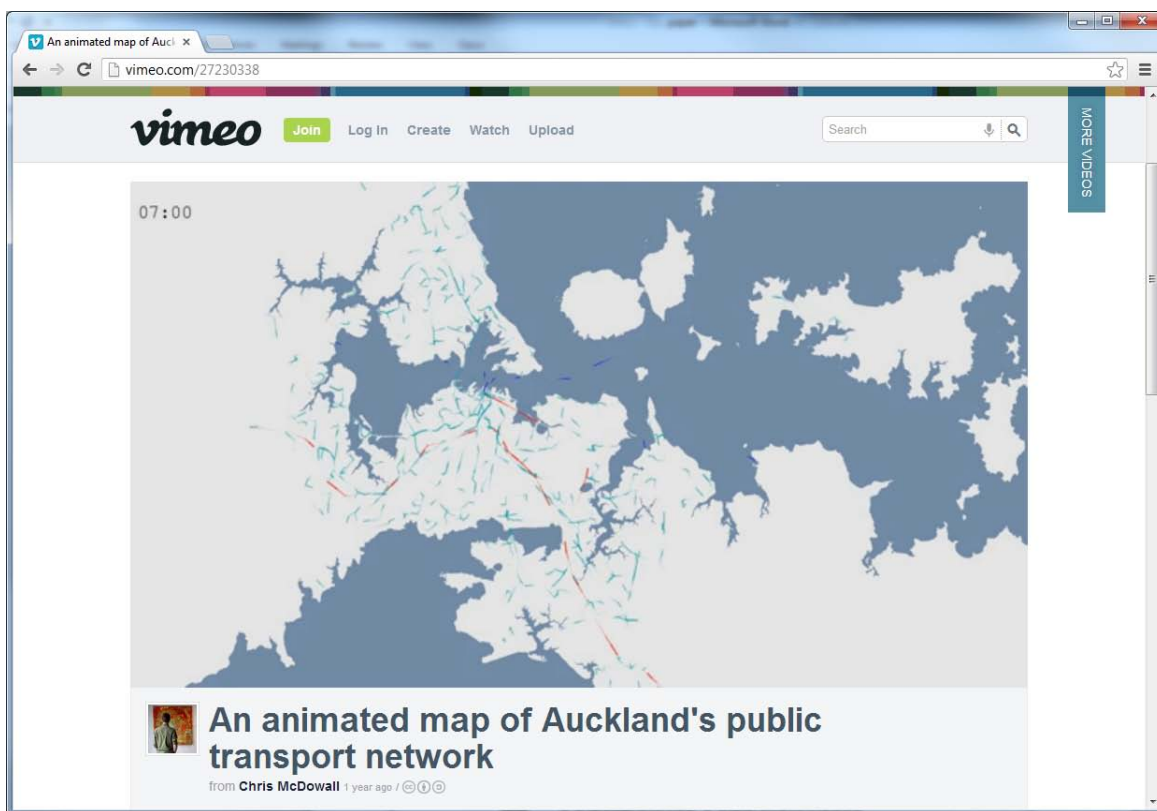


Figure 2-5 An animated map³ of Auckland's bus, rail and ferry network (Mcdowall, 2011)

³ If this doesn't run in Explorer, try it on [Google Chrome](http://www.google.com/chrome/)

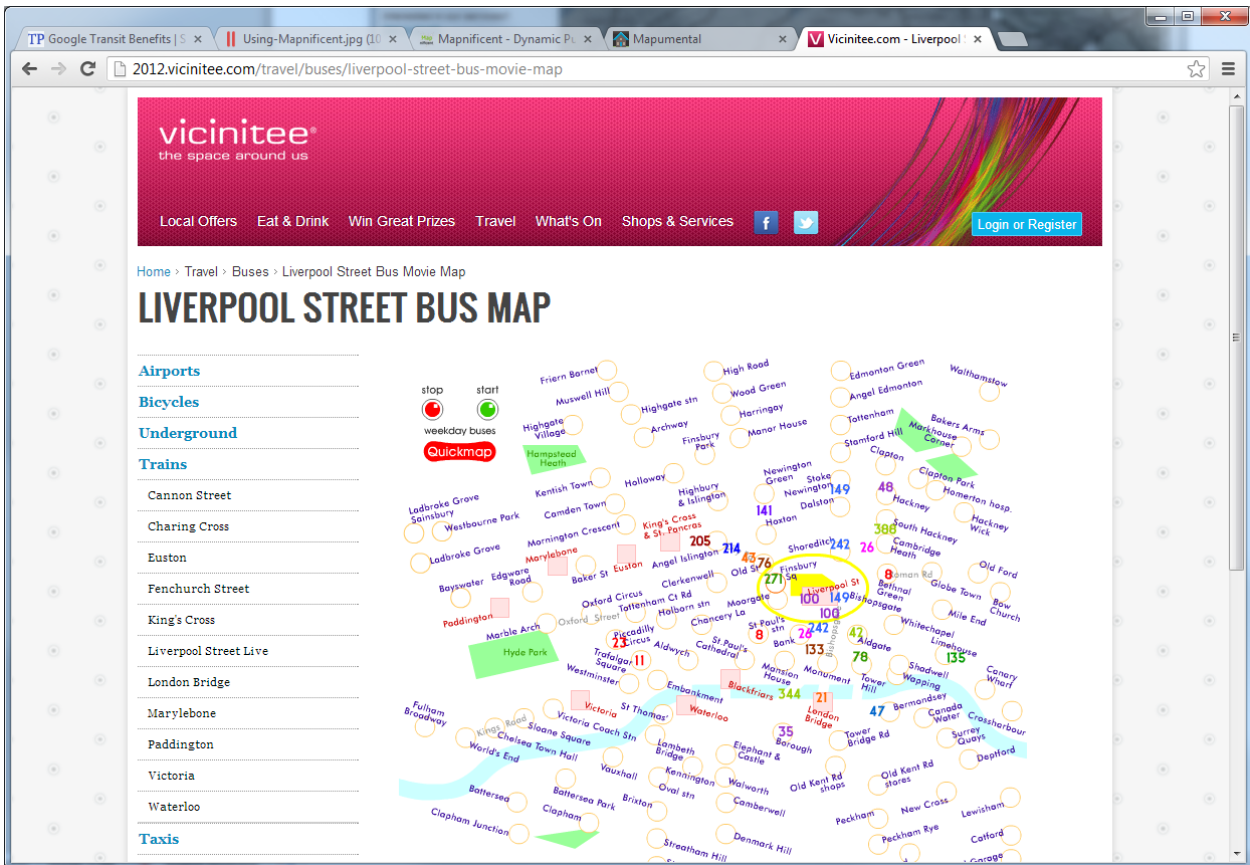


Figure 2-6 Animated bus map for Liverpool Street, London (Vicinitee, 2012)

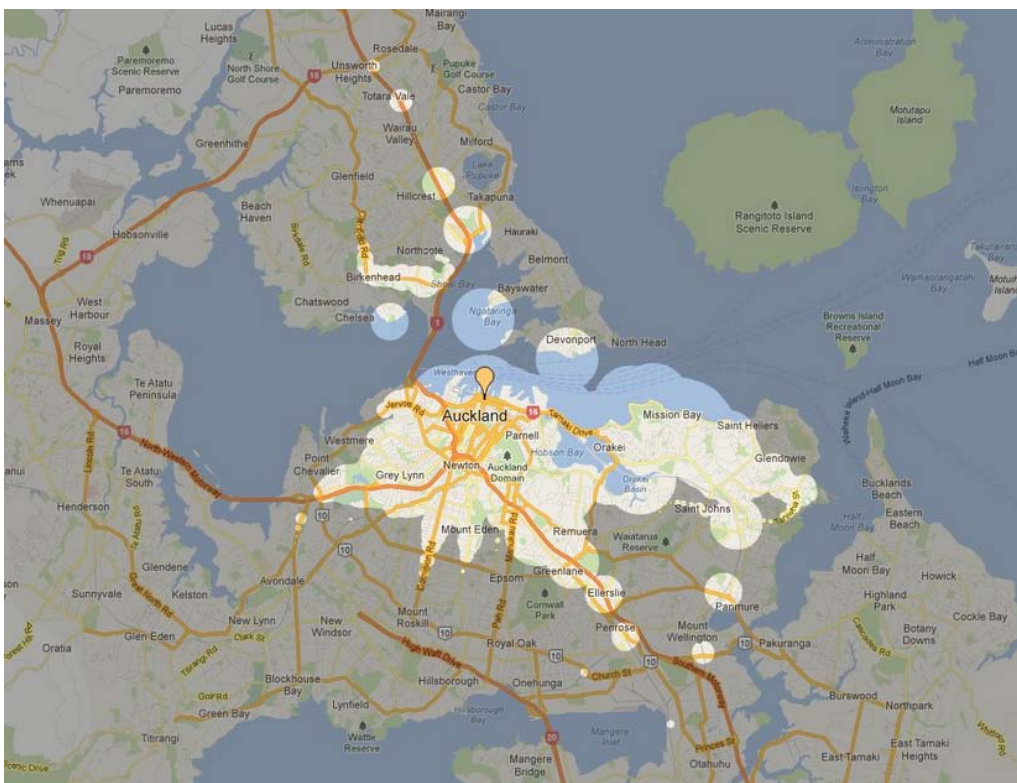


Figure 2-7 Mapnificent allows users to see areas that can be accessed by public transport within a specified journey time from a particular origin (Arbury, 2011)

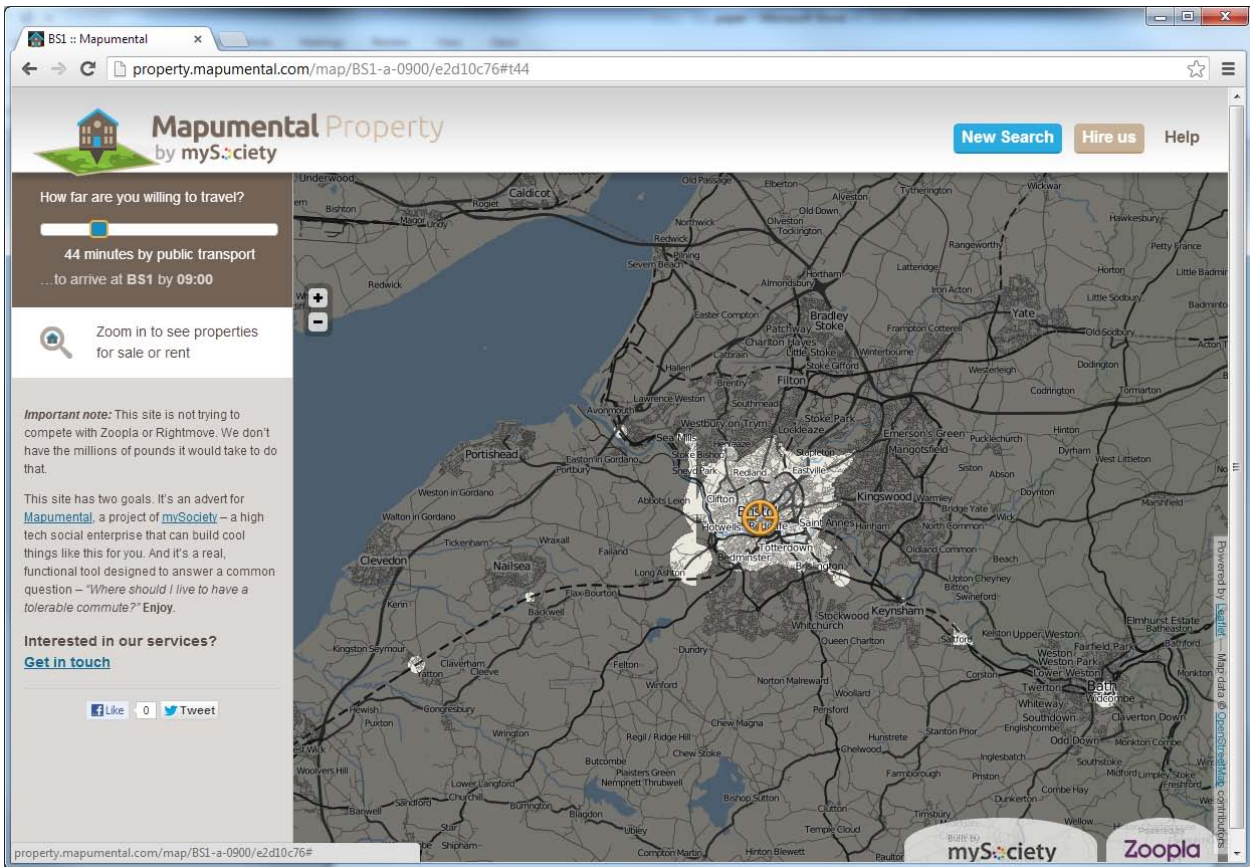


Figure 2-8 Mapumental feature allowing users to search for property within a specified commute time of their destination (Thomas, 2012)

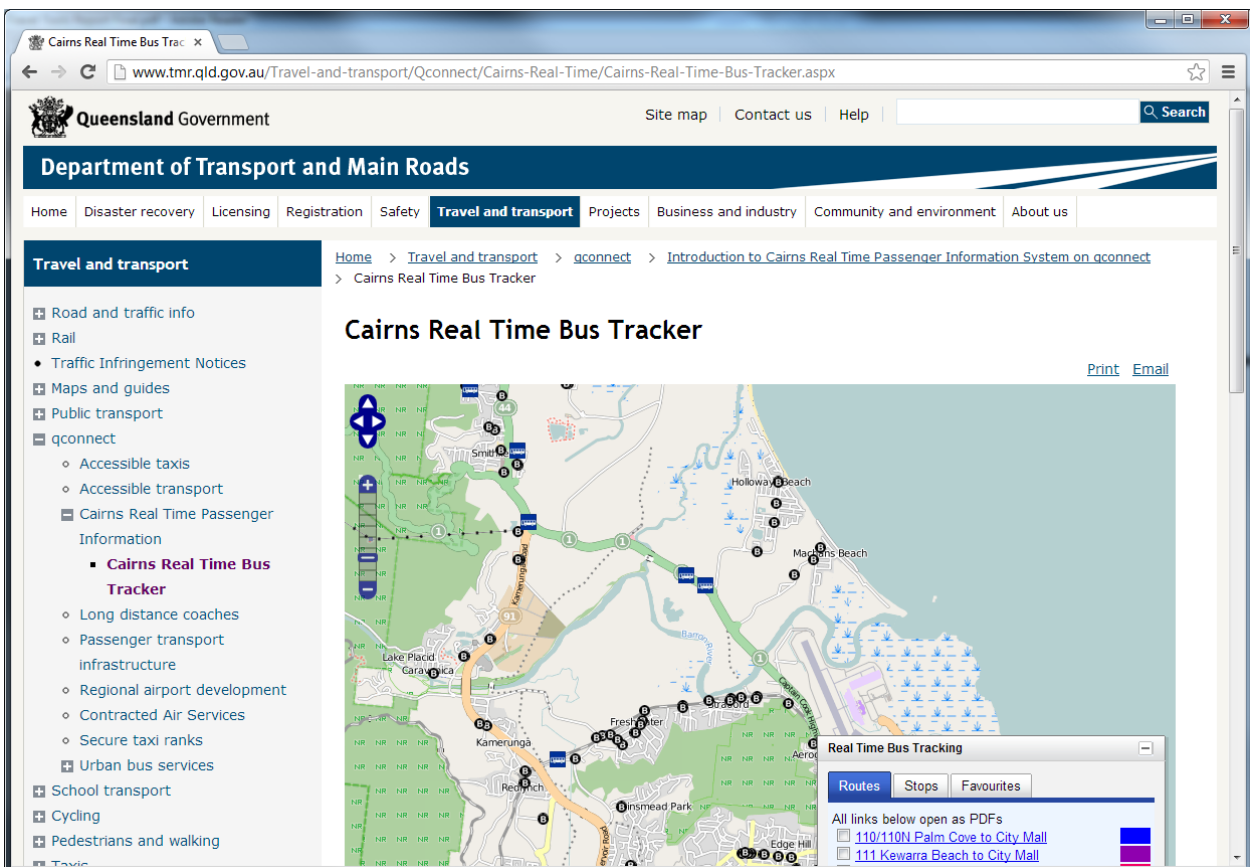


Figure 2-9 Cairns, Australia Real Time Bus Tracker Map (Queensland Government, 2011)

2.2 Carpooling and taxi sharing

Let's Carpool, the government-backed carpooling website for New Zealand was launched in 2012 (see Figure 2-10). It will be interesting to watch how it evolves in particular how it will be affected by the trend, particularly among Generation Y⁴ to seek carpools within their social networks (Martin, John W, 2010).

A taxi-sharing app for NZ does not appear to be available but it would probably be well-received by the travelling public; a taxi sharing app might also help to make Auckland's water taxi services more viable⁵. Taxi sharing apps are available in a number of cities in Europe and the US, see Figure 2-11.



Figure 2-10 Let's Carpool, NZ's government-backed carpooling website (NZ Government, 2012)

⁴ "Generation Y, also known as the Millennial Generation, is the demographic cohort following Generation X. There are no precise dates for when Generation Y starts and ends. Commentators use beginning birth dates from the latter 1970s, or from the early 1980's to the early 2000's" Wikipedia (2013). This generation has had constant access to technology (computers, cellphones etc.) in their youth.

⁵ Numerous Auckland-based water taxi businesses have gone into receivership over the past few years; water taxis can offer some of the fastest journey times for some trips, facilitating sharing would make trips more affordable and could potentially increase demand to a commercially viable level



The screenshot shows the website for Fare/Share, a taxi-sharing service. The page features a navigation menu with links for About, Screenshots, Features, FAQ, Press, Data Analysis, Our Story, Your F/S Stories, and Blog. A prominent banner encourages users to access the mobile webapp at <http://m.faresharenyc.com>. A video player displays a demo of the app on a smartphone. Below the video, there are several promotional links and social media integration options. On the right side, a section titled 'Ride Shares & Requests' lists several ride requests with details such as location, destination, and time.

Fare/Share
socialize your ride

Log in Register

About Screenshots Features FAQ Press Data Analysis Our Story Your F/S Stories Blog

Access the Mobile Webapp at <http://m.faresharenyc.com>

Fare/Share Demo Video

Fare/Share is a unique but simple tool that helps New Yorkers share taxis on the go.

It features one-click ride requests, fare calculations, identification by photo or apparel, PayPal integration and a rating system.

Socialize your ride!

Sign up for our Email Newsletter

Privacy by [SafeSubscribe™](#)

Ride Shares & Requests

- Andy is looking for a cabmate near Near 1-2 Warwick Dr heading to SW15
July 12, 2011, 4:25 am
- Taj is looking for a cabmate near (null) Bowey Bay Blvd heading to Lower East Side
June 15, 2011, 10:57 am
- Nicola is looking for a cabmate near 3rd Ave, New York, New York heading to Battery Park City
May 10, 2011, 10:32 am
- Emo is looking for a cabmate near Kennedy Pl, Tuckahoe, New York heading to Astoria
May 5, 2011, 11:22 pm

- Download Fare/Share for the iPhone on the iTunes App Store!
- Available via webapp for
- Follow us on Twitter
- Become a fan on Facebook
- Foursquare, Twitter and Facebook Integration - share your ride requests with friends by linking your accounts!

Figure 2-11 Taxi-sharing app in New York (Hanna, Novich et al., 2010)

2.3 Making a trip, not choosing a mode

One of the challenges facing TDM professionals is to change the mindset of commuters towards planning a journey rather than choosing a mode. Generation Y in particular are more likely to think this way (Martin, John W, 2010). These younger travellers are driving efforts to amalgamate mode options so that users can seamlessly find trips from place to place. [RideScout](#) is an app that aggregates real-time multi-modal data so allowing users to find trips that fit them best (see Figure 2-12).

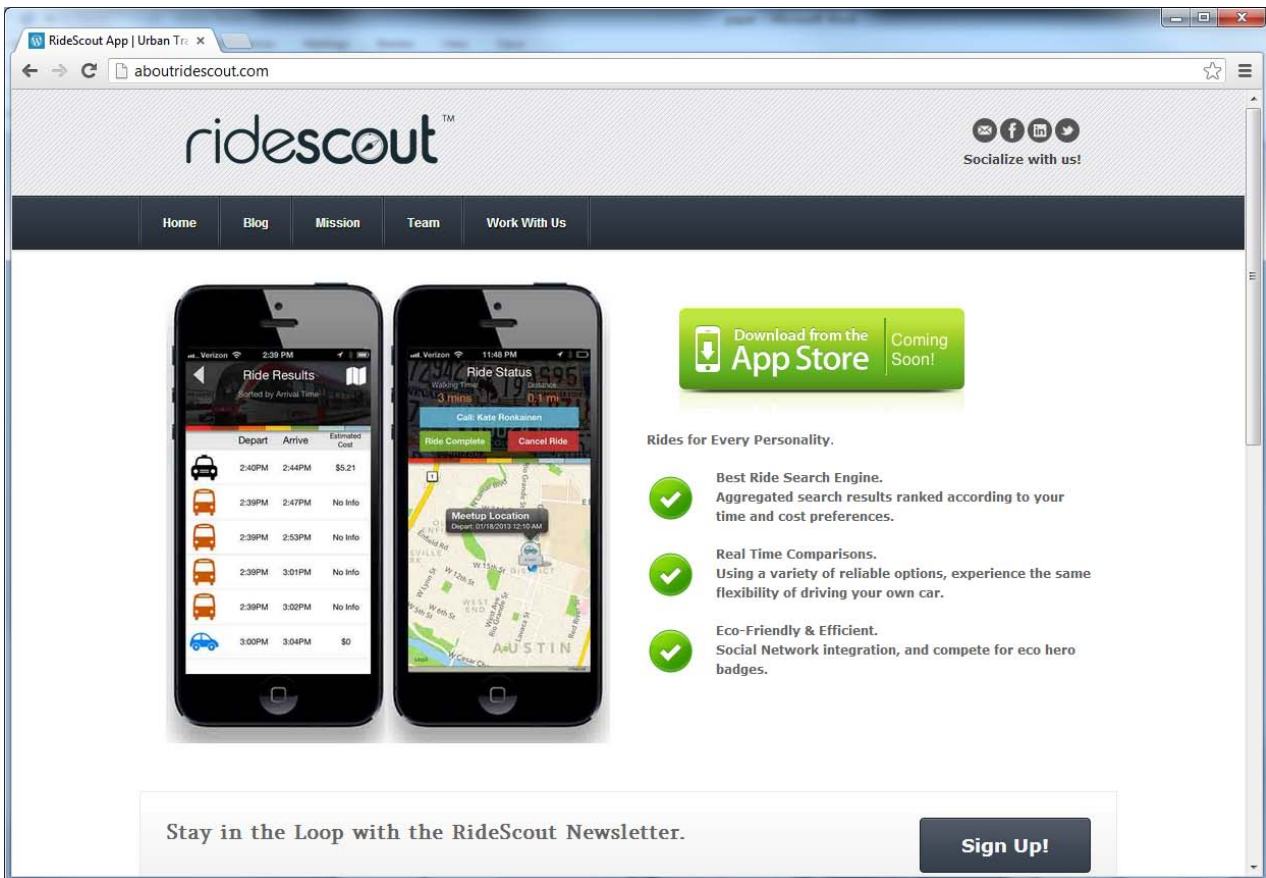


Figure 2-12 Ridescout, an app that aggregates real-time bus, taxi and carpool trips (Ridescout, 2011)

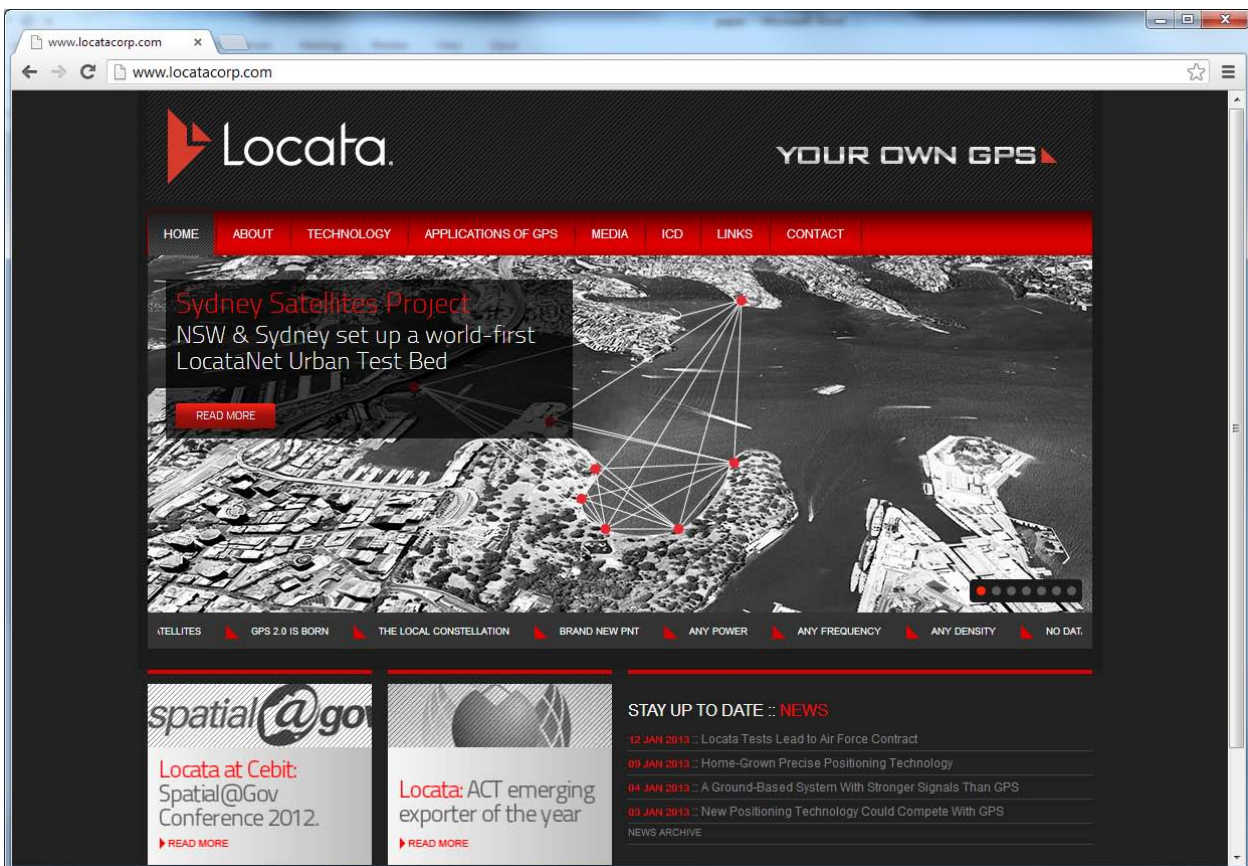


Figure 2-13 Locata: recently launched positioning technology that offer greater accuracy than GPS (Locata Corporation, 2012)

In addition, advances in the accuracy of positioning systems will bring benefits to users of location-based apps, particularly in cities or indoors, Locata's⁶ uptake would be worth watching (Figure 2-13).

Readers wishing to keep up to date with the latest location-based developments can follow key people on Twitter, read Wired and New Scientist magazines, review the results of hackathons around the world and New Zealand's [Mix and Mash](#) competitions, follow conversations at [gathergather](#) and visit the Google Maps, Apple Maps and OpenStreetMap's API pages (<https://developers.google.com/maps/>, <http://www.apple.com/ios/maps/>), <http://wiki.openstreetmap.org/wiki/Develop>).

3 SOCIAL MEDIA: THE CROWD ON THE MOVE

"For centuries, the idea of democracy has relied on a public sphere of debate that would inform the decisions and understanding of the electorate, but the existence of such an area has been uncertain at best. Now it's there, and you can choose to be part of it" (Harkaway, 2012)

There is no longer a neat line denoting where location-based tools end and social media begins, as a result this section and the preceding one overlap. The intention of this section is not to provide a how-to guide to Twitter, Facebook, Foursquare, Tumblr, YouTube, Pinterest, Google+, Blogs etc.⁷ rather it has been included to present a few examples of how social media is being used in a transport context with the intention of stimulating thinking around our use of social media and its potential.

Numerous service providers and government bodies are using social media to communicate regularly with a large number of followers. Auckland Transport and New Zealand Transport Agency both have very active Twitter pages (see Figure 3-1). There are also well-used independent websites e.g. [Fix My Street](#)⁸; FixMyStreet allows users to put pins on a map and report issues (e.g. glass in a cycleway, potholes on the road), the site then reports issues on to the relevant agency and tracks progress with their resolution (see Figure 3-2). In the previous section, the tendency for Generation Y to want to seek carpools within their social networks was mentioned. Sites similar to that offered by NextDoor (see Figure 3-3) and proximity-based social networks⁹ may well overtake or displace carpooling websites as the place people go to first to share rides.

Social media offers a valuable platform for collecting user feedback and local information. [Inrix](#) offers an interesting case study that demonstrates the power of crowd-sourced data, Inrix combines information from local authorities, traffic cameras and crowd-sourced reports of local issues to power its real-time traffic information systems, Inrix data powers the navigation tools behind Google Maps and a wide variety of in-vehicle navigation systems (Harris, 2012).

The number of social media messages and data that are geo-tagged will increase as people and things stream their position. Instant analysis of this data should provide us with meaningful information in real time about the performance of our transport services and networks and the experience of users. This should also provide us with more predictive powers, furnishing users and service providers with better information with which to plan their journeys. [Tweereal](#) is worth mentioning here, it's a world map showing geo-tagged tweets in real time; these could be tweets geo-tagged by users but could also be geo-tagged tweets from public transport service operators. At the time of writing, Tweets showed up over New Zealand infrequently (see Figure 3-4), [Tweetping](#) also presents location-based data from Twitter.

⁶ Locata's positioning system allows positioning accurate to within a few cm's, this is much more accurate than current GPS technologies can offer either indoors or in cities

⁷ Readers looking for such guidance might like to read Kaufman's paper: [How Social Media Moves New York](#) (Kaufman 2012), a more general overview of social media can also be found at <http://socialmedianz.com/>

⁸ FixMyStreet was launched in September 2010 as part of the [Open New Zealand](#) initiative, it is run by volunteers

⁹ Proximity-based social networking applications connect users based on their physical proximity to each other

We're moving out of an period when social media was focused on disseminating and discussing information and into a period when the crowd is gaining the power to effect change. A possibility worth considering is at what point might the balance tip from it being more commercially viable to run passenger transport or demand responsive networks using a "top down" approach to it being more beneficial for operators to respond to real-time demands from the crowd (this scenario of decentralisation is just taxi-sharing, scaled up).

As the public provide more information about their whereabouts and share their observations and experiences of transport, they are choosing (sometimes not consciously) to trade off their privacy in favour of participation and convenience; governments have a duty of care to protect individuals' digital footprints, the US government has recently introduced a bill to do just that (Singer, 2013).



Figure 3-1 Auckland Transport's Twitter page (Auckland Transport, 2012)

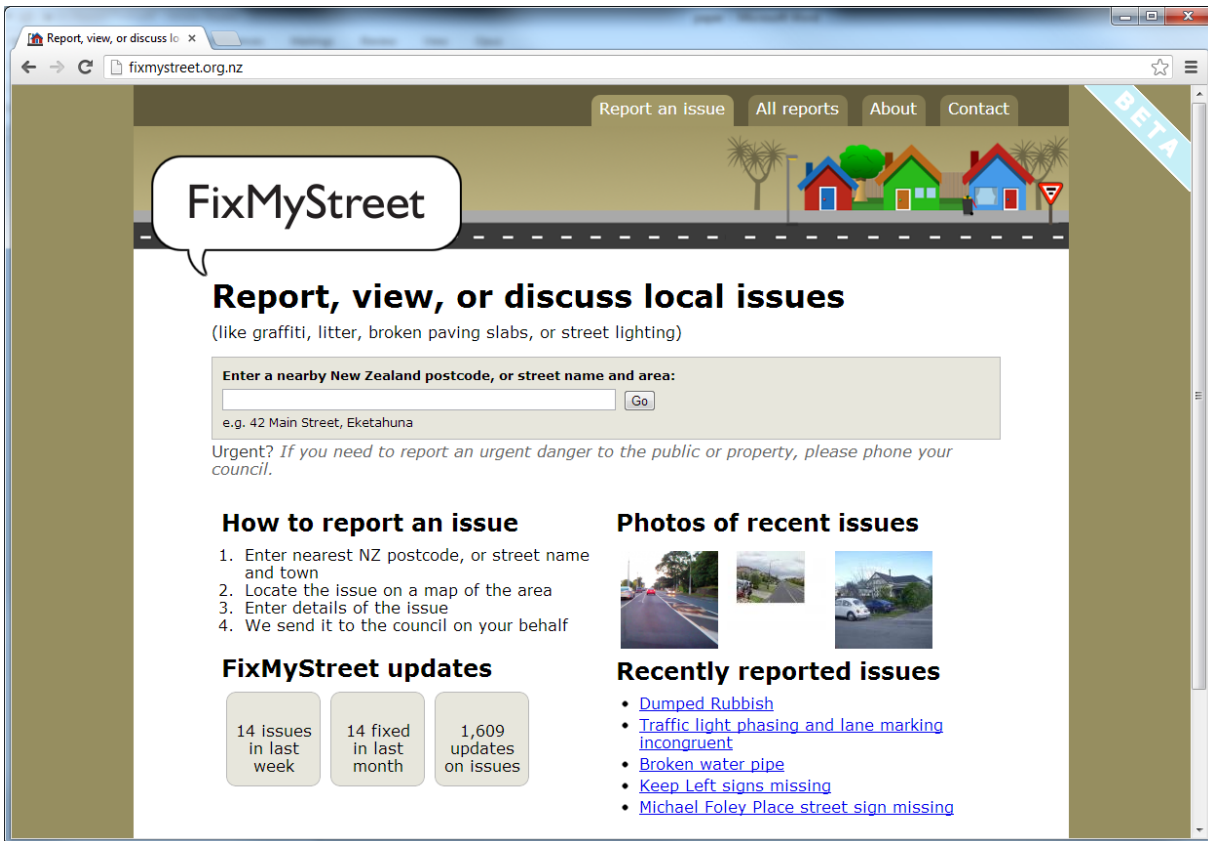


Figure 3-2 Fix My Street allows people to report or discuss local issues (Hunt, 2010)

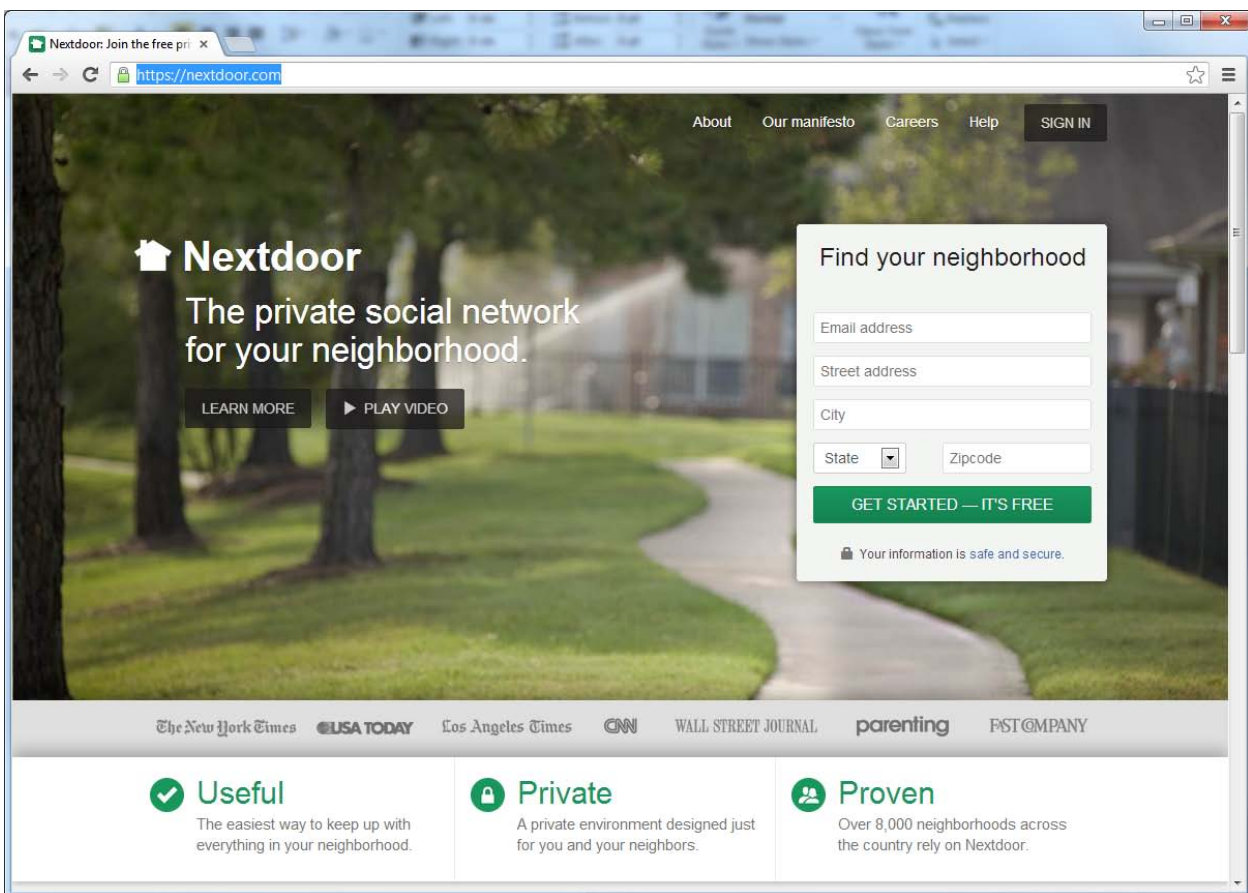


Figure 3-3 'NextDoor' offers geographically bounded social networks for communities (Ryan, 2013)

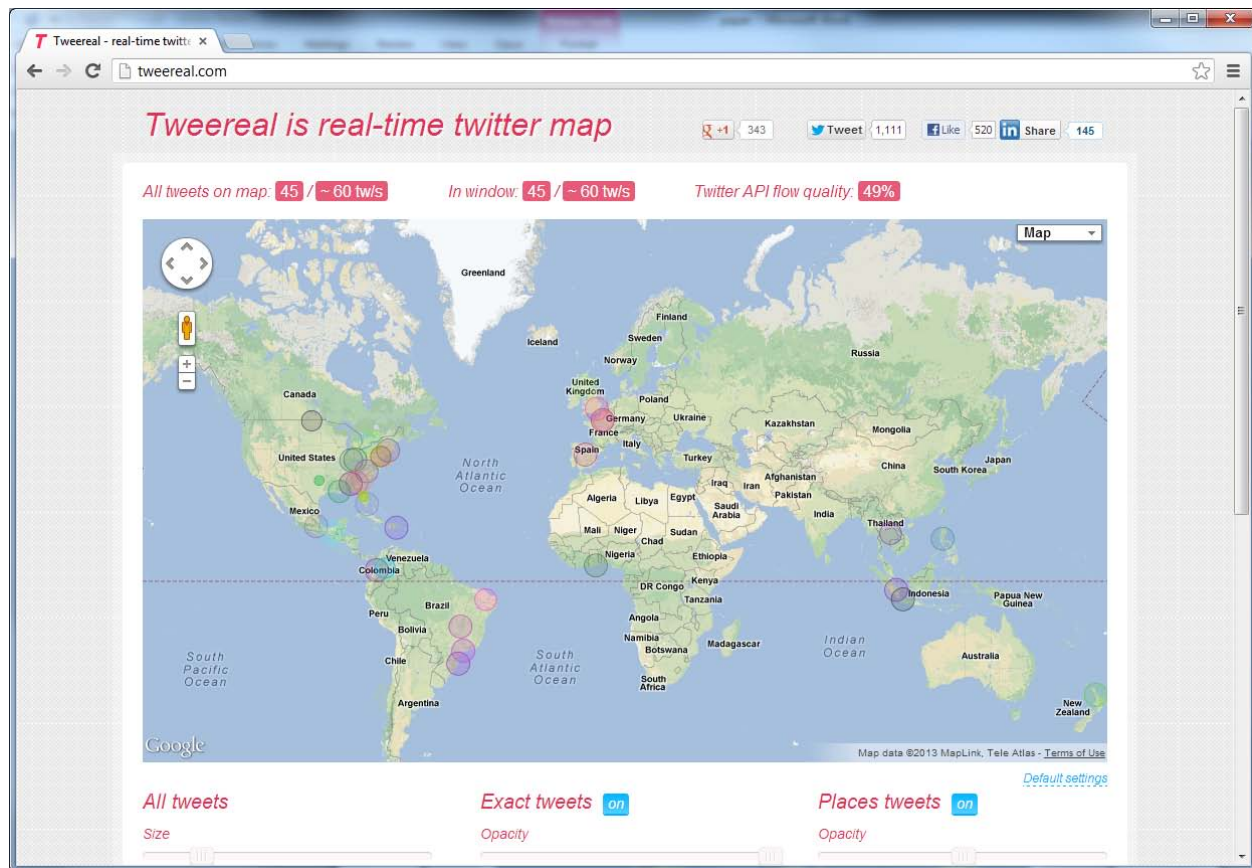


Figure 3-4 Tweereal- a real-time Twitter map (Bey, 2012)

3.1 Data, data everywhere

A huge amount of data is being generated by social media, real-time positioning technology, location-based services and data from the [Internet of Things](#). Tools are already available that help us to make sense of this data and to filter out meaningless chatter from the crowd to distil salient content and identify trends (e.g. [Hootsuite](#) and [Hadoop](#)).

In the next few years we can expect significant advances in how we analyse and make sense of big data. Recent developments in topological data analysis are particularly interesting and could offer benefits to those analysing transport data (two US government-backed start-ups to watch are [Ayasdi](#) and [BeyondCore Lucid](#)) the US government agency DARPA is also backing the development of big data in open source code (Harris, 2013).

4 NZ TDM PROFESSIONALS: YOUR NEXT MOVE IS DIGITAL

“...this is not the wisdom of the crowd, but the wisdom of someone in the crowd. It’s not that the network itself is smart; it’s that the individuals get smarter because they’re connected to the network” (Johnson, 2010).

Sections 2 and 3 of this paper put some ‘parts on the table’ with the intention of stimulating good ideas among TDM professionals who might have been hesitating to embrace digital technology. The parts were gleaned from many disparate sources: we’re moving through an era where information is scattered, it’s no longer possible to keep abreast of everything that’s happening by reading a handful of journals. Rather we should seek to keep up to date by embedding ourselves into online networks that allow us to connect, learn, participate, share our knowledge and collaborate with digital developers.

The TDM profession could provide the travelling public with a better digital transport experience by actively

encouraging needs-based innovation. We need to identify gaps, collect together information that is useful to the travelling public and take the legwork out of the current experience. We should be seeking to create a cohesive, user-friendly digital transport experience and to give the public confidence to use the apps and websites that work. It's worth noting that New York is very actively developing its digital economy, NY has a Digital Roadmap (City of New York, 2012) and has monitored and reported its progress in implementing this for two consecutive years¹⁰. A similar strategy for New Zealand does not appear to exist (although there is policy that supports digital development such as '[better public services for business](#)' and '[better public services for the public \(for individuals\)](#)', and the [Ministry of Business, Innovation and Employment](#) is supportive of the digital development community).

In order to achieve this, TDM professionals need to collaborate more effectively and direct the efforts of programmers to solve transport problems. We need to rethink what we can endorse and promote, get behind the good stuff and support it financially, particularly if it will replace a less inefficient in-house system or process. Without restraining innovation, we need to step in when help is needed to build the critical mass that some apps, websites or social networks need in order to function effectively.

We need to actively listen to the crowd and use their feedback to provide travellers with quality information about their travel options, in real-time where appropriate. We need to re-evaluate how we measure and improve transport network performance so that we become better able to identify problems in real-time and fix them quickly.

I wrote this paper because I would like to see more TDM professionals take hold of our digital future. It is not realistic to expect order to emerge from the crowd (i.e. bottom up), the knowledge in the networks and the digital developer economy won't generate that (e.g. the majority of developers creating apps for mobile devices struggle to break even (Vision Mobile, 2013)).

If we collaborate, connect and direct our funds and efforts, we could create a better experience for the travelling public in NZ, increase our ability to effect positive travel behaviour change and realise in a timely manner the efficiencies and sea-changes that the digital revolution has to offer.

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¹⁰ Established in January 2011, the mission of NYC Digital is to "realise New York City's potential as the world's leading digital city". The [NYC Digital Page](#) is well worth visiting.

- <http://www.google.co.nz/maps?ie=UTF8&f=d&dirflg=r&hl=en&saddr=100+beaumont+street&daddr=brito mart&ttype=dep&date=30%2F1%2F13&time=3%3A37pm>. Last accessed 30/1/2013.
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