Exploring the Potential of Government 2.0 in Dublin City Cycling

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

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Kieran O'Hare

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Abstract

Citizen-government engagement and collaboration using social Information Systems is a relatively new concept, but whose potential several authors have previously explored. The Irish Government has set an ambitious target for cycling modal share by 2020, with Dublin city being a key contributor to this. It has also presented a vision for e-government, with new and emerging technologies and media central to that vision. Urban cyclists represent a passionate community but face challenges in the areas of safety, security, and ride quality. There is potential for cycling citizens and government to share data to address these challenges. However, collection and sharing of cycling data has, to date, been limited and low-tech. This study explores the key aspects of Government 2.0 as well as previous uses of Information Systems in urban cycling. Direct engagement with key stakeholders is undertaken, via an electronic survey offered to cyclists, and face-to-face interviews with cycling advocates and state authorities. Based on the findings from these engagements, this Dissertation concludes that social media is unsuitable for cycling discussions between government and citizen. The government side feels that traditional, face-to-face, or physical interactions are more effective than online engagement. Social media does have other niche uses, mainly in the area of promotion. The smartphone is adjudged to be the platform of choice for hard data collection and sharing. The Irish Government has made some creditable forays into open government, but more data of relevance to cycling should be made available by default. Better organisation of this data, and integration of existing and desired Government services into a smartphone App, is recommended. Cyclists showed most desire for an App to geolocate and report issues with the cycling infrastructure to the authorities. Resource shortages in Government are currently the key obstacle to wider realisation of the potential of Government 2.0.

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List of Abbreviations

API	Application Programming Interface
CSO	Central Statistics Office
DCC	Dublin City Council
GIS	Geographical Information System
GPS	Global Positioning System
HIPE	Hospital In-Patient Enquiry
ICT	Information and Communications Technology
PDF	Portable Document Format
POWCAR	Place of Work – Census of Anonymised Records
RFID	Radio Frequency Identification
ROS	Revenue Online Service
RSS	Really Simple Syndication
SCATS	Sydney Coordinated Adaptive Traffic Systems
SMS	Short Message Service
URL	Uniform Resource Locator

1. Introduction

1.1 The Background and Rationale of this Research

Cycling is increasingly being seen as a sustainable and healthy mode of transport and cycling levels are growing globally. The number of people cycling in Ireland, having been high in the 1980's, decreased dramatically up to 2002. Cyclists numbers then started to increase gradually again in line with several factors. The global recession, and a brutal property-related economic crash in Ireland, resulted in more people cycling to work rather than driving.

The 2009 National Cycling Policy Framework (NCPF) aims to increase bicycle mode share to 10% of all trips by 2020. This, along with other policy interventions, has already resulted in cycling infrastructure improvements. A tax incentive scheme allowing employees to offset bicycle purchases against tax contributions has been in place in Ireland since 2009. Bicycle sharing schemes have been established in many cities worldwide; Dublin has the very successful 'dublinbikes' scheme which continues to expand, and other Irish cities and towns are about to introduce similar schemes.

Information Systems are a pervasive part of most people's lives in the developed world. Web 2.0 and social media platforms have grown in popularity as they are an inexpensive and appealing way to communicate thoughts, opinions, and experiences, and to connect with others. A large proportion of people in Ireland have accounts on these platforms, as can be seen in Figure 1.1, and it seems likely that the platforms are here to stay.

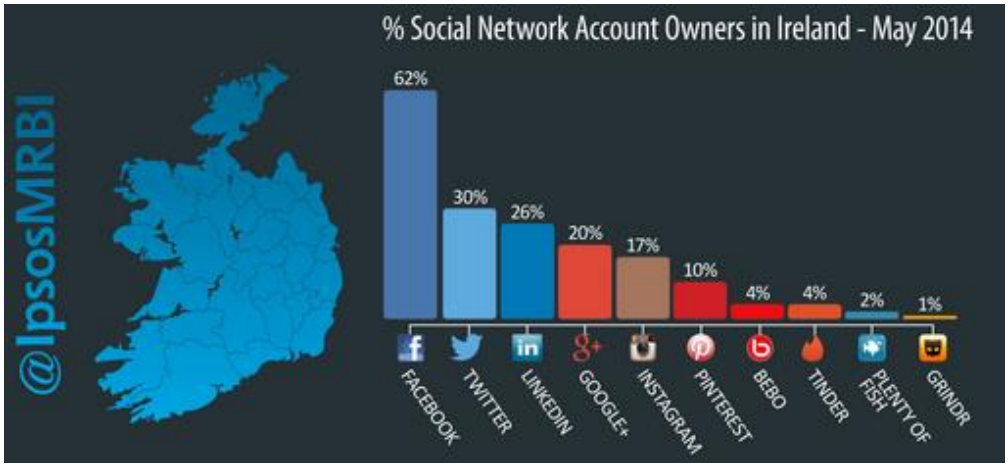

FIGURE 1.1 – Social Network Account Holders in Ireland (source: Eircom, 2013)

Smartphones have ported the Internet from the desktop to the handbag and the coat pocket, and they also contain an array of sensors that collect a huge amount of potentially valuable data. Figures from 2013 show there to be approximately 1.6 million smartphones in use in Ireland (Eircom, 2013).

In line with the technological evolutions above, national and local governments are under pressure to make services and data available to the public online, to be more open, and to provide a more participatory, collaborative society. The new platforms offer the potential for governments to reach large amounts of citizens in a radically different manner, and technology-savvy citizens are developing expectations of how governments should make themselves available and participate in online spaces. The paradigm shift to always-on connectedness presents numerous challenges to the government status-quo.

Dublin is the capital city of Ireland and is also by far the most populous city, accounting for 28% of the population (Central Statistics Office, 2011), so interventions that can increase commuting cycling levels here will contribute significantly to achieving the figure of 10% for bicycle mode share nationally. More commuting cyclists in Dublin, however, will mean more pressure on limited road space in a city that was founded in 988 A.D. and has always struggled to accommodate rising levels of road users. These increasingly constrained and congested transportation corridors will have to be shared by cyclists and motorised traffic. It is therefore important that informed and intelligent infrastructure decisions are made.

Cyclists constitute a passionate community but struggle with their identity on the road. Security, safety, and image are issues of concern to cyclists in Dublin, in common with other cities worldwide. Unlike motorised traffic however, cyclists in Ireland are unlicensed, unregistered, and failure to adhere to the rules of the road effectively carries no penalty for them. This has created a background whereby each stakeholder has a less than perfect reputation amongst the other.

Collection and sharing of data using Information Systems could play a key part in helping address cyclists' concerns, in promoting cycling in the city, and in persuading would-be cyclists to take up this mode of commuting to achieve the 2020 target. It could also be an effective way to raise and enhance the profile of cyclists amongst other road users. Without appropriate data to support interventions, however, the bicycle modal share target is unlikely to be achieved.

Of equal importance to data collection and sharing is the choice of Information System platforms to use for these activities. Web 2.0 platforms and social media may have potential in this context, providing that the resources are available for engagement using them, that citizens and government are likely to engage, and that they are more effective than traditional methods of data collection.

1.2 Research Questions

The primary research question being asked is:

Can citizen-government interaction in the style of Government 2.0 benefit Dublin city cycling?

The objectives of this research are to find out:

What are the most important aspects of Government 2.0?

How have Information Systems been used to address the issues of urban cyclists?

In what ways should Government 2.0 be applied in Dublin city cycling?

1.3 Who will benefit from this Research

This purpose of this research is to determine if and how Information Systems can be harnessed to improve the Dublin city cycling experience. The topic is of interest to local and national governments in understanding the potential to use Web 2.0, social media, and technology such as smartphones, to collect and share valuable data from cyclists. Knowledge of the most pertinent issues and concerns of Dublin city cyclists will be of benefit in focusing interventions and initiatives. A profile of the smartphone and Web 2.0 usage of these cyclists will help inform decisions on effective ways to engage with this community. The findings may also be of benefit to cycling advocacy groups in shaping their engagements with both the cycling community and government on these platforms.

1.4 Scope and Boundaries of this Research

This study focuses on commuting cyclists in Dublin city and the potential for Government 2.0 in addressing the concerns of such cycling citizens.

1.5 Roadmap of Subsequent Chapters

This dissertation consists of five chapters, of which this is the first. An overview of subsequent chapters is given below.

Chapter 2: Literature Review: This chapter presents the results of the literature review. It gives the theoretical background of the research and aims to critically review the literature. The most important aspects of Government 2.0 are identified, and existing research on, and uses of, Information Systems to address cyclists' issues and concerns are discussed. Finally, the cycling citizen-government ecosystem in Dublin is described with regard to governance, policy, and stakeholders.

Chapter 3: Research Methodology and Field Work: This chapter describes the methodological choices that were available, and the methods that were chosen as being most suitable in the context of answering the research question. The data collection and analysis procedures adopted, and the associated ethical considerations, are described. Finally, any limitations and problems with the chosen method are discussed.

Chapter 4: Findings and Analysis: This chapter analyses and discusses the results of the online questionnaire and distills the main themes that emerged from the subsequent face-to-face interviews.

Chapter 5: Conclusions and Future Work: The purpose of this chapter is to discuss the findings of the research and to draw conclusions to support answering of the research question. Recommendations are also made with respect to what practical measures should be taken in light of those conclusions. Finally, suggestions are made with regard to opportunities for future research in the area of Government 2.0 and cycling.

2 Literature Review

2.1 Introduction

The purpose of this chapter is to critically analyse the literature available on Government 2.0 and on Information Systems use in urban cycling. This dissertation seeks to explore the potential for Dublin city cyclists and local government to engage and collaborate using Information Systems, so the first part of the literature review examines published research into Government 2.0. Secondly, research into the use of Information Systems to address the concerns of urban cyclists is examined and critically evaluated. Finally, the landscape of cycling in Dublin will be described in the context of the preceding topics, showing the important influences at the citizen and local government sides.

2.2 Aspects of Government 2.0

2.2.1 Origin

The OECD definition of e-government, or electronic government, states that e-government 'focuses on the use of new Information and Communication Technologies (ICTs) by governments as applied to the full range of government functions. In particular, the networking potential offered by the Internet and related technologies has the potential to transform the structures and operation of government' (Organisation for Economic Co-operation and Development, 2002).

Tim O'Reilly, the founder of O'Reilly Media Inc., credits himself with co-creating the term Web 2.0 (O'Reilly, 2005). He visualized Web 2.0, or the second generation of the World Wide Web, as a set of principles and practices that tie together a vast range of websites. These principles include the web as a platform, software as a service that is device-agnostic, scalable and remixable data sources, and user control of data in a participatory culture that uses collective intelligence.

Osimo later defined Web 2.0 quite succinctly as a combination of technologies, applications, and values (Osimo, 2008). Web 2.0 platforms today are generally accepted to encompass a range of functionalities centred on the ability for people to collaborate and share information online. Social networking sites such as Facebook and Twitter, blogs and wikis, and content sites such as YouTube and mashups, are all regarded as being Web 2.0 platforms.

Government 2.0 is a term that is used to describe the fusion of Web 2.0 fundamentals with those of e-government. Gartner defined Government 2.0 as 'the use of IT to socialize and commoditize government services, processes and data' (DiMaio, 2009). Meijer et al. (2012) defined Government 2.0 as "government that uses interactive communication technologies to transform connections between government and citizens into increasingly open, social, and user-centred relations". Government 2.0 is therefore not just Web 2.0 in a government setting. Rather, it is a process of fundamental transformation.

Several studies have analysed the contexts in which Web 2.0 platforms have been implemented in government. Osimo (2008) identified the public sector as a key field for ICT due to the impact that ICT-enabled public services can have on economic growth, inclusion, and quality of life. The research highlighted the concept of 'user as producer' via Web 2.0 technologies, and predicted that the most visible impact would be in the area of political participation. Ostergaard et al. (2008) asserted that Web 2.0 is a disruptive, hard to predict technology, and predicted that e-Democracy, Health Care Networks, Public/Private Surveillance networks, and community circles using the Facebook and/or YouTube models, were the likely high growth rate areas.

A watershed moment for Government 2.0 arrived in 2009 when President Obama issued the Open Government Directive for achieving key milestones in transparency, participation, and collaboration. In 2010 Federal departments published an Open Government Plan for making operations and data more transparent, and expanding opportunities for citizen participation and collaboration (White House, 2009).

In the global context, the Open Government Partnership was launched in 2011 to provide an international platform committed to making governments more open, accountable, and responsive to citizens. The partnership has grown from eight initial participant countries to the current figure of 63 (Open Government Partnership, 2013). It is planned that full membership for Ireland will be achieved in 2014 (Open Government Partnership Ireland, 2013).

2.2.2 Measuring the Progress and Success of Government 2.0

It is important to be able to measure how mature implementations of Government 2.0 are. The terms e-government and Government 2.0 are sometimes used interchangeably, and a respected international indicator of e-government maturity is the United Nations E-government Readiness Index (United Nations, 2012). In this index, the two primary indicators

that contribute to a country's ranking are the state of e-government readiness and the extent of e-participation. Ireland is ranked 34th out of 193 countries on the worldwide e-government development index for 2012, down from 21st in 2010, as shown in Figure 2.1.

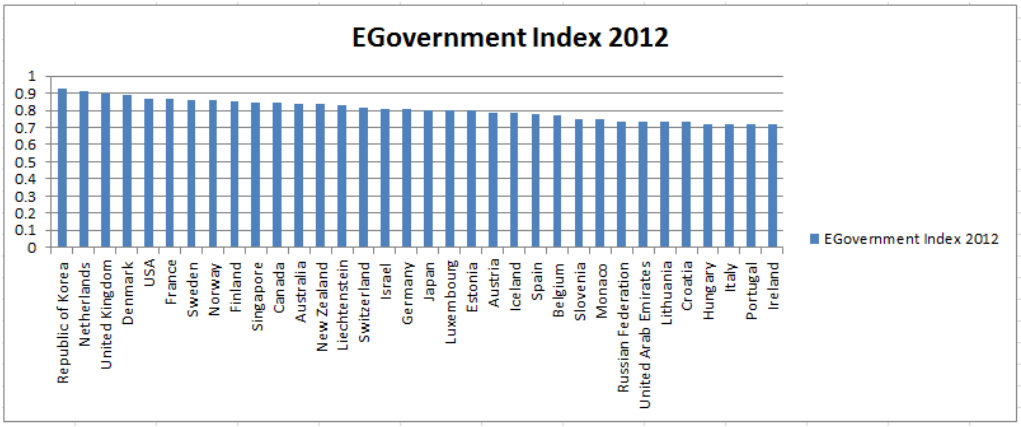

FIGURE 2.1 – E-government Index 2012 (reproduced from United Nations, 2012)

Osimo (2008) found that take-up levels for Government 2.0 were low, and that the impact was difficult to see in many cases. Take-up level is important, as a high level of user input is a quality assurance mechanism. He further concluded that there was only anecdotal evidence of positive impact in many initiatives. Because the technology is cheap, though, experimentation should still be encouraged. Criado et al. (2013) also highlighted a need for better metrics for the success of social media initiatives.

Lee et al. (2012) argued that outcome-centric metrics are just as important as process-centric metrics in evaluating open government social media initiatives. Mossberger et al. (2013) went further by raising the question of how representative social media content is of citizens' views.

2.2.3 Platforms

Most of the literature on Government 2.0 consists of some analysis of the platforms used. Nam (2011) found that Web-based contests and social voting mechanisms were the most promising mechanisms as they have the tangible benefit of material incentive or the pleasure of having one's voice published, and that the quality of the design of the Government 2.0 platform is also vital to its performance.

Chua et al. (2012) researched the extent to which Web 2.0 applications are prevalent in government websites worldwide, how they are used, and the relationship between the presence of Web 2.0 applications and the perceived website quality. The authors also

proposed a quality framework for evaluating website quality, and found a correlation between the presence of Web 2.0 content and the overall quality of a government website.

Bonsón et al. (2012) analysed the extent of use of Web 2.0 platforms in EU local governments and created a sophistication index based on the extent of their use. In general, they found that Web 2.0 platforms were not used extensively, and that RSS feeds, blogs, and official YouTube videos were the most common.

Mossberger et al. (2013), in their study of social media use in U.S. local government, highlighted the emergence of open data portals for collaborative improvement of information availability, the use of contests for development of applications and reputation systems to allow commenting.

An interesting common mistake identified by Osimo (2008) in early initiatives was a focus on developing a proprietary application, despite most collaboration happening outside government websites. More recently, Criado et al. (2013) conducted a review of previous publications on government innovation through social media and found that in-house, ad-hoc tools and approaches now supplement the enormous private sector social media platforms.

2.2.4 Purpose of Initiatives

Picazo-Vela et al. (2012) stressed the importance of governments understanding the problem that is to be solved using social media networks before embarking on their use. Bonsón et al. (2012) found that most local governments are using Web 2.0 tools and platforms to enhance transparency, and that the concept of corporate dialogue and e-participation are still in their infancy. Criado et al. (2013) found that the goals of social media applications in governments are more geared to innovation of the external citizen-facing layer of interaction than they are to internal managerial functions.

The research by Mergel (2013) found that adoption of social media usage by governments is influenced by two main factors; the passive attention network - or the list of departments that a director perceives as innovative, and whom they emulate - and, to a lesser extent, the formal guidance from top management. The general lack of formal guidance has resulted in government departments mostly experimenting with social media tactics to date.

2.2.5 Process/Transformation

The predicted transformative nature of Government 2.0 prompted early debate into *how* this will take place. William Eggers argued that governments, due to change-resistant bureaucracies, regulations, and other barriers, face a daunting task. They must change their way of thinking and bring about change by using technology effectively. He argued that Government 2.0 is really about government reform (Eggers, 2005).

Chun et al. (2010) outlined the development of Government 2.0 as taking place in four stages according to the pattern of interactions of digital governments with the public:

- Initial passive web presence stage
- Second stage of simple email and web form interaction
- Third stage that includes online transaction services such as tax payments
- Final stage of seamless information flow and collaborative decision making

A one-way flow of information from government to the public characterises the first three stages, and the fourth stage hasn't been achieved yet. Lee et al. (2012) looked at stages in the evolution of Open Government and developed an Open Government Maturity Model for social media-based public engagement. Their model has five levels, represented in Figure 2.2.

❶ Initial conditions ⇨ ❷ Data transparency ⇨ ❸ Open participation ⇨

❹ Open collaboration ⇨ ❺ Ubiquitous engagement

FIGURE 2.2 – Stages of Open Government

Meijer et al. (2012) focused on leadership issues and suggested that a collective leadership is required, which should be applied from both the top down and the bottom up. Lee et al. (2012) also highlighted the prevalent hierarchical organisational culture in government agencies as being a challenge.

Lips (2012) identified two dominant streams of e-government thinking. E-government 1.0 is a technological deterministic perspective, where IT departments 'own' e-government initiatives, and a 'build it and they will come' strategy prevails. E-government 2.0 is a perspective that explicitly relates the use of Information Systems in government and its external relationships with transformational change. The author argued for a focus on the particular institutional

environment of the public sector as determining whether e-government projects will be transformational.

2.2.6 Roles

Government 2.0 will involve a change to the roles fulfilled by stakeholders. Ostergaard et al. (2008) asserted a social programming basis for 'e-government 2.0' and argued that it is the societal and participatory aspects of the emerging business models that represent the most radical change expected. Crowdsourcing was not seen widely within public services; rather, a proliferation of individual initiatives to create communities.

Osimo (2008) found that Government 2.0 is characterised mainly by a more active user role, with users being both civil servants and citizens. Governments' role varies from active promoter to passive subject, and indeed there are examples of initiatives launched without government authorisation or without Government even being aware of them.

Linders (2012) looked at citizen coproduction in the age of social media and saw Information Systems in some cases replacing government as the intermediary by facilitating direct citizen-to-citizen assistance. The study advocated the adoption of crowdsourced, real-time systems, and concluded that Web 2.0 increases the viability of citizen-government coproduction, that the boundaries between players are being blurred, and that a debate on sharing responsibilities is needed. Citron (2009) also acknowledged the increasing blur of public and private personas when looking at changing roles in line with Government 2.0. Chua et al. (2012) acknowledged the emergence of the concept of citizens as partners and co-creators, and Criado et al. (2013) extended this to self-organisation by citizens to solve social problems using social media in a 'wiki-government' fashion, drastically changing the centrality of governments.

Bonsón et al. (2012) asserted that governments need to move from a passive presence outside social networks to a more active presence inside them. Governments who are not active in social media platforms are missing out on citizens' opinions on policies.

2.2.7 Resource Challenges

Osimo (2008) highlighted resource shortages, and trust and privacy concerns, in suggesting that the most favourable context for implementing Web 2.0 in a government context was the back office. Proper governance mechanisms need to be in place, and user participation must be actively cultivated despite the risk of low quality contributions.

Chun et al. (2010) identified several challenges in the area of resource demand, especially problems analysing, sharing, and searching Big Data, and applying social media innovatively. They also saw challenges in integrating data from different sources without endangering privacy, in managing identities, and in filtering out noise. Chua et al. (2012) said that with increasing volumes of user-generated content, inappropriate or unwanted content has to be constantly removed. Picazo-Vela et al. (2012) also observed that citizen participation through social media could be destructive and must be continuously monitored. Whether governments include social networks within their own platforms, or use sites like Twitter and Facebook, data responsibility and control issues are created. Criado et al. (2013) stated that the future of social media use in government is dependent on innovating traditional public organisation forms using a new generation of information technologies.

Lee et al. (2012) suggested that government agencies should focus on achieving one open government maturity level at a time to avoid stretching themselves too thinly. Challenges identified included the capability to respond to citizen communications in a timely manner, creating and maintaining public engagement, accountability coordination, and open collaboration complexity. Linders (2012) looked at resources and expectations at the citizen side and highlighted the risk of probability versus certainty of resource availability for volunteerism, and the concern that co-production could become expected or even mandatory.

2.2.8 Trust, Privacy, and Identity Challenges

Ostergaard et al. (2008) proposed that challenges with the IT infrastructure, such as identity management, data ownership, and a trust model, need to be addressed as a first step, and that a user-centric trust model is required. Meijer et al. (2012) also identified mutual trust as a key challenge in realising Government 2.0. Identity is a double-edged sword; more identity information may enhance trust, but at the same time it can diminish privacy.

Citron (2009) looked at privacy concerns for Government 2.0 - especially around Facebook and MySpace - and concluded that robust privacy protections are required. More can be learned about an individual from their social media profile(s) than from traditional law enforcement tactics, and a ’one-way’ mirror model is proposed whereby individuals can see government data and engage in policy discussions, but government cannot use, collect, or distribute citizens’ data.

Mergel (2013) investigated the factors that influence decisions to use social media applications in government and found uncertainty amongst public managers due to third party platform design and hosting, lack of control of technical changes and citizens' evolving usage models, and increased attention to government operations.

2.2.9 Engagement and Inclusivity

Citizen engagement on Government 2.0 platforms has been studied by several authors. Bonsón et al. (2012) found that many EU government websites offered web television and videos, but that in many cases citizen feedback on the content was not possible. Chua et al. (2012) found that citizens are more likely to gain a sense of connection with government websites that incorporate Web 2.0 content, as it can lend a human face and create an emotive connection.

To incentivise citizens to use Government 2.0 platforms, Meijer et al. (2012) reason that the platforms must satisfy citizens' desire for self-expression and social interaction; citizens must be entertained. Criado et al. (2013) highlighted a need for reliable information on the demand-side of social media in government, namely what motivates citizens to interact with public agencies.

Mergel (2013) looked at engagement tactics in U.S. government departments and identified three social media tactics; representation, which is a 'push' strategy with no feedback, engagement or 'pull' strategies, where citizen-created content is solicited and responses given; and 'networking' strategies of dialogue or extensive discussion among citizens and government.

Mossberger et al. (2013) used Mergel's classification scheme for social media tactics and discovered that for Facebook, Twitter, and YouTube, practically all U.S. local government websites allowed user comments, and that push strategies predominated with the exception of Twitter. More must be done to bring citizens to the portals, while setting rules for participation. An interesting point was that engagement with new portals might be limited to those with the required technical skills to use them. This backed up the findings by Linders (2012) in the area of inclusivity of Government 2.0, who highlighted a risk of the empowered becoming more empowered, and Picazo-Vela et al. (2012), who referenced the digital divide as a risk for social media adoption in the public sector.

2.3 Addressing Cycling Issues using Information Systems

Urban cyclists face challenges in areas such as safety, infrastructure, security, and the quality of their cycling experience. The following sections examine published research on, and practical applications of, Information Systems in these areas. The aim of this is to expose the technological options available to underpin Government 2.0 in cycling.

2.3.1 Safety

Liebner et al. (2013) prototyped a bicycle warning system based on the global positioning system (GPS) functionality of a frame-mounted smartphone. Positional data for a cyclist carrying the phone determined the proximity to a passing car, with a warning triggered at an appropriate threshold, but the prototype had limitations if the smartphone was stored in the cyclist's pocket. Funded by local authorities, Bristol has started trialling 'CycleEye' technology aimed at reducing cyclist collisions with large vehicles. Fitted to the outside of a vehicle, the unit uses radar and camera sensors to identify when the cyclist is in the vehicle's blind spot, and issues an audible alert. Trials saw the system achieve a 98.5% success rate in correctly identifying cyclists (Bristol City Council, 2014).

The 'safety in numbers' effect describes the positive relationship between cyclist numbers and cycling safety. Countries with the lowest levels of bicycle use have the poorest cyclist safety records (Jacobsen, 2003), so initiatives to encourage cycling can market improved safety as a benefit. In this regard, RFID (radio frequency identification) tags combined with smartphones have been used to promote cycling in the BikeTrackBike scheme (European Cyclists' Federation, 2012). BikeTrackBike incentivises cyclists to increase their cycling via online competitions, but based on trip figures on the website the initiative appears to have had a very low uptake. A similar initiative in Ireland is Smarter Travel's workplace '10 Minute Cycle Challenge'. The website for the 2014 initiative showed a modest 775 users and 22,264 journeys (Smarter Travel Workplaces, 2014).

Dill and Gliebe (Transportation Research Board, 2008) used GPS to record where cyclists rode their bicycles, with the aim of examining the effect of infrastructure type on cycling choices. The results suggested that as cyclists become more comfortable cycling in traffic, they are less likely to travel additional distances for safety reasons. The study concluded that GPS technology has great potential for use in bicycle commuting studies.

Caulfield et al. (2012) examined the cycling infrastructure preferences of Dublin cyclists via a stated preference survey. Various safety attributes were examined, and the scenarios in the survey were made as visual as possible by including graphics of the various infrastructure types. Dublin city cyclists' perceptions of safety were studied by Lawson et al. (2013), who found that the perception of safety increased alongside compliance with the rules of the road, and that motorists' behaviour was detrimental to cyclists' perceptions of safety. The authors argued that extensive cycling requires the perceived safety of the mode to increase.

Short and Caulfield (2014) highlighted issues with data quality in Information Systems and the reporting of cycling safety. The cycling accident data in the Road Safety Authority (RSA) database, and the hospital discharge data in the Hospital In-Patient Enquiry (HIPE) system, are short on detail and misrepresent actual accident volume, with the number of cyclist traffic injuries possibly being six times the Garda-reported number. The study concludes that pro-cycling policies regarding safety should start with a more careful collection and organisation of accident data.

Elsewhere, microwave sensors linked to traffic signal controllers allow safer negotiation of junctions by cyclists in the US (Rich, 2011), and in Denmark lights adjacent to the cycle lane glow brighter when a cyclist or pedestrian approaches, and dim when they have passed (Kristensen, 2013).

2.3.2 Infrastructure

Information Systems have been used to model and measure cycling infrastructure. Heikkilä and Silvén (2004) studied camera-based systems for monitoring and counting various types of traffic, and described a prototype system that can accurately distinguish between vehicular traffic, cyclists, and pedestrians. In relation to road conditions, Thepvilojanapong et al. (2011) used various sensors in a frame-mounted smartphone to implement a prototype sensorized bicycle that could recognise cycling states and infer road conditions.

Many cities worldwide have implemented roadside automated bicycle counters. Dublin City Council (DCC), the local authority governing central Dublin city, implemented a counter on the city's canal in 2011 (Ginty, 2011a). A roadside electronic display, shown in Figure 2.3, displays the numbers of cyclists passing the counter daily and yearly.

FIGURE 2.3 – Cyclist ‘totem’ counter in Dublin, Ireland.

Some problems have arisen with these counters. Dun Laoghaire-Rathdown Council also implemented a counter in 2011, but later had to admit that it could not count bicycles that passed it in the bus lane (Ginty, 2011b). An extension of the counters’ functionality is the linking of their loop detectors to traffic signals at city junctions, so that a green light can be advanced when a cyclist is detected (Pucher et al., 2010). Los Angeles is one example where this is in place, as part of its Bicycle Friendly Streets (LADOT, 2014). Radar technology has also been used to count passing bicycles (Deenihan et al., 2013), but is unsuitable where there is no separation of bicycles from motorised traffic. The cities of Copenhagen and Amsterdam provide a ‘green wave’ to cyclists via synchronization of the cities’ traffic signals to give them consecutive green lights (Pucher and Buehler, 2012).

Public bicycle sharing schemes use smart cards to unlock and lock bicycles at fixed stations, and display real time information on bicycle availability on their websites, or via a smartphone app. The dublinbikes scheme has been very successful, but little or no trip data is available on its website. An unofficial dublinbikes app entitled ‘DublinBikes2Go’ has been made available, and uses real-time bicycle availability information from the official website (DublinBikes2Go, 2014). Another innovative project harvested the same data to develop an interactive display showing the movements of the bicycles across the city over the course of the day (Science Gallery Dublin, 2012). Having observed the traffic patterns, locations for new bicycle stations could be inferred. The two examples above show citizens supplementing public services by using publicly available data for the benefit of cyclists.

Elsewhere, the Social Bicycles scheme moves the rental process from the station to a large keypad on the bicycle. Associated apps allow cyclists to socialize their ride by sharing

mapped rides and photos, to request bicycle parking, and to report road conditions (Social Bicycles, 2013). The German railway company DB Bahn's 'call-a-bike' system requires the renter to phone to obtain an unlocking code, and to indicate the desire to return the now-locked bicycle (DB Bahn, 2014).

2.3.3 Crime and Legal Issues

GPS technology is utilised in commercially available anti-theft tracking devices cleverly concealed inside the bicycle, which send an SMS when bicycle movement is detected (Integrated Trackers, 2014). The Bike+ platform (Wireless Machine To Machine, 2014) takes this to a new level, advertising itself as the first cloud-enabled platform for biking analytics and theft protection. The Copenhagen Wheel also uses GPS in conjunction with the user's smartphone in its locking and anti-theft capabilities (Outram et al., 2010).

Bike Index is a privately-run, open-source web portal for bicycle registration founded in 2013 (Bike Index, 2014). The website allows bicycle owners and bicycle shop workers to register bicycles and transfer ownership. A prior initiative called Bicycode required an identification code to be engraved on the bicycle and entered into a database to represent a 'Bike Passport' (Bicycode, 2012). An equivalent system in the Netherlands maintains a register of bicycle frame numbers and codes from anti-theft chips embedded in the bicycle frames (RDW, 2014). Bike Register is a private initiative in Ireland that allows free registration of a bicycle in a secure database by supplying personal details and the bicycle frame number. A separate blog contains posts for each individual bicycle theft report (Bike Register, 2014). With regard to biking accidents, a private law firm in the U.S. is now allowing cyclists to geolocate on a map the location of a cycling accident as well as other details about it (Willenslaw, 2009).

Bicycles, Information Systems, and the law combine in the MyBikeLane Toronto website (MyBikeLane Toronto, 2014). In a type of cyclist vigilantism, the privately-maintained site records vehicular bicycle lane violations submitted by cyclists, and raises interesting legal questions surrounding cyclists identifying vehicle license plates. In London, the self-titled 'Traffic Droid', shown in Figure 2.4, documents traffic infringements by cyclists and motorised traffic via an array of bicycle and helmet-mounted cameras. He subsequently uploads the footage to YouTube, and also sends it to the police.

FIGURE 2.4 – Lewis Dediare as ‘Traffic Droid’.

In Dublin, a similar initiative involved a cyclist using a GoPro helmet camera to film and catalogue, via YouTube, dangerous or illegal driving by cars and buses. Registration plate numbers are included in most cases, and a video was carried on the website of a major UK newspaper, with the bus company featured feeling compelled to investigate the incident as a result (Phelan, 2014).

Running of red lights by cyclists can be seen regularly on the streets of Dublin. However, there is no official data quantifying the level of this activity, and very little elsewhere. One study in Australia used a covert video camera to identify the rate and associated factors of red light infringement among urban commuter cyclists in Melbourne (Johnson et al., 2011), but Information Systems have otherwise not been used to tackle this issue.

2.3.4 Environmental Factors

Outram et al. (2010) detailed ongoing research and development of The Copenhagen Wheel. This device, shown in Figure 2.5, fits into the wheel of a standard bicycle and provides real-time environmental sensing capabilities, feeding back the rider’s performance and location data to both a bicycle-mounted phone and the Web. The brief for the project is termed ‘Cycling 2.0’, referring to the use of the technology to share information in the manner of Government 2.0. Levels of environmental pollutants, proximity of social media ‘friends’, and other ride data, are recorded. The rider can share their data with the city, and this is where the real potential of the device for collaborative governance is seen. The Copenhagen wheel is due to be commercially available in 2014 (Superpedestrian, 2013).

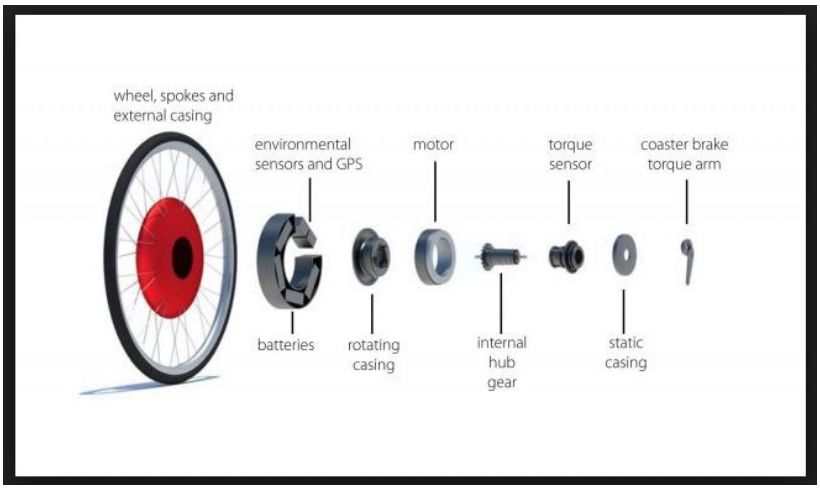

FIGURE 2.5 – Make-up of the Copenhagen Wheel (source: Outram *et al.,* 2010)

Wireless sensors have been attached to cyclists in UK cities in a project to improve the accuracy of air quality measurements (Professional Engineering, 2009). The project, led by Imperial College London, used the sensors to measure traffic emissions and noise pollution levels. In common with most other initiatives, smartphones were used to transmit the data measured. Knowledge exchange of bicycling routes, facilitated by smartphone-enabled sensors and location-based services, was the goal of the Biketastic pilot study (Reddy et al., 2010). The smartphone microphone logged noise level data for recorded routes to infer and compare traffic levels, and users could geo-tag interesting or valuable information about the route.

2.3.5 Ride Enjoyment

Eisenman et al. (2009) carried out some early academic research in deploying the BikeNet mobile sensing system for cyclists. The system collected personal, bicycle, and environmental data, allowed inter-bicycle networking, and included a BikeView web portal to facilitate social networking and sharing of cycling-related data. Flüchter et al. (2014) interviewed electric bicycle users on the benefits and requirements of mobile sensors, and user attitudes to the sharing of geopositional and usage data. Attitudes to the sensors were positive, with 25% of participants saying they would unconditionally share their data.

There has been an explosion in personal cycling-related apps in recent years, many of which, such as MapMyRide, utilise the GPS on the cyclist's smartphone to record trip information (MapMyRide, 2014). Almost all have integrations with online maps and social networking platforms, and some enhanced versions integrate health data. Reddy et al. (2010) claimed

that their Biketastic platform differentiates itself from other offerings as it is aimed at logging commuter routes and sharing of these with a larger community. A very interesting finding from this study is that critiques of the platform were largely based on the disruption the use of the platform caused to cyclists when turning Biketastic on and off, and the lack of motivation to stop and capture images or video of route features.

Cycling route planner apps have become ubiquitous, covering many cities worldwide. Gavin et al. (2011) made an early contribution to the area with a design for a prototype smartphone-based personalised route planning app called ROTHAIM. More recently, the National Transport Authority (NTA) launched a Dublin Cycle Planner app and website in December 2013 (Transport for Ireland, 2014). A cycling route planner for many worldwide cities, including Dublin, that uses OpenStreetMap map data, had previously been available (BBBike, 2014) but the Irish Government offering differentiates itself by providing information for all licenced public transport services. The NTA app faced some unwelcome publicity when it was shown that cyclists were being directed down footpaths, LUAS light rail tracks, and pedestrian zones (Ginty, 2014). Google has been adding biking directions to Google Maps since 2012, and this was extended to Ireland in 2013.

2.4 The Cycling Citizen in Dublin

Pucher et al (2011) studied the levels of cycling in the USA and Canada over a twenty year period and found that cycling levels have increased in both countries. In Europe however, the most recently published official figures from 2010, shown in Figure 2.6, reveal disappointing numbers of people using cycling as their main mode of transport. Only six European countries had a bicycle mode share of greater than 10%.

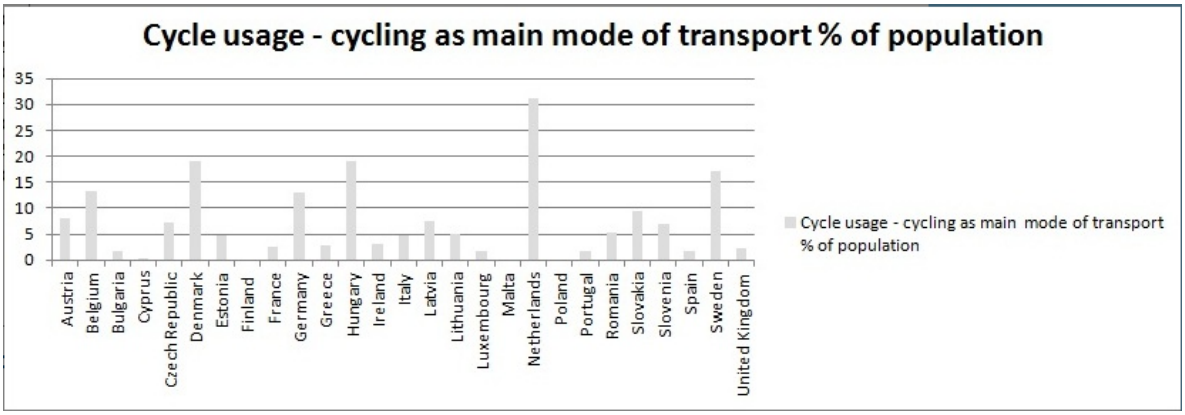

FIGURE 2.6 - Cycling as main mode of transport (source: Gallup 2011).

2.4.1 Ireland and Dublin Contexts

Historically, Ireland has not compared favourably with other European countries for numbers cycling. Between 1986 and 2002, cycling in Ireland declined dramatically. The number of people cycling to work almost halved and, because the number at work grew, the modal share for cycling fell to below 2%. The decline halted between 2002 and 2006 and cycling started to grow again, supported by policy, the building of cycle ways, and more recently, the severe economic downturn (Short and Caulfield, 2014). Despite this, in 2006 in Ireland, only 4% of adults used a bicycle to travel to work (National Transport Authority, 2011).

By 2010, Ireland was placed 18th out of 27 countries, with just a 3.2% bicycle modal share (Gallup, 2011). The Netherlands led the way with 31.2%, with the average being 7.8%. The 2011 Census of Ireland, means of travel of working commuters section, showed that national cycling levels had declined further, and that the share of commuters cycling to work was then at 2.4% (Central Statistics Office, 2012).

A National Cycling Promotion Policy document was published in 2008 by the cycling campaign bodies (Cyclist.ie, 2008). Its key recommendations were widespread education and research, active law enforcement, reduced traffic speed and volume, and the establishment of national, statutory, oversight bodies. The Cycle To Work Scheme (Citizens Information Board, 2014), a tax incentive scheme launched in 2009, aims to encourage employees to cycle to and from work, and has had a large uptake. Also in 2009, the National Cycle Policy Framework expressed the desire to see 10% of all trips to work being made by bicycle within the next 12 years (Department of Transport, 2009). The stated mission was to create a strong cycling-friendly culture and to counter cycling's poor image, and the framework outlined a package of infrastructure and communication interventions intended to make cycling easier and safer.

The number of people cycling in Dublin is now increasing rapidly. The percentage mode share for bicycles in Dublin rose from 3.2% to 4.1% in the period 2006 to 2011, representing a 10% increase in the number of trips (National Transport Authority, 2011). Caulfield (2014) examined the growth of cycling in Dublin in more detail and found that, because the topography of Dublin is quite flat and the climate mild, with on average 61mm of rain per month, Dublin is an ideal candidate city for cycling. Cycling infrastructure is also being rolled out, with 120 km of cycling lanes having been constructed in Dublin since 1990 (DublinCityCycling, 2014). The Irish Government's Greater Dublin Area Cycle Network Plan

of August 2013 proposes to increase the amount of on- and off-road cycle paths from 500 km to 2,840 km over a 10-year period to 2024 (National Transport Authority, 2013).

The 2013 Copenhagenize index of bicycle friendly cities is shown in Figure 2.7. It ranked Dublin, with a score of 60, as the 9th most bicycle-friendly city worldwide out of 150 rated. The bicycle modal share for Dublin was reported to be 7.5%, but the overall index is calculated by examining 13 different parameters including advocacy, infrastructure, facilities, modal share for bicycles, cycling culture, and safety (Copenhagenize Design Company, 2013).

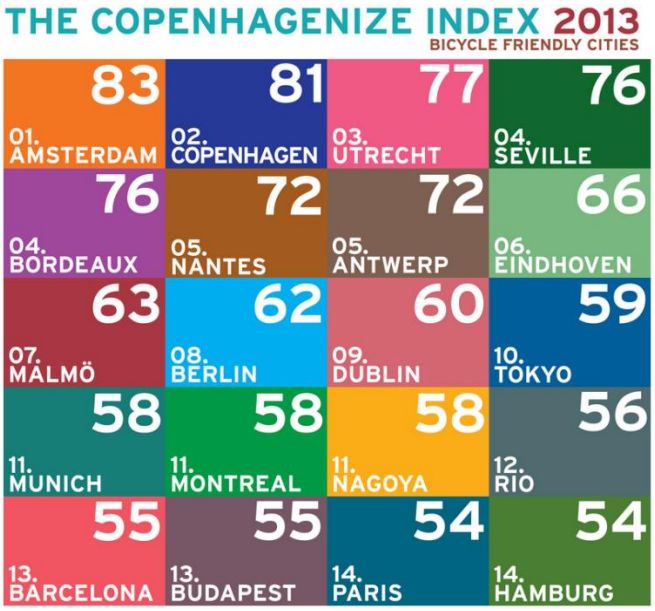

FIGURE 2.7 - Copenhagenize Index (source: Copenhagenize Design Company, 2013)

The main methods used to count cyclists in Dublin are a visual Canal Cordon Count and roadside bicycle counter devices. The counter data shows that between 2012 and 2013 cycle numbers have increased by about 20% along the three main routes into and out of the city (Dun Laoghaire-Rathdown County Council, 2014).

With respect to safety, five cyclists were killed on Irish roads in 2013, three less than the previous year, and a joint 20-year low shared with 2010. The Dublin City Council area, which has the highest concentration of cyclists, had no deaths within its boundaries in the period 2011-2013 (Irish Cycle, 2014a). The council's decision to ban heavy goods vehicles from the city streets, and the introduction of a 30kmph speed limit, contributed to this reduction. The summary figures are displayed in Table 2.1.

TABLE 2.1 - Cyclist deaths on Irish roads (source: Irish Cycle 2014a).

DEATHS																		
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Ireland	22	24	21	14	10	12	18	11	11	10	9	15	13	7	5	9	8	5
Dublin		10	7	4	3	4	7	0	2	3	6	3	4	2	1	1	1	1
Rest of Ireland		14	14	10	7	8	11	11	9	7	3	12	9	5	4	8	7	4

DEATHS																		
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Ireland	22	24	21	14	10	12	18	11	11	10	9	15	13	7	5	9	8	5
Dublin (all)		10	7	4	3	4	7	0	2	3	6	3	4	2	1	1*	1**	1
Dublin City		6	5	2	2	4	4	0	2	3	3	3	3	2	1	1	0	0
Dun Laoghaire-Rathdown						0		0	0	0		0	0	0	0	0		1
Fingal						0		0	0	0		0	1	0	0	0	1**	
South Dublin						0		0	0	0		0	0	0	0	0		

Regrettably, there has been a big increase in cyclist road deaths in the first seven months of 2014, with nine cyclist fatalities in that period (Road Safety Authority, 2014). The vast majority of Dublin city's existing cycle routes suffer from serious continuity, quality, or design flaws, according to recent ratings contained within a Dublin City Council report (Murphy, 2013).

Bicycle theft in Dublin appears to be a growing problem, though official statistics are unavailable. A presentation to the Dublin Cycling Campaign in April 2014 estimated it to be running at four times the official recorded rate, and to be growing at 10% per year. A possible explanation for this is that the ‘Bike to Work’ scheme has increased the value of bicycles, thus making bicycle theft more attractive. In line with increasing thefts, a number of Garda stations are currently publishing images of recovered stolen bicycles on a Garda Flickr site (Flickr, 2014).

There is also a lack of meaningful official statistics on law breaking by cyclists in Ireland. A lack of enforcement, chiefly due to resource constraints, appears to be the main catalyst for law breaking. A short two-day study in 2012 showed that 46% of cyclists were failing to observe the rules of the road (Cunningham, 2012).

The Dublin area is overseen by four local authorities; Dublin City Council covers the central city area; South Dublin, Dun Laoghaire-Rathdown, and Fingal county councils cover the remainder of the county. In 2012, the Irish Government launched a policy document entitled ‘eGovernment 2012 – 2015’, which details a vision for e-government along with 45 actions to realise that vision, which are shown in Figure 2.8. The actions in the ‘Use New and Emerging Technologies and Media’ category include the use of apps for mobile devices, and development of a social media usage policy (Irish Government, 2012). Many of the actions can be described as Government 2.0 in nature.

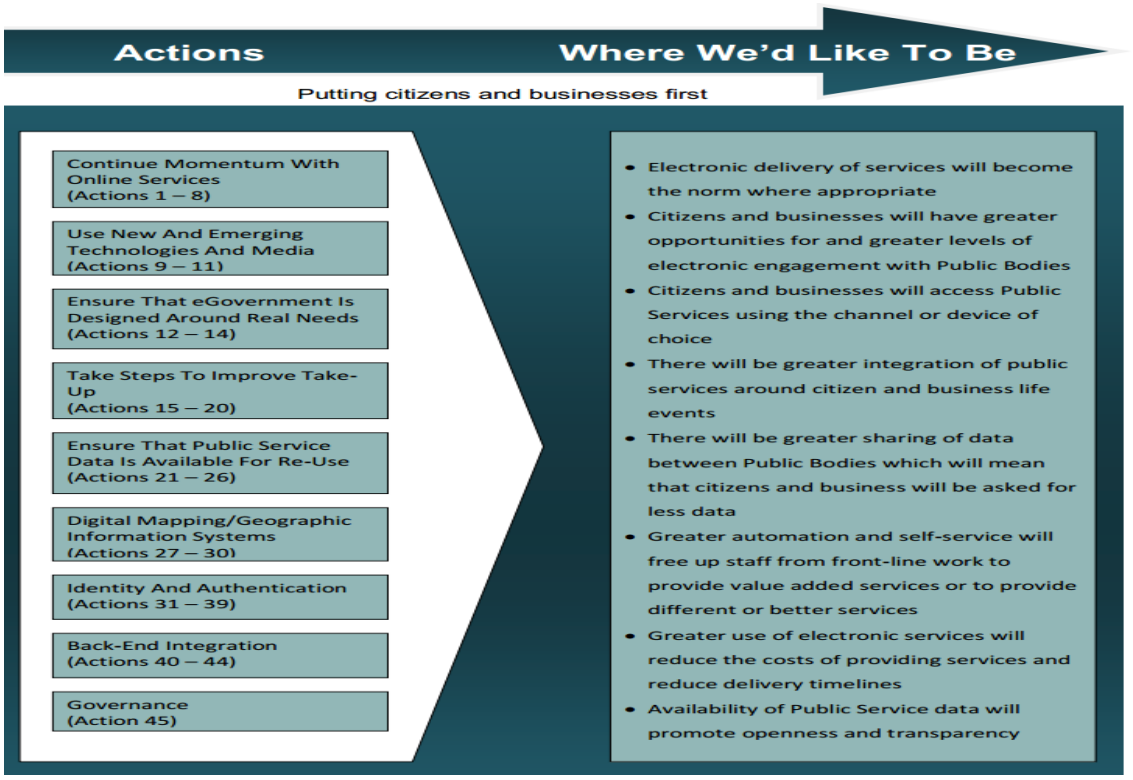

FIGURE 2.8 – Vision for e-government in Ireland (source: Irish Government, 2012)

Some high profile success stories in the area of e-government in Ireland have been the Revenue Online Service (ROS) which was launched in 2000, the Motor Tax Online service launched in 2004, and more recently the Residential Property Price Register of 2012 and the 2013 Local Property Tax payment portal.

With respect to open government, Fingal County Council leads the way in open data provision with a dedicated website launched in 2010 (Fingal Open Data, 2014). Dublinked, a larger scale platform that contains datasets from public and private sources across all four local authorities, followed in 2011 (Dublinked, 2014). In relation to social media and Web 2.0, the Irish Government Information Service launched a new social networking-led internet platform in 2010 based on WordPress, Flickr, Facebook, and Twitter, called 'MerrionStreet.ie'. This was an attempt to move away from traditional forms of information dissemination to a more dynamic platform (MerrionStreet, 2014). The Irish Government's 2014 National Action Plan for Open Government contains technology and innovation proposals including a proposal to introduce a dedicated web platform to promote participation in government, and to encourage wider engagement with politics and policy using online tools (Open Government Partnership Ireland, 2014).

Each Dublin local authority has a presence on the most popular social media platforms. Statistics for these and other stakeholder organisations are shown in Table 2.2. Each local authority also independently publishes a social media usage policy, although in most cases it tends to be buried deep within the website.

TABLE 2.2 - Statistics for local authority and other stakeholder social media presences.

	Facebook likes	Twitter followers	YouTube subscribers	RSS feeds
Fingal County Council	1,485	6,629	11	no
Dublin City Council	2,865	21,400	156	yes
South Dublin County Council	3,368	5,584	56	no
Dun Laoghaire Rathdown County Council	367	1,551	no	no
Dublin Cycling Campaign	4,086	1,523	240	no
cyclist.ie	448	71	no	yes
irishcycle.com/cyclingindublin.com	473	2,080	no	yes

2.5 Conclusion

The literature review has uncovered the important aspects of Government 2.0 and the ways in which Information Systems are currently used in urban cycling, with the final section setting the Dublin city context for both of these topics. Information Systems use in urban cycling was seen, but there was little evidence found of Government 2.0 in the area of urban cycling. The next step in answering the research question is to engage directly with the cycling citizen and local government stakeholders in Government 2.0. The methodological considerations for this are detailed in the next chapter.

3 Methodology and Fieldwork

3.1 Introduction

This chapter describes the methodological approaches that were considered for this dissertation, and the justification for the chosen methodologies. The strategy that was used to obtain research results is described, as are the types of data gathered and the sources for that data. Finally, lessons learnt during the research process are discussed.

3.2 Research Philosophy

3.2.1 Ontology

Ontology is concerned with the nature of reality and is a very important concept when conducting research. The two principle ontological positions that can be taken are objectivism and subjectivism. Saunders et al. (2009) stated that objectivism takes a position that social entities exist in a reality external to social actors concerned with their existence. Subjectivism on the other hand views social phenomena as arising from the perceptions and resultant actions of those social actors concerned with their existence. Social phenomena are therefore in a constant state of change. This dissertation adopts a subjective position in that it seeks to understand the subjective reality of citizens and government in order to be able to decipher and interpret their feelings, motives, and actions in a meaningful and valuable way.

3.2.2 Epistemology

The research philosophy is the first layer of the research ‘onion’, the means by which Saunders et al. depict the underlying issues in the choice of data collection techniques and analysis procedures for answering a research question (Saunders et al., 2009). This is shown in Figure 3.1.

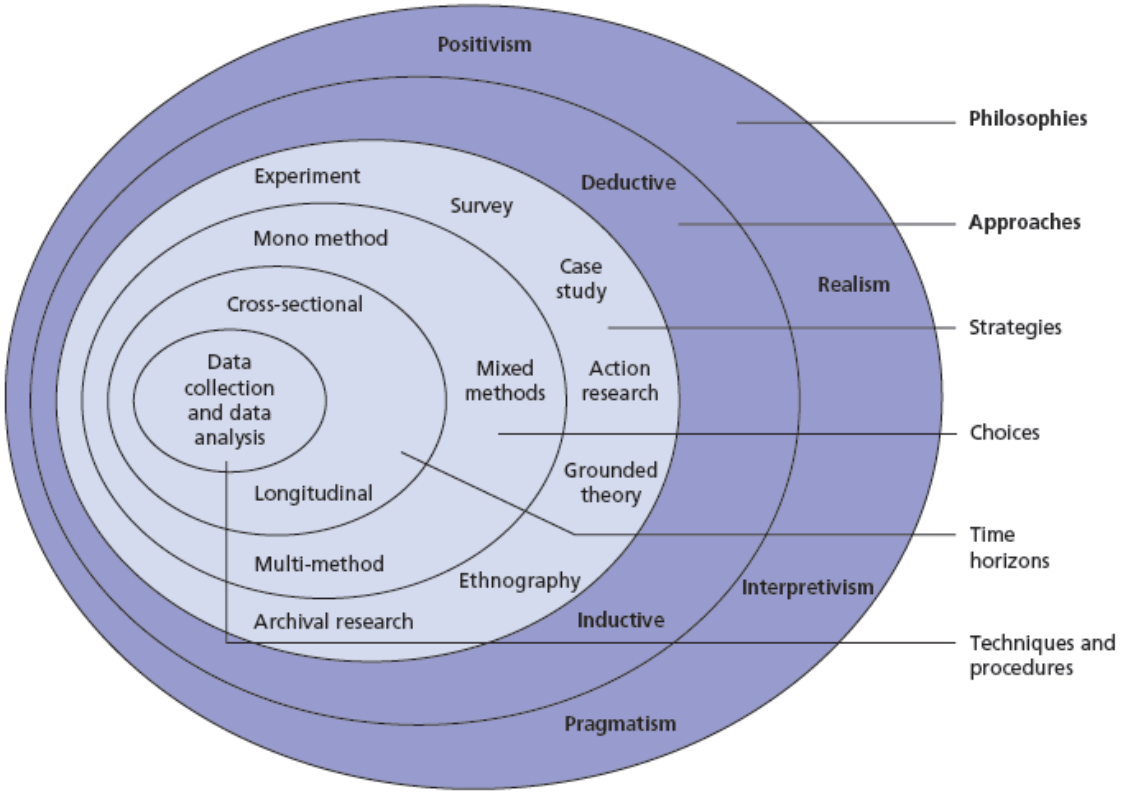

FIGURE 3.1 – Saunders' Research Onion (source: Saunders, 2009)

Epistemology is concerned with what constitutes acceptable knowledge in a field of study, and the philosophical positions that can be adopted here are positivism, realism, interpretivism, and pragmatism. A positivist philosophy behind this dissertation would hold that the research be undertaken with a value-free approach, and that the researcher is external to, and independent of, the data collection process. Realism believes that objects have an existence independent of the human mind and, like positivism, assumes a natural scientific approach to the development of knowledge, which is unsuitable for this study. The philosophy of pragmatism holds that in deciding on the research methods the most important consideration is the research question itself. Tashakkori et al. (1998) argued that pragmatism is intuitively appealing and that one should study what interests them, what is of value to them, and in the different ways that are deemed appropriate.

This dissertation, in addition to technological phenomena, is concerned with the behaviours and intentions of people on both the government and citizen side of society. Personal and subjective involvement of the researcher, via face-to-face interviews with the social players on both sides, is required to arrive at an answer to the research question. Interview questions

will be framed accordingly, and answers will be interpreted rather than statistically analysed. The interpretivist philosophy holds that insights into complex socio-technological phenomena - in this case Government 2.0 - cannot be reduced to a series of law-like generalisations like that of the positivist philosophy. Interpretivism is therefore the philosophy that underpins this research, and the study will abide by the assertion of Saunders et al. (2009) that an empathetic stance is crucial with an interpretivist philosophy; it is important to understand the points of view of the research subjects.

3.3 Research Approach

Research projects involve the use of theory. The extent to which the researcher is clear about the theory at the outset of the study determines whether a deductive or an inductive approach is taken. A deductive approach develops a theory and hypotheses, and designs a research strategy to test the hypotheses. It is more suited to research of a scientific nature where a theory is rigorously tested, there is a causal relationship between variables, and the data is quantitative.

A deductive approach requires that the researcher remain independent of what is being observed, and is therefore unsuited to this study. Saunders et al. made the point that for the deductive approach, concepts under investigation need to be operationalised so that they can be quantitatively measured. The exploratory nature of this research, and the relative newness of the Government 2.0 concept and modest amount of academic literature on it, provides reasons why a deductive approach is not taken.

An inductive approach is suited to going into the field to better understand a problem using data collection methods such as semi-structured interviews and qualitative surveys, with a theory then being synthesised out of the data. It is suited to studies - like this one - that are interested in the context in which events or behaviours take place, and the human element of Information Systems use.

3.4 Research Strategy

Research strategy is the third layer in Saunders' research onion. Experiments, surveys, case studies, action research, and grounded theory are common types of research strategies employed. Each of these was considered in the context of the research question.

Yin (2009) defined a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, where the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used. A case study was deemed to be an unsuitable research strategy for this dissertation as citizen-government collaboration using Web 2.0 is a relatively new phenomenon, and no evidence was found of a significant present circumstance that could be examined.

The experimental strategy is rooted in natural sciences and its purpose is to study causal links. It can be useful in exploratory research, but it was felt that it would be impossible to carry out an experiment that would adequately answer the research question, and that an experimental strategy would be more applicable to further study arising out of the dissertation's findings. Action research was ruled out as a strategy for the same reason.

The grounded theory strategy for research was introduced by Glaser and Strauss (2012) for qualitative interpretation of data. It involves inductive thinking but can be complemented by deductive reasoning. The first step in the strategy is data collection. The main points in the collected data are then organised into codes. The codes are then grouped to develop concepts, and those concepts are then used to create categories from which a theory is created. The dynamic nature of the data analysis, coding, and concept revision was deemed to be unsuitable for the scope of this dissertation.

The survey strategy tends to be used in exploratory and descriptive research. It enables the collection of quantitative data and it is possible to generate findings that are representative of the whole population at less cost than collecting the data for the whole population (Saunders et al., 2009). This strategy, operationalised via an online survey, was therefore deemed to be the most suitable strategy for data collection from the community of cyclists that is one focus of this study. It was important to quantify the levels of smartphone, Web 2.0, and social media platform use amongst this community so as to be able to make recommendations on the optimum modes of engagement with the government side.

The semi-structured interview in qualitative research entails the interviewer and the interviewee engaging in a formal interview. An interview guide, or ordered list of questions and topics that need to be covered during the conversation, is prepared beforehand. The interview guide is followed, but it is permissible to follow topical directions in the conversation that stray from this if the interviewer sees them as appropriate and valuable to the research topic. A semi-structured interview was regarded as the tool that would yield the highest

quality, and therefore most valuable, data in understanding the opinions, feelings, and outlook of the government, cycling advocacy body, and transport research stakeholders in the application of Government 2.0 in urban cycling.

3.5 Research Choices

Research can be facilitated via data collection techniques and analysis procedures that are quantitative, qualitative, or a combination of both. A mixed methods approach combines *both* quantitative and qualitative data collection and analysis techniques. It can be subdivided into mixed method research, where both quantitative and qualitative data collection and analysis are undertaken - but not in combination - and mixed-model research, which combines quantitative and qualitative data collection techniques and analysis procedures. Using the latter approach, quantitative data can be qualitised for conversion to a narrative that can be analysed qualitatively.

As discussed in section 3.4, both online survey (quantitative) and face-to-face semi-structured interview (qualitative) data collection techniques were preferable for this study, and this constitutes a mixed methods research choice. The online survey was designed to yield quantitative data but also included two optional free-text fields, giving the cycling community the opportunity to share additional information that would be of value in answering the research question. Saunders et al. (2009) asserted that mixed methods, both qualitative and quantitative, are possible, and sometimes preferred, in one study.

3.6 Research Time Horizons

Research can be either cross-sectional or longitudinal. Cross-sectional studies study a particular phenomenon at a particular point in time, whereas longitudinal studies are conducted over a period of time, and are useful in studying change and development in that phenomenon. This study is cross-sectional primarily due to time constraints, but that does not diminish its value. Because Government 2.0 is a phenomenon in an early stage of maturity, a cross-sectional study conducted now will provide a valuable point-in-time reference for future studies on this topic.

3.7 Population

A research population is a collection of individuals that is the main focus of a scientific query, and for the benefit of whom the research is done. In Chapter 2 Government 2.0 was shown to

potentially benefit both citizen and government. Therefore, the research population for this study consists of Dublin city commuting cyclists as well as the Dublin local government authorities.

3.8 Sampling

A sampling frame is a list of all elements within a population that can be sampled. There is no sampling frame available for cyclists, be they commuting or leisure cyclists, in Ireland or in Dublin. A combination of sampling methods was undertaken; snowball sampling via email and social media dissemination of the survey URL, and non-probability convenience sampling via handout of the survey URL to commuting cyclists passing city junctions, was used for primary data collection at the citizen side. At the government side, the sampling frame consisted of cycling officers, or the designated cycling representatives, of the four Dublin local authorities. An attempt was made to contact each local authority with a view to primary data collection via semi-structured interviews. Table 3.2 shows the outcome of these contacts.

3.9 Conduct of the Research

3.9.1 Literature Review

A comprehensive literature review was carried out, which continued alongside the remaining phases of the research. Relevant sources were located using a combination of keyword searches using the Trinity College Dublin Library Stella Search utility, the Library's online database repository, and Google Scholar. Items of relevance appearing in quality newspapers of the day, and established and reputable online locations, were also recorded during the period of the research.

3.9.2 Data Collection

The primary data for this study consists of answers to an online survey, answers to face to face interviews, and, in one case, answers to questions that were returned via email.

An online survey was created using the Surveymonkey platform (Surveymonkey, 2014). The survey consisted of 16 questions that aimed to gather data on the issues facing Dublin city cyclists and their attitudes to the use of Information Systems - particularly Web 2.0, smartphone, and social networking platforms - in a collaborative way to address these issues.

The survey was open for participation for 38 days from Friday, 14th March 2014 to Monday, 21st April 2014. The survey was initially piloted with five work colleagues who work in the Information Technology area and who are also cyclists. Feedback from these respondents was incorporated into the final survey questions and design. Thereafter, these colleagues circulated the survey link to friends who are cyclists, and a snowball sampling approach generated some further responses. At this time, a link to the survey was placed on the website and Facebook pages of the Dublin Cycling Campaign and Cyclist.ie, and in the latter case the link was also added to the organisation's Twitter feed. Requests via email and web form enquiry to both Dublin City Council and dublinbikes for publication of the survey link on their websites elicited no response.

It became apparent that advertising of the survey via the methods above was producing a limited number of responses, and that direct engagement with cyclists was needed to generate more survey responses. A total of 500 'business' cards printed with the URL of the survey were therefore handed out to passing cyclists over three mornings between 08:15 and 9:30 approx. at three busy city centre junctions in Dublin. Details of the handout locations are shown in Table 3.1.

TABLE 3.1 – Dates and locations for handout of cards containing survey link.

Date	**Location**
Friday 28th March 2014	Junction of Patrick St. and High St.
Tuesday 1st April 2014	Junction of Capel St. & Ormond Quay Upper
Friday 4th April 2014	Junction of Grove Rd. & Rathmines Rd. Lower

The junctions are circled in red on a map of Dublin city centre in Figure 3.2. The junctions were chosen because they are along main arteries into the city centre and it was known that relatively large numbers of cyclists cross these particular junctions on weekday mornings. Also, the period that traffic was stopped at the junctions due to a red light suited the handing out of the printed cards.

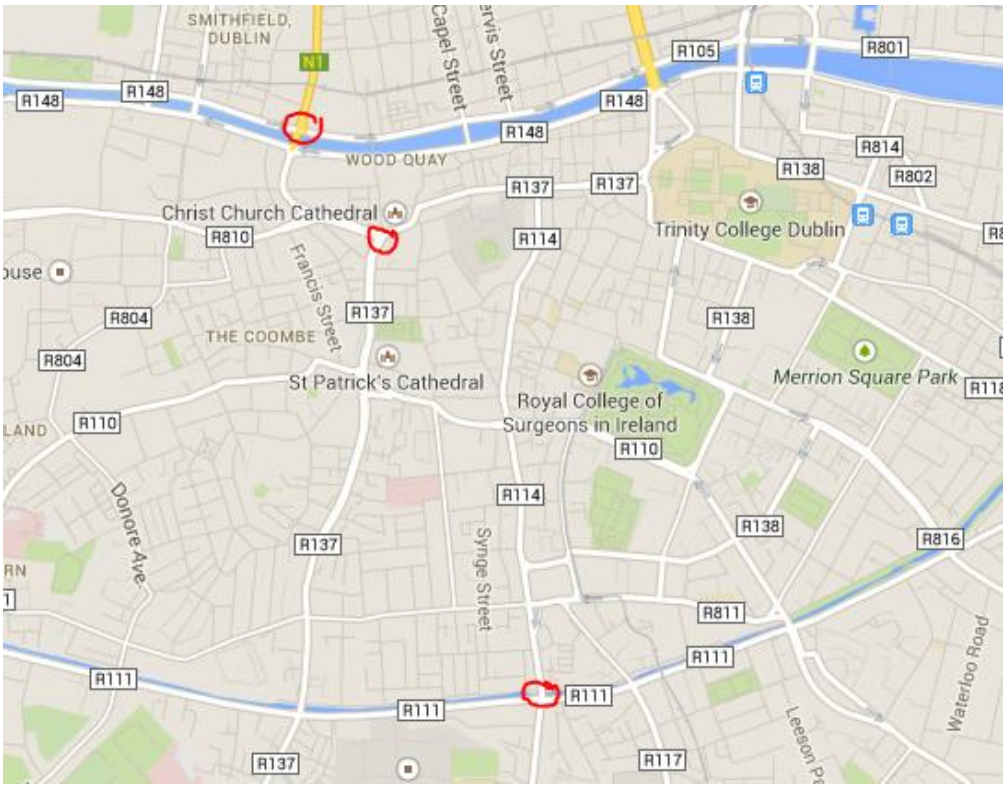

FIGURE 3.2 – Locations where printed cards were handed out to cyclists

Face to face interviews were scheduled by making email contact with persons adjudged to be key stakeholders in Dublin city cycling. Table 3.2 shows the contacts made and the outcomes.

TABLE 3.2 – Contact methods and outcomes

Stakeholder	**Contact method**	**Outcome**
Dublin Cycling Campaign	Email & in person	Interview carried out
Cyclist.ie	Email & in person	Interview carried out
Irish Transport Research Network	Email	Interview carried out
Road Safety Authority	Email	Answers via email
Dublin City Council	Email + referral	Interview carried out
Dun Laoghaire-Rathdown County Council	Email	Interview carried out
Fingal County Council	Email	No response
South Dublin County Council	Email	No response
Irishcycle.com	Email	No response

3.10 Analysis of the Data

The Surveymonkey software used for the online survey has built-in analysis capabilities that were used to calculate percentages of responses for each question. Several tools were considered for analysis of the text answers to the two open-ended questions in the survey. Word clouds such as Wordle are applications into which text responses can be inputted to give a visual impression of the most common words present. Many of these are free and easy to use. Commercial analysis applications such as Nvivo 10 Qualitative Analysis Software, and IBM SPSS Text Analytics for Surveys, offer additional features such as semantic processing of data. For this research, the text of the open-ended responses to Questions 6 and Question 16 were inputted online into Wordle. Trial copies of NVivo and SPSS were downloaded and the same text was inputted to these.

The results obtained using the tools above were not particularly helpful; the first problem encountered was that a lot of terms e.g. cyclist, cycling, road, lane, needed to be manually excluded to the point that the remaining terms could not be considered prominent. Secondly, the context of the word usage was often lost. After careful consideration, it was decided to maintain only the Wordle output for the answers to Question 16, and that the size of the open-ended response text for both questions was small enough to justify mainly manual analysis of these.

3.11 Research Ethics

Details of the proposed research methods were submitted to the Ethics Committee of the School of Computer Science and Statistics, Trinity College Dublin, in accordance with the school research ethics protocol, and approval to proceed was received. Online survey respondents were presented with an information sheet explaining the background to the research, the procedures to be used, any conflicts of interest, and the participant's rights. Prior to the interviews, interviewees were supplied with an equivalent information sheet, an informed consent form to be signed prior to the interview, and the interview questions.

3.12 Limitations of Chosen Method and Lessons Learned

The two open-ended survey questions were provided to allow sharing of additional ideas on the use of Information Systems to improve the Dublin city cycling experience. Although a satisfactory number of respondents chose to answer these questions, their answers tended to

focus more on cycling issues in the Dublin context, rather than ideas on Information Systems use to address these issues.

It was difficult to secure access to representatives in the local authorities. It became apparent during the course of the interviews that the cycling officers or cycling representatives had varying familiarity with, and responsibility within their organisation for, social media and Web 2.0 initiatives. In the majority of cases, it was not possible to identify a social media or Information Systems designate and, in the case where they could be identified, no response to email communications was received. It is proposed that a similar difficulty would have been encountered, whereby the social media and Web 2.0 designate, if interviewed, might be ill-equipped to provide an opinion on cycling matters.

3.13 Conclusion

This chapter investigated various methods that can be used in pursuit of the answer to a research question. It was decided to make use of an online survey of cycling citizens, and a series of face-to-face, semi-structured interviews with local government and other key stakeholders, to further realise the objectives of the dissertation. A subjective position and interpretivist philosophy have been adopted, allied to an inductive approach using a survey and interviews. The study is cross-sectional in nature and makes use of mixed methods data collection techniques.

4 Findings and Analysis

4.1 Introduction

This chapter firstly presents the findings from the answers received to the sixteen questions in the survey of commuting cyclists. Secondly, the findings from the five semi-structured interviews that were carried out are presented. Finally, the answers to interview questions that were returned via email are detailed.

4.2 Survey Findings and Analysis

The survey answer data is presented in full in Appendix A. This section discusses the summary findings.

Question 1 asked participants for agreement with the terms and conditions of the questionnaire. Four respondents (1% of the total) did not agree, and were therefore exited from the questionnaire. Question 2 sought to determine if cyclists mainly used their own bicycle when cycling, or whether they mainly used the dublinbikes scheme bicycles. 93% of respondents mainly used their own bicycle when cycling in the city.

Given the prevalence of smartphone usage in existing implementations of technology in cycling, as highlighted in the literature review, Question 3 sought to determine the profile of smartphone usage amongst cyclists. The results reveal that 90% of surveyed cyclists own a smartphone, and that Android and iPhone operating systems together make up 94% of smartphones owned.

Question 4 asked cyclists to rate several cycling concerns in terms of how important they were to them. The purpose of the question was to determine where efforts to use Information Systems to improve the cycling experience would be best targeted. The risk of collision with vehicular traffic and pedestrians was the overriding concern seen, with 61% of respondents rating it as of ‘Crucial’ importance to them. This finding is not surprising as the risk of injury or death is bound to take precedence over other concerns. However, the quality of the bicycle lane surface and design (51%), and the risk of bicycle theft (38%), were also found to be dominant concerns.

Question 5 asked respondents how often they used different social media platforms. The aim of the question was to identify the social media platforms that cyclists engage with most often, and which consequently would have the most potential for use in Government 2.0 initiatives

in the area of urban cycling. Combining 'Often' and 'Always' responses, Facebook is by far the most-used social media platform at 59%, and is followed by instant messaging (40%), content communities (40%) and crowd-sourcing platforms (37%). Blogging and forums are the least frequently used social media types.

Question 6 addressed an emotive issue in the area of cycling, that of adherence by cyclists to the rules of the road. Respondents were asked to identify what they considered to be the main motivation behind instances where the rules of the road are not adhered to, with an 'Other' answer option included to try to account for a full spectrum of motivations. The main cause of law breaking is found to be traffic signals that do not differentiate between cyclists and other vehicular traffic (26%), with lack of law enforcement (22%) and the danger of sharing road space with vehicular traffic (21%) also figuring highly.

Almost 16% of respondents (61 respondents) specified 'Other' for their answer to this question. Information on the answers, and the coding of each answer following analysis, is available in Appendix A. A summary of the responses is shown in Table 4.1.

TABLE 4.1 Summary of themes identified in open-ended responses to Question 6

Motivation to break rules	No. of answers	% of 'Other' answers	% of total
Attitudinal	13	21	4
Identity	8	13	2
Ignorance	6	10	1
Safety	4	6	1
Comfort	3	5	1
Reclassified answers	19	32	5
Disqualified answers	8	13	2
TOTAL	**61**	**100**	**16**

Responses coded as 'Attitudinal' are those where the respondent viewed the motivation for the law breaking behaviour as an attitude of disregard for the rules of the road or other road users. Responses coded as 'Identity' are those where the cyclist felt that they should not be classified in the same way as motorised traffic and should have, in fact, a unique identity in the context of the rules of the road. Several responses cited ignorance to the rules of the road as the motivational factor. Safety reasons, and reasons of comfort (having to slow down, dismount, and then remount), were also cited. Nineteen responses were reclassified as preset answer choices, and eight were disqualified as not being motivations.

Question 7 asked respondents for their opinion on how useful various Web 2.0 platforms would be in adding to the debate on cyclists and the rules of the road. The answers reveal that by far the most popular choice was an online local authority forum where cyclists can input into the design and redesign of cycling infrastructure. The answer option that scored next highest was a local authority online forum for cycling discussions.

Question 8 aimed to profile the problem of bicycle theft in the Dublin city area. The results revealed that 57% of cyclists have had a bicycle stolen at least once. This supports findings in the literature review that cycle theft is indeed a significant problem in Dublin city.

Question 9 asked respondents to rank technological solutions in terms of how valuable they would be for Dublin city cyclists. A bicycle mounted GPS device received the highest average ranking by respondents in terms of its value to the cyclist as a solution to bicycle theft, with a value of 2.86 on a scale of 1 (least valuable) to 4 (most valuable). A surprising finding is that the Smartphone-rich cycling community gave the Smartphone solution for bicycle theft the lowest average ranking (1.98 out of 4).

Question 10 introduced the concept of Government 2.0 and asked respondents if they felt that the concerns of cyclists could be addressed by collaboration with the local authority using technologies such as social media. The aim of the question was to gain an insight into attitudes to technology-based collaboration amongst the cycling community. 86% of respondents felt that cyclists' concerns could be addressed in such a manner, which is a very encouraging finding.

Question 11 aimed to quantify the degree to which members of the Dublin city cycling community report problems or issues with public services to the relevant local authority. The results show that 52% of respondents have reported a fault or issue on at least one occasion.

Question 12 was related to Question 11. Respondents were asked to rank, in terms of their value to the cyclist, several different conceptual online platforms for sharing information about cycling. The facilities described differ in terms of their purpose and mode of interaction. Respondents indicated a clear preference for an online portal to report and expedite faults and issues relating to the cycling infrastructure, giving it an average ranking of 3.44 on a scale of 1 (least valuable) to 4 (most valuable).

Question 13 asked cyclists what their main motivation would be for engaging with platforms like those described in Question 12. The results reinforce the findings from the results of the

previous question, namely that the clear motivation for engaging with Government 2.0 platforms is to highlight problems and issues so that they can be resolved in a timely manner (71%). 13% would use the platforms to keep informed on cycling developments, and 12% to participate in an online community representing cyclists.

The literature review revealed initiatives in the area of Information Systems use in cyclist environmental monitoring. Questions 14 and 15 arose out of these findings. The purpose of Question 14 was to explore whether cyclists feel that controllable environmental factors affect their experience. 81% of the respondents felt that such environmental factors do affect their city cycling experience, and a slight majority of these also indicated that this is a concern for them. Question 15 aimed to determine the willingness of cycling citizens to participate in environmental monitoring by use of technology fitted to their bicycle, or running on their Smartphone, for example. The purpose was to see if cyclists would be likely to participate for purely altruistic reasons, or whether some sort of direct reward would be more likely to engage them in such initiatives. The results indicate that 67% of cyclists would be happy to participate in such initiatives for no direct reward. This is another positive finding for anyone considering trying to engage cyclists to collect environmental, route preference, or route quality data.

Question 16 was an open-ended question that asked respondents if they had any ideas of their own for how Information Systems could improve the Dublin city cycling experience. The aim of the question was to capture any ideas that had not been discovered during the literature review. 88 respondents - almost 21% of the survey total - returned valid answers to the question. More information on these answers is available in Appendix A; a summary of themes identified in them is shown in Table 4.2. The answers returned tended to focus on cycling issues and concerns in general, rather than ideas on how Information Systems could address these concerns.

Table 4.2 - Summary of main themes in responses to Question 16

Coding (theme)	Count
Issue reporting	17
Motorist behaviour	15
Law enforcement	13
App	12
Traffic signals	9
Route planning	8
Safety	8
Forum	7
GPS	7
Route usage	7
Camera	6
Sensor	6
Collaboration	5
Parking information	5

4.3 Interview Findings and Analysis

4.3.1 Interview 1

The first interviewee is a board member of the Irish Transport Research Network, and has published several journal articles in the area of cycling.

He has previously used online surveys for data collection from cyclists, has collected raw data from devices, and has undertaken manual counting of cyclists. With respect to automated methods of counting, he mentioned sensors/counters on the Great Western Greenway that count cyclists on a dedicated cycling path. He combined the counter data with weather data from the local weather station to investigate patterns in cycling. He mentioned that there can be problems with under- and over-counting by the devices.

In relation to how Information Systems could address a major concern of cyclists, namely the risk of collision with motorised vehicles, he has done some research on this. The Irish Road Safety Authority has a 12-year database of all accidents, but he was of the opinion that it underestimates the number of actual accidents by a factor of about six to seven. Another database, called HIPE, contains hospital records. He thinks that a good solution would be to merge the databases to create an online databank that could be mined to understand better where any why these accidents occur. He also advocates the use of smartphones to geolocate the presence of faults or issues with the cycling infrastructure for logging with local authority.

In relation to traffic signals and road infrastructure perhaps not catering adequately for cyclists, he mentioned ‘desire lines’ between point A and point B. These are informal and often illegal routes between two points taken by cyclists. A use of technology here would be to fit sensors to dublinbikes to see the level and locations of this activity and to inform infrastructure decisions. Dublinbikes has a huge database of cycling activity, but it is run by a private company and they don’t share data. He has manually skimmed off some data from the dublinbikes website to give an idea of usage of each station, but not the movements between them.

In relation to the use of smartphones in cycling, he mentioned a study that developed a prototype smartphone app to record cyclist route information around Dublin city. Another study looked at how much pollution people take in while cycling, and used GPS and a breathing apparatus. The interviewee pointed out that not many people are generally needed

to take part in research projects like this. In general, he thinks that smartphones are still in their infancy when it comes to transport research, but that there is a lot more that can be done to leverage them. The main use he can see would be in the reporting of accident black spots.

In relation to crowd-sourcing of transport users' opinions using Web 2.0 platforms and social media, he feels that these have not played any role to date in relation to cycling. He has carried out textual analysis of Dublin Bus and Irish Rail Twitter feeds, and those companies have re-tweeted his survey links. Something like this would be very interesting for cycling in his opinion.

He could not think of any prior examples of cyclists and government bodies collaborating and sharing information using Information Systems. He cited the National Cycle Planner application taking millions of Euros and almost two decades to implement, and compared it with a similar citizen-sourced application called 'Hit The Road' which is better and was developed within one month. According to him, "innovation just isn't something that is part of government agencies' mantra". However, he believes that Dublin has improved a lot in relation to making data available, and that Dublinked (an open data sharing website and local authority engagement mechanism) is a great example of this. The local authorities have lots of data but they don't have app developers, and they don't have the resources to do anything with the data.

In relation to the motivation of citizens to participate in data gathering and sharing using the platforms described, he thinks that cyclists would be willing. However, for his research he is paying cyclists to use an app, so that is part of the motivation. It also depends on how a study is framed, and selling it to people in the right way.

In relation to research bodies or cyclists themselves utilizing open government data to improve the life of the cyclist, he stated that there is already some good data out there; the CSO (Central Statistics Office) have a POWCAR database that contains details of how people get to work and how long it takes them, and it is all anonymized. You have to apply to get this data, though.

TABLE 4.3 – Main Findings from Interview 1

Better integration and availability of cycling data needed; bicycles should be sensorised
Smartphones have much potential in research and data sharing
Cyclists are willing to contribute to appropriately-framed studies

4.3.2 Interview 2

The second interviewee is a senior organising member of the Dublin Cycling Campaign cycling advocacy group which has 300 members.

When asked about collecting data on cyclist concerns, he said that they hold public meetings, and as a public forum these are very useful. The Campaign also issues online surveys but response rates varied. The Campaign's Facebook page allows posts and comments on topics, and tends to be found before their official site when searched online. If they have some major event coming up they tend do a leaflet hand-out on Dublin city centre streets.

The user comments posted to social media have been overwhelmingly positive; only occasionally have negative comments been submitted. The Campaign also has a Twitter account and a number of Campaign staff regularly Tweet, which has had the result of raising the Campaign's media profile.

In relation to his ideas for a cycling smartphone app, he praised the free National Transport Authority Dublin Cycle Planner app, and advocates integrating short term weather forecasts into this. It is planned to drastically increase cyclist numbers by 2020, so displaying secure parking space availability for bicycles in a Smartphone app would also be very useful. Promotion of cycling by the authorities is lacking due to staffing shortages, and he thinks that an app would certainly be a useful alternative method for promotional activities.

In relation to an online database for bicycle or cyclist registration to address issues such as bicycle theft and law breaking, he said that they have talked to Gardai about this issue. The main problem is that bicycle registration is not within the Gardaí's remit; they only get involved when the bicycle is stolen and it becomes a crime. Private companies do have a system whereby you can register your bicycle so that if it is stolen it can be traced. The Campaign thinks that bicycle registration would be a good idea for Ireland, and advocated the Dutch, multi-agency approach, to this. In relation to law breaking, he thinks that there is a role

for registration in dissuading this, and that bicycle registration at the time of sale would be the optimal way to do this.

As to how Information Systems might address the most serious concerns identified in the survey results, namely collision risk, and infrastructure such as traffic signals not catering adequately for cyclists, the interviewee spoke about bicycle detection via induction loops linked to traffic signals. It would cost a lot, and be disruptive, to retrofit the city with these. As regards alternative means of detection, he mentioned that the city council is looking at an infra-red detection system that is sensitive enough to distinguish cyclists, but this is prohibitively expensive at present.

Asked whether the Campaign had participated in any collaborative projects with the local authorities, and if any of these had made use of Information Systems, he spoke about physical meetings with the councils, with the Campaign having representatives on all of their forums. This is where cycling issues are raised and input to infrastructure planning is given. The councils have never made a request for cyclists to participate in data gathering or sharing by, say, fitting a device to their bicycle, or using their smartphones, but he does think this would be useful in getting a picture of journeys made. Regarding other citizen feedback, he mentioned a public consultation process for the Greater Dublin Area Cycle Network Plan where cyclists or citizens in general could contribute.

The survey found that 68% of cyclists are happy to participate in initiatives that would require them to gather cycling data. In relation to engaging and motivating cyclists to participate, he feels that you have to go out and try to get cyclists to help you. The Campaign is a voluntary body with those involved doing it for altruistic reasons. It is difficult to get people helping consistently, and membership numbers do not compare favourably with other cities worldwide. Cycling Ireland, the official cycling body, has high membership by virtue of it providing a cycling insurance system; it is not active in cycling policy or improving facilities. In general, a lot of people are not interested in contributing, and just want to see better infrastructure.

Asked what he thinks of an existing local authority online facility to report faults, and how it could be enhanced to be of more use to cyclists, he highlighted confusion regarding two similarly-named self-service portals; fixyourstreet.ie, a countrywide local authority facility, and fixmystreet.ie, a private initiative. He thinks that fixyourstreet is a great facility but that the follow up on issues is sometimes unsatisfactory, and that there is not a 100% response to

requests submitted. Asked about receiving a reference number for a logged issue, he said that it is more a case of hoping that the issue would be fixed rather than tracking progress of a request.

The interviewee was then asked if the Campaign could send a stronger message to government using Web 2.0 platforms versus traditional lobbying methods. He again listed face-to-face forums with various parties such as the local authorities, Gardaí, National Transport Authority, and the Railway Procurement Agency. For him, sitting around a table makes it much easier to know what another person is thinking. You can do a certain amount online, but often you just have to meet, discuss, and come out with a final answer. The Campaign regards this as both a strategic and an effective method of dealing with planning and policy issues. Internally, they have a collaborative intranet for members to discuss different issues, and they also use it to recruit volunteers for upcoming events.

Regarding open and available data, he thinks that the council's cycling-related online content, such as planning documents, has improved greatly, and technology has enabled this. He finds Dublin City Council pretty open and approachable, bearing in mind that the Campaign is one of numerous organisations looking for information on transport issues. If he seeks information or data, he generally gets it, even though staffing shortages means that it might take a bit of time to collate the data. A part of gaining access to the data is developing relationships, and you have to work on those relationships.

TABLE 4.4 Main Findings from Interview 2

Meetings and physical interactions are effective for collaboration and data sharing
Smartphone Apps should integrate lots of different data of use to cyclists
Confusion surrounds various online self-service fault logging portals

4.3.3 Interview 3

The third interviewee is chairman of Cyclist.ie, a large national cycling lobbying group and federation of cycling groups.

Regarding collection of data on the concerns of cyclists and the methods used, he said that this has happened in an informal way through Facebook, Twitter, their website, and email. They have never surveyed cyclists, but they have surveyed politicians on cycling policy, for

example. Asked if Cyclist.ie has crowd-sourced cyclists' opinions on cycling issues using platforms like Facebook/YouTube/forums/wikis, and the positives and negatives of these, he said that they use Facebook effectively as a way to pull in cyclists into the main website where issues can be explored in more depth. They also create videos and publish them to YouTube and Vimeo. They have just posted videos made in conjunction with the National Transport Authority and Dublin City Council was paid to do this. The public bodies approached Cyclist.ie as Cyclist.ie has the video making skills.

He thinks that Facebook is also a fantastic medium for cycling advocacy and for creating a cultural shift, but the challenge is to gather an audience. They have a number of journalists 'following' them on Twitter, as well as councillors and politicians. That is where Facebook and Twitter do matter as they're vital in bringing these people into the cultural mind shift. It may not be the politician themselves who reads the Tweets, but somebody working for them is monitoring social media. Cyclist.ie posts every day on Facebook and looks at the comments received. Finally, he mentioned that they use the cycling thread on the popular bulletin boards site 'boards.ie' to ask questions of the cycling community.

The survey showed that 90% of surveyed cyclists own a smartphone. The interviewee said that the feature of most use in a Cyclist.ie app would be the ability to send a geolocated photo of a cycling fault directly to the city council. He also highlighted the confusion around the self-service portals. Another app he would like to see is one that would measure or track the state of the road pavement.

Asked about the creation of an online database to register bicycles that could address bicycle theft and law breaking by cyclists, the interviewee stated that theft is a major problem and it is thought that there is massive underreporting of incidents. His organisation does not want private enterprise to be registering bicycles, as it will result in many different databases that don't talk to each other or to the Gardaí, and may not be secure. The Gardaí have set up a database on a pilot basis, but it is a voluntary register and isn't integrated with the main Pulse system, so it isn't widely searchable. He thinks that the Department of Transport would want to charge cyclists a fee to manage a bicycle database. However, a bicycle is so simple that there should not be any impediment to its ownership or usage. "Cycling, like walking, is one of the freedoms of life" according to him.

In relation to cyclists breaking the rules of the road, he thinks that addressing law breaking would be easier if there was a national register of bicycles, but a problem would be that

anybody could be riding the bicycle. He doesn't want to see the alternative of cyclist registration as this would just make cycling complicated.

In relation to collaborative projects with the local authorities, particularly ones that make use of Information Systems, he again mentioned the 'Cycling Stories' YouTube videos. Cyclist.ie has not participated in any projects involving fitting sensors to bicycles. Speaking about the small number of electronic bicycle counters located around Dublin, he said that they want to see a lot more measuring of cyclists, because if cyclists are not being measured, they don't count with local or national governments. Cyclist.ie has learned from a combination of the November canal cordon counts (which don't count dublinbikes), electronic counters, and the annual CSO 'travel patterns' survey, that cyclist numbers coming into the city are growing rapidly.

It was then put to the interviewee that the survey results showed that 68% of cyclists are happy to participate for no reward in initiatives that would require them to gather data e.g. by fitting a device to their bicycle. He is of the opinion that cyclists are motivated to participate and engage because they have a great sense of community, borne of a fear that they are threatened with extinction. Cyclists want to better conditions, to improve the commons. He thinks that what is missing in Ireland, but is present in countries like Denmark, Netherlands, and Germany, is political leadership. Politicians in Ireland are supine, and they follow the crowd. There is very little leadership, and the Minister for Transport himself is not really doing anything on cycling promotion. In 2013, a directive to form a cycling forum and to appoint a cycling officer in all local authorities was issued, but progress has been slow. It's not enough to issue a direction; you need to follow up on it.

The interviewee was then asked if he thinks it is difficult to get volunteers for cycling campaigns. He said that membership of Dublin Cycling Campaign is huge in relation to the other Irish campaigns, but compared to Cycling Ireland whose membership is 20,000, it is very small. If you want to take part in a charity cycle you must join Cycling Ireland, and this is a major reason for their membership increase.

The interviewee was then asked about Government 2.0, and if he thinks Cyclist.ie can send a stronger message to government using Web 2.0 platforms and social media, versus traditional lobbying methods. He said that at the European Cyclist Federation AGM in Dublin in April 2014 they had an Irish Minister of State attend and sign an ECF Europe-wide cycling manifesto. They were also able to get to talk to the Minister for Transport and other senior

politicians. They are the ones who make the changes, and the current lobbying methods are therefore getting results. He thinks that if you have lots of cyclists using these platforms to communicate with government, staff resources will not be available to digest all of the communications. Public sector staffing has been decimated and, in the words of the interviewee, “there is nobody to read the stuff, never mind formulate a policy response”. The Department of Transport has a Smarter Travel Division trying to achieve a 10% target for bicycle modal share by 2020, but it comprises a very small number of people, some of whom are part-time. This can be compared to the city of Munich, which has a similar population, but employs 40 people for cycling promotion. He feels that his organisation is doing the promotional work for the Government.

Finally, the interviewee was asked does he have any thoughts on how Cyclist.ie can utilize open government data in its activities. He is of the opinion that citizens should have access to hospital accident and injury data, but that this is all hidden in the HSE, and is not openly available. He said that the data would be useful in formulating policy. A lot of the time the government doesn’t assemble the data in a useful way, but he did mention the Greater Dublin Area Cycling Network Study, where trip origin and destination information was overlaid on maps of streets to predict the ways that cyclists would come into the city, and dots were used to visually represent density of traffic.

TABLE 4.5 Main Findings from Interview 3

Niche use of social media; more widespread use in lobbying limited by govt. resources
Geolocation and reporting of cycling faults using smartphones is highly desirable
More counting of cyclists and better availability of this data is needed
Obstacles lie in the way of bicycle and cyclist registration

4.3.4 Interview 4

The fourth interviewee is a former mayor of Dublin City Council and is a current city counsellor and cycling advocate.

For collection of data on citizen issues and opinion, the interviewee said they have used ‘Your Dublin Your Voice’, a Council civic engagement website that runs surveys. DCC also has a website called Dublincitycycling.ie which asks for feedback to inform interventions, such as asking people where they would like to see bicycle stands in the city. He feels that this site hasn’t really worked well because a small cohort of people was contributing repeatedly, and a

distorted picture resulted. In the end, the site was abandoned. He said that the website has not been marketed as the council does not have the budget for marketing.

DCC also has electronic cycle counters. Other counting is done by recording video for 24 hours with somebody then sitting in front of this to count the cyclists. The council has been doing a canal cordon count for at least 30 years, and it is done at the same time each year to note trends. Since the dublinbikes scheme started five years ago, the number of cyclists in the city centre has doubled, and the numbers crossing the canals has gone up 50%. The dublinbikes scheme has cost €6 million to date, compared with 'several billion' for the LUAS light rail project. This €6 million figure is actually the cost to DCC, because dublinbikes is sponsored by a private company.

The interviewee said that getting the sheer numbers of cyclists is very important in arguing for more action related to cycling. Initiatives like a proposal for a new cycling route along the city quays, at the expense of a car lane, are easier to argue for if you can show the figures back. Having hard figures can also make you more ambitious.

DCC has quantitative data, but not qualitative. In Copenhagen they do a phone survey every two years of cyclists and potential cyclists, and the results inform their decisions. Another source of cycling data in Ireland is the census, which is taken every five years. The data within the census is not great as only the main mode a person uses to get to work is counted. Cycling legs of a multi-leg journey can therefore be discounted. The data shows, via heat maps, the geographical spread of cycling activity.

Another source of data he mentioned was dublinbikes data. Dublinbikes has been reluctant to share their data with the public, but a deal was recently struck to make the data available via their open API's. The dublinbikes data will be made available via dublinked, an open data portal. He also mentioned that when dublinbikes was launched, an unofficial app for it called Fusio was made available. However, the creators were soon threatened with legal action if they didn't remove their app from the App Store. He also mentioned that part of the deal struck was that people can in future put out their own apps, and that the dublinbikes data will be available to them.

In relation to collecting non-dublinbikes journey data, he suggests recruiting a number of people and putting a GPS device on their bicycles, asking those people to use one of the free ride mapping Apps such as Moves and to upload their data to you, or even writing an app.

When asked about the potential for collaborative projects in conjunction with the cycling community that might require DCC to equip cyclists with software or hardware sensors to collect data, he said that a concern would be whether you could say that you had a representative sample of people and their cycling activity. The council has not done such types of projects, nor is it planning to, unless the benefit of doing them can be clearly shown.

Asked next about the advantages and disadvantages of engaging and collaborating with a community such as cyclists on their issues and concerns using Web 2.0 technologies (so-called 'Government 2.0'), he stated that, in his opinion, social media tends to be a very aggressive, confrontational way of talking to people. "On the Internet it is like you are in a bubble, and you can tell people to '**** ***', similar to when you honk your horn in a car." The anonymity of the Internet, and the non-personal nature of the interactions, allows for a level of aggression and nastiness. Perhaps this is because of the younger age profile of the people that generally use these platforms. By way of example, he was one of the instigators of the 30Kmph speed limit in Dublin city centre, but received a lot of abuse as a result, via various online forums including the bulletin boards site, boards.ie.

Social media is not conducive to making better cycling decisions in his opinion. He is keen to get more data to help improve services, but he doesn't think Facebook and Twitter are the way to do it. He thinks there is a high degree of bandwagon jumping when it comes to social media, compared to surveys where you can be more specific. He thinks surveys, sensors, and gadgets are better approaches for data collection. A good way to use Facebook, he thinks, is to post a link to a survey there. In this way, Facebook is seen as being the 'way in' to the survey. Similarly, a Tweet can be sent asking people to partake in a survey.

Finally, he said that he is not in favour of having discussions on Facebook; he thinks that you can only really have a proper discussion with a small number of people. He does Tweet a bit himself, but generally about cycling issues that are not very confrontational. His employer, the council, does respond to some citizen communications that are made via Twitter, mainly to supply the correct information if something misleading has been posted.

TABLE 4.6 Main findings from Interview 4

Better use could be made of existing online local authority platforms
Lots of data exists on cycling but some is difficult to access
Social media is not conducive for local authority-citizen cycling discussions

4.3.5 Interview 5

The fifth interviewee is the Cycling Officer with Dun Laoghaire-Rathdown County Council (DLRCoCo).

DLRCoCo has nine cycling counters in the county that collect cycling data. The data from these is sent to a website where it can be read by council staff. They are looking at how to make the data available publicly, but if anybody requests the data they will supply it. In relation to surveys, they did one in 2013 whereby cyclists were stopped and their general views on cycling were obtained via a qualitative survey.

Asked about canvassing other opinions, and whether his organisation looks at public internet discussion forums like boards.ie, he said that it does watch what views are being expressed there, especially if there is a scheme being implemented that is controversial. His opinion about the views expressed on these forums is that there are usually two sides to a story.

In relation to cycling data that is, or would be, most beneficial to DLRCoCo, he said that a review of the bicycle network used CSO data to see where the demand was, and that a cycle network map was drawn up from this. The same type of approach was subsequently used by the Greater Dublin Area Network Plan. The CSO data is limited as it only includes trips to work and education, and therefore includes morning peak trips only. The CSO Household Travel Survey is useful for off-peak cycling numbers, and gives more information than the census data. Road safety data is available to the local authority via a GIS accident database compiled by the RSA. It is a mapped version of all collisions, but it is usually about two years out of date. Elsewhere, the SCATS traffic signal system can count the number of vehicles passing over the induction loops in the roads, but cannot count bicycles passing over them.

DLRCoCo does not make as much use of social media and Web 2.0 platforms as it could. In fact, a policy prohibits the use of social media for individuals, so he cannot access Facebook at work. However, the authority's press office monitors Facebook and Twitter, and forwards items of interest to him for a response, so the council does respond to issues raised via social media to a limited degree. The same press office also Tweets, but Tweets received by it are usually negative. Facebook is mainly used to promote events and for announcements regarding public consultations. The council does not use YouTube, blogs, or forums, partly because of lack of expertise. In his opinion, most of the people in the local authorities involved in cycling schemes have little time for anything else.

Asked what he thinks the advantages and disadvantages of a self-service portal for cycling issues would be from the council's point-of-view, he said that 'Fixyourstreet' is there to report maintenance issues but is not cycling-specific, and that the council also has a cycling email address with some issues come in via this also. One of the drawbacks he sees in a self-service cycling portal is the difficulty in dealing with many issues from a resources point-of-view.

He is of the opinion that a national register of bicycles would be a good idea, although there are private companies that do this already. Theft levels are increasing in line with cyclist numbers, and anything that reduces this is to be welcomed, in his opinion. In relation to addressing law breaking by cyclists using such a register, he is not sure if it could be made to work; the Gardai have limited resources and can only do so much.

Regarding the advantages and disadvantages for the Council in engaging and collaborating with a community such as the cyclists using Web 2.0 platforms (so-called Government 2.0), he said that the council will soon be setting up a cycling forum with representatives of cycling stakeholders in a round table setting, and the details of the meetings will be put online for public consumption. He thinks that this approach would be more efficient and effective in moving cycling forward than the use of Web 2.0 platforms. These types of forums are very common in the UK and seem to work well. He has also consulted focus groups of cyclists on their ideas for developing cycling infrastructure, and feels that these types of engagements are better than the 'free-for-all' of social media where the views expressed might not be representative of the cycling community as a whole.

Finally, in relation to data held by government departments or public bodies that is of relevance to cycling, the interviewee stated that most of the data the council needs is made available if it is requested. With respect to data that the council makes available itself, most of the time the file is exported off their website rather than having to grant access to the website itself. He thinks that, in general, public schemes are fairly open in that they put a lot of material online such as responses to public consultations and drawings.

TABLE 4.7 Main findings from Interview 5

Social media used for monitoring cycling discussions, rather than direct engagement
Organisational factors limit social media's use beyond announcements/service updates
Traditional round-table forums for cycling discussions are favoured

A full transcript of the above interviews is contained in the document entitled 'Interview Transcripts.docx' on the CD included with this dissertation.

4.4 Analysis of Other Data Collected

The Road Safety Authority chose to return answers to the proposed interview questions via email.

As regards prior data collection from cyclists, it stated that it has conducted observational studies of cyclists to gauge rates of high-visibility clothing and helmet usage nationally. In addition, and as part of wider face-to-face interviews with a nationally representative sample of 1,000 drivers, the RSA has asked a number of specific questions of a sub-group of cyclists. Cyclists were not recruited directly; rather, the proportion of cyclists included in the study was allowed to fall out naturally based on quota sampling of drivers. The RSA has also conducted a national 'Sharing the Road' survey of road users, which included over 200 cyclists who were interviewed in their own homes.

Questioned on how Information Systems could be used to collect useful data on cycling to realise their mission, it stated that social media is an important tool for it in public communication with cyclists. Given the popularity of social networking sites on smartphones, the RSA regularly runs promotional activity and giveaways across its social channels to do with cycle safety. A 'safety tip swap' giveaway gave every person who submitted a tip a set of bicycle lights in return. The giveaway proved to be very successful; the combined reach of the giveaways reached over 10,000 people, and earned 350 direct engagements on Facebook.

Asked about exploring the potential of social media for engagement with cyclists, the RSA stated that it has five social media channels and is very active across all of them. It has two Facebook accounts, 'rsaireland' (44,240 likes) and 'rsadrivingtest' (24,039 likes), and two Twitter accounts, @rsaireland (4,483 followers) and @rsadrivingtest (416 followers). It has a YouTube channel that has a suite of cycle safety videos. It has found social media to be a very effective way of engaging with its audience to educate and increase road safety awareness. For the RSA, Facebook and Twitter are a quick and effective customer service platform for the public. Typically, road users who partake in RSA research studies are recruited via third party market research organisations who advise on best practice in terms of appropriate research techniques.

Asked about the potential for technology-based collaborative projects between the RSA, cyclists, and other road users, and aimed at a safer cycling experience, the RSA stated that this is a new area of development and that any such collaborative projects would need to balance safety benefits with potential distractions.

Finally, the RSA was asked if it makes a lot of data available online to the public, and if that data could be connected with other departments' data to present information more usefully to the road user. The response received pointed to a section of the RSA website that contains a lot of national safety data. The road collisions part of this website integrates collision data with online maps, and it is possible to filter for cyclist-only collisions and severity of collision. The RSA also issues road safety data in press releases on its website and via messages on Facebook and Twitter.

TABLE 4.8 Main Findings from RSA response

Social media is a valued tool for promotional activities in the area of cycling safety
Direct feedback from citizens is obtained via surveys

4.5 Conclusion

The survey results have profiled the online engagement of the 'cycling citizen', and have determined what online facilities would be of most value to them. The interviews with the advocacy bodies and the local authorities have highlighted opportunities and obstacles to online engagement from the government point of view. The next step is to combine these findings with those from the literature review, and to draw some conclusions on how Government 2.0 can improve the city cycling experience.

5 Conclusions and Future Work

5.1 Introduction

This dissertation sought to answer the question: Can citizen-government interaction via Government 2.0 benefit Dublin city cycling? The final chapter draws together the findings from all phases of the data collection to show that there is certainly potential for this in certain areas. The following sections make recommendations for how this can best be realised.

5.2 Government 2.0: Critical Success Factors and the Irish Context

Globally, most Government 2.0 initiatives are still in their infancy, and overall usage levels are modest to date. Ireland is lagging behind other countries in terms of its e-government sophistication. It has had some e-government success stories, and platforms like merrionst.ie are trying to help the shift towards Government 2.0. The Irish Government's 'eGovernment 2012 – 2015' policy document includes actions for using apps and mobile devices, development of a social media usage policy for improved access to services, making public data available for reuse, and back-end system integration. The 2014 National Action Plan for Open Government proposes a dedicated web platform to promote participation in government and encourage wider engagement.

This study recommends that citizen-government collaboration or data sharing using Web 2.0 platforms should abide by the following critical success factors:

- A clear purpose must exist for initiatives
- Motivation and engagement levels must be sufficient for these platforms to be deemed representative and inclusive
- Platform design and quality must attract users in and encourage them to return
- Resources and appropriate skills must be available to effectively manage and extract value from these platforms
- Institutional transformation, with appropriate leadership for initiatives, is required
- The roles and responsibilities for government and citizen must be clear
- Technical and integration challenges must be overcome
- Mutual trust and privacy must be maintained
- Accountability, measurable impact, and return on investment, must be clear

Commuting cycling levels are again increasing in Dublin and Ireland, but the target of 10% of modal share by 2020 may not be achieved. Perceptions about cycling, and insufficient data to counteract those perceptions, are deterring cyclists. This study identified the chief concerns for existing cyclists in Dublin as being the risk of collisions with other traffic, poor quality infrastructure, and bicycle theft. A word cloud representing cyclists' opinions on what cycling issues Information Systems should address is shown in Figure 5.1. The recommendations made in this chapter address many of these concerns.

FIGURE 5.1 – Cyclists' ideas on how Information Systems could address their concerns

Pucher et al. (2010) found that a comprehensive program of interventions produces a greater impact on cycling numbers, and that ongoing citizen input from cyclists is required. Government and citizen alike can benefit by collecting and sharing more cycling data using appropriate Information System platforms.

5.3 Hard Data: Smartphones and Apps

This study recommends that smartphones should be central to the collection and sharing of 'hard', or quantitative, cycling data to inform infrastructure interventions. The GPS functionality provides rich location data that would be invaluable for governments in terms of planning and policy. The survey for this research revealed that 90% of Dublin cyclists own a smartphone, and for this reason also they are adjudged to be the optimum platform for engaging with cycling citizens for quantitative data collection and sharing.

Licensing of commercially-available cycling apps that map cyclists' routes should be investigated by local authorities, and the accelerometers on smartphones have potential in collecting and sharing data about the state of the cycling environment. A large majority of

surveyed cyclists in this study indicated that they would be willing to fit a device, or operate a smartphone app, for no direct reward, to their bicycle to provide data to the local authority.

Interviewees and survey respondents strongly advocates the use of smartphones for the purpose of geolocating faults and issues with the cycling infrastructure, either via an app or a smartphone-enabled website, with the ability to send a geolocated photograph to the local authority. It is recommended that two existing government-sourced apps, subject to some improvements, be integrated into a new 'umbrella' cycling app.

5.3.1 Fixyourstreet

Over half of surveyed cyclists previously reported problems with public services to the local authority. It was found that there is confusion regarding two similarly-named fault reporting portals; Fixyourstreet is the official countrywide service, whereas Fixmystreet is a similar-looking privately-run initiative. There is also a third, legacy, fault reporting utility within the Dublin City Council website. Fixyourstreet is not geared specifically towards cyclists, nor does it allow categorization of cycling issues. The follow-up on requests is unsatisfactory and testing of the app for this research resulted in a disappointing experience; no reference number was given for a logged fault, and no timeframes for response or resolution were given. It is recommended that a cycling-specific app version of Fixyourstreet be created for the integrated platform. Alternative quick wins could be achieved by removing duplication of self-service sites, providing the ability to categorise cycling-specific service requests, and forging a clear identity for the service.

5.3.2 Dublin Cycle Planner app

The feature-rich free Dublin Cycle Planner app is one of the best apps in the area of cycling in Ireland, but it is recommended that some aspects of this app are improved and enhanced. Traffic signal red light waiting times do not seem to be included in the calculated journey times. During testing, the app also underestimated the time for a familiar daily commuting route. In addition, the app is still directing cyclists the wrong way along one-way streets. The app currently offers little in the way of data sharing. Enhancing the functionality to allow users to record and share journey data with the local authorities would highlight the problems mentioned, and provide additional valuable data. SMS messages or push notifications, with information such as a link to a cycling survey, could be sent to agreeable App users. Further useful enhancements would include weather forecasts and real-time information on bicycle parking facilities and spaces.

5.4 Hard Data: Other Devices

Collection and sharing of environmental data would be valuable in encouraging cycling, informing route choice, and guiding cycling interventions. The mobility of cyclists constitutes superior, but untapped, measuring potential. It is therefore recommended that a pilot project be instigated by the local authorities, in conjunction with willing cycling citizens, to use the Copenhagen Wheel. The added ability to share ride data online using the Wheel's companion app makes such an initiative worthy of pursuit.

The advocacy body interviewees thought that collaborative projects with the local authorities, whereby cyclists fit sensors to their bicycles or use some type of app, would be a good way to get a picture of journey types. 'Desire lines' between source and destination points of a journey often result in illegal road behavior by cyclists, such as cycling the wrong way along a street. Fitting of GPS sensors to bicycles would be a good way to record and share the level and nature of this activity. Dublinbikes is a ready-made infrastructure for data collection initiatives; any privacy concerns surrounding data collection from sensors fitted to dublinbikes bicycles could be addressed by anonymising the data. RFID tags could also have potential in measuring activities if tags could be supplied to willing cyclists, or better still fitted to new bicycles as standard.

5.5 Soft Data: Social Media versus Traditional Engagement

The survey results point to high levels of social media usage amongst the Dublin cycling community, with Facebook being used most, instant messaging applications and content communities also popular, and Twitter used least.

Surveyed cyclists showed a preference for an online forum for direct engagement with the local authority, where opinions on cycling issues could be expressed. However, the opinions expressed by the advocacy group and local authority interviewees regarding favoured modes of engagement are in stark contrast to those of the cyclists. They mainly rely on public meetings to understand cyclists' issues, and consider them useful and effective. Overall, physical, face-to-face methods are most effective for them in the sharing and understanding of cyclists' concerns. One interviewee stated: "When you are sitting around a table, it is much easier to know what a person is thinking. You can do a certain amount online, but often you just have to meet, discuss, and come out with a final answer".

A cycling advocate also mentioned face-to-face meetings with representatives as a more effective lobbying approach than Web 2.0 and social media. The Road Safety Authority emphasized physical, personal methods of data collection in relation to safety, and it too felt that a round-table setting, with representatives of key stakeholders in cycling, is a more effective way to engage. Social media is seen as an anonymous "free for all", where the views expressed cannot be trusted to be representative of the cycling community as a whole, and where communications can be aggressive and confrontational. It was generally felt that it is only possible to have a proper discussion with a small number of people.

Although favored by cyclist survey respondents, the interviews support the conclusion that social media platforms are not suitable for local authorities in getting feedback to make better cycling decisions. Any collection of data about cyclists' concerns using popular platforms such as Facebook or Twitter is done in an informal way, and supplements use of official websites and email for such activities. It is therefore recommended that resources should not be directed towards social media as a platform for direct discussion of issues between cycling citizens and government. Traditional face-to-face methods are more effective; those cycling citizens that have a genuine interest in improving the cycling experience tend to take the trouble to attend a meeting or write an email, rather than the lightweight engagement of commenting or posting on social media.

5.6 Niche Uses of Social Media

Although not recommended for government-citizen discussion of cycling issues, the interviews highlighted social media's value in other, niche areas. Facebook is usually the first way that a cycling organisation is 'found' when people are exploring online, and Twitter has a value in cycling advocacy as a direct communication channel with influential journalists in mainstream media. Also, local authorities will often follow up on citizen-sourced Tweets related to traffic congestion, for example. They do respond to some Tweets, but only to the extent of supplying the correct information if something misleading has been tweeted. Content communities can be a catalyst to mainstream coverage and resultant response by government, for example where the law enforcement body becomes aware of a road rules infringement due to a viral YouTube video, and then conducts a follow-up investigation. Another niche use of social media is for linking to an online survey from Facebook, or Tweeting of the link and asking people to participate. In this way, social media has a value as

a ‘way in’ to data collection. Such surveys are deemed to be more effective ways to get citizens’ feedback than online discussions, despite variable response rates.

The local authorities make a niche, monitoring, use of cycling discussions on boards.ie, which covers many topics and interests including cycling. One of the advocacy bodies goes further by putting questions to the cycling community there. A lot of the cycling debate in Ireland happens on this site, but it is outwardly citizen-to-citizen and the philosophy tends to be anti-establishment, so it would be inadvisable for the local authorities to engage with the cycling community in a professional capacity there. Critically though, it is currently where the critical mass of cycling opinion resides, and therefore has significant value in its exposure of a wide spectrum of opinions and ideas.

Social media also has a role to play in promotion of cycling safety. It has been shown that more cyclists means safer cycling, so more government promotion of cycling is required. Caulfield (2014) asserted that one of the key elements in encouraging modal shift in Dublin is the promotion of cycling. The Road Safety Authority uses social media heavily as a promotional tool for one-way communication with cyclists. The ‘Dublin Cycling Stories’ YouTube videos are also a positive development, and represent a template that has massive potential as a promotional vehicle.

Based on the above examples and discussion, this study recommends that the social media element of any Government 2.0 initiatives in the area of cycling should focus on its use in promotion.

5.7 Collaboration and Motivation

Over 86% of surveyed cyclists think that cyclists’ issues can be addressed via collaboration with the local authorities using Information Systems. 68% of surveyed cyclists stated that they would be happy to carry a device on their bicycle, or use an app on their smartphone. The interviewees, on the other hand, questioned whether this could be made to work in practice. A salient comment was: “Some people might come along to a meeting once, but to get people helping consistently it is very difficult. A lot of people are not interested in hearing about or contributing to activities; they just want to see better infrastructure”.

There are concerns that citizen-government data collection initiatives should reflect a representative sample of cyclists, and another challenge identified is the willingness of cyclists to disrupt their ride for the purposes of collecting data or operating a device. Overall,

the interviewees felt that the benefit of these initiatives, and the impact on cycling, has to be clearly shown in order to get support from both the cycling citizen and the local authority. Not many cyclists need to participate in data gathering exercises, but they may need to be paid or otherwise incentivized, and participation is more likely if the study is framed appropriately.

The 'Cycling Stories' YouTube videos mentioned earlier are an example of successful collaboration between a local authority and cycling citizens. Elsewhere, 'Your Dublin Your Voice' is an online civic engagement initiative of the Dublin local authorities. It periodically offers online surveys to its 4,000-plus membership. It is an established online community of willing citizens, and this study therefore recommends that the local authorities investigate ways to use it to collect cycling data. For example, cyclist-specific surveys could be delivered from here. Dublin should also emulate the biannual survey of cyclists that is carried out in Copenhagen where a report, called the Bicycle Account, is subsequently published online (Cycling Embassy of Denmark, 2013). It is a relatively low tech. approach, but it is still a good example of effective collaborative engagement by Government and citizens on cycling issues.

5.8 Informational and Data Challenges

This study finds that duplication of services, and a chaotic collection of online public cycling resources, are working against cycling's profile. This is illustrated by DublinCityCycling.ie, a dedicated DCC cycling promotional website. Despite its ranking as the top search result when the string 'cycling Dublin' is searched via Google, the site has not been updated in two years. The similarity of its website name to that of the Dublin Cycling Campaign also works against the website's profile.

'Allbikesnow' is the official app for the dublinbikes scheme, but information about the Allbikesnow app is buried deep within the dublinbikes website and is quite difficult to locate and typing the string 'dublinbikes app' into the Google search engine returns another, privately-created app as the top search result. Dublinbikes' large database of cycling activity is a potentially valuable source of data, but has not been made available publicly as yet. Given the rich data that smartphone-equipped cyclists can provide, resources should be directed to create a customized, dublinbikes-branded version of this app, with cyclists being incentivized to use the app via reduced subscription fees.

The cyclist 'totem' counters in the city are a rich source of quantitative data, and the interviewees felt that publication of cycling data online is helpful as it can lead to innovation.

Raw data from these is currently only sent to a local authority intranet website. This data should be shared centrally, or in a uniform manner by all local authorities. An open data portal such as 'dublinked' is the logical location for publication of the data.

Other government data which would be of use to cycling safety, such as the CSO's POWCAR database, is not available easily. While it is understandable that the entire database would not be made publicly available, it would be useful for some or all of the cycling-related data to be published. In relation to cycling safety, the RSA maintains a 12-year database of accidents. Another separate database of hospital records is maintained by the Economic and Social Research Institute (ESRI). It would be useful to look at merging the data in the RSA and ESRI databases and making a view of the combined data available to citizens.

This study determined that bicycle theft is a huge, growing problem in Dublin. The Netherlands has an online National Bike Register containing all new bicycles sold, and stolen bicycles are marked as such in it. Also, almost every new bicycle sold is equipped with an anti-theft RFID chip (RDW, 2014). It would make sense for Ireland to emulate the Dutch approach, but so far measures have been piecemeal. It was felt by the interviewees that if the Department of Transport was to maintain a bicycle register, it would want to charge cyclists a fee, and this would be counterproductive.

Law breaking by cyclists is commonplace in Dublin, and could only really be addressed using Information Systems if a national database of *cyclists,* rather than bicycles, was created. The interviewees did not wish to see cyclist registration, however, as it "would just make cycling complicated". Attempts at cyclist registration elsewhere have not worked as the process is too expensive to administer versus revenue generated.

5.9 Resourcing

The drastically-curtailed resourcing in the public sector in recent years is another reason that mass engagement using social media and Web 2.0 is not feasible to implement. There are simply not the staff numbers to digest the communications of large numbers of cyclists using these platforms. One interviewee stated that their local authority does not use YouTube, blogs, or forums, the main reason being that "staff members involved in cycling schemes have little time for anything else". In relation to making data open and available, an interviewee highlighted skill sets as an additional problem.

Absence of skill sets, lack of resources, bureaucratic delays, or inappropriate marketing of government services is leaving a void that is being filled by citizen-sourced initiatives. The National Cycle Planner took millions of Euros and almost two decades to create. However, a similar, citizen-sourced, service called 'Hit The Road' was developed by just two people within one month. "Innovation just isn't something that is part of government agencies' mantra" was the view of one interviewee.

The National Cycle Policy Framework proposed a range of measures to do with cycling, some of which have been delivered, but there is little progress on marketing initiatives, a cycling portal, or cyclist surveys. In the absence of a government cycling portal, some creditable citizen-sourced initiatives have emerged in this area. The most 'comprehensive' and up-to-date of these is Irishcycle.com, which provides news and information about cycling in Dublin and Ireland [Irish Cycle, 2014b]. A similar, smaller scale, initiative is the Dublin Bike Blog. This has a dedicated comments section and also has a forums area, although the latter is little-used. The site has an educational flavour, with several extensive posts dedicated to understanding issues in the area of cycling, such as safety and the rules of the road (Dublin Bike Blog, 2014).

These citizen-sourced platforms are essentially filling a void and doing the government's job in educating, promoting, and engaging with the community of cyclists. Government-sourced initiatives in the area can be made to work though, as is shown in the useful and engaging local authority facility provided by the Los Angeles Department of Transport (LADOT Bike Blog, 2014), an example of Government 2.0 in action. A vital ingredient required for initiatives to increase cycling numbers is political leadership. This leadership is present in countries with high levels of cycling such as The Netherlands and Denmark, but according to the advocacy body interviewees, the Minister for Transport in Ireland is "not really doing anything on cycling promotion".

5.10 Limitations, Generalisability, and Further Study

The methodology for this study included solicitation of expert opinion in the areas of urban cycling and Web 2.0. It should be borne in mind, however, that the local authority interviews secured were predominantly with cycling representatives. Despite attempts, it was not possible to identify or gain access to Web 2.0 experts on either side. Input from such experts could have added additional dimensions to the findings.

Generalisability refers to the extent to which the findings of a research study are applicable to other settings (Saunders, 2009). Only two semi-structured interviews could be secured with local government representatives. Also, the public sector in Ireland at the time of the study was suffering chronic resource shortages as a consequence of a massive economic crash. For these reasons, the generalisability of the findings should be treated with a degree of caution.

A practical element to the research, such as a pilot project, was desirable but not feasible in the timeframe allowed. The next step for research in this area would be the recruitment of volunteer cycling citizens for a practical application and evaluation of the data collection and sharing measures recommended in this dissertation. Such a study would require a longer time frame than that allowed for this research, and would also require significant preparatory and ongoing work of a technical nature.

References

BBBike 2014. *BBBike.org – Your Cycle Route Planner* [online] Available at: http://www.bbbike.org/ [Accessed April 13 2014]

Bicycode 2012. *BICYCODE® marking response to a real need* [pdf] Available at: http://www.bicycode.org/pages1/Documents_PDF/plaquette__Bicycode_GB_082013_r.pdf[Accessed 22 March 2014]

Bike Index 2014. *Bike Index - Bike Registration That Works* [online] Available at: https://bikeindex.org [Accessed 8 February 2014]

Bike Register 2014. *Bike Register* [online] Available at: http://www.bikeregister.ie [Accessed 13 April 2014]

Bonsón, E., Torres, L., Royo, S. and Flores, F. (2012) 'Local e-government 2.0: Social media and corporate transparency in municipalities', *Government Information Quarter*ly, 29, 123-132.

Bristol City Council 2014. *New bus trial to improve cyclist safety*. [online] Available at: http://www.bristol.gov.uk/press/new-bus-trial-improve-cyclist-safety [Accessed 5 June 2014]

Caulfield., B. (2014). Re-cycling a city - examining the growth of cycling in Dublin. *Transportation Research Part A: policy and practice*, 61, 216 – 226.

Caulfield, B., and O'Reilly, A. (2014). *Using Social Networking to Keep Public Transport users Informed*. [unpublished paper] Trinity College Dublin.

Caulfield, B., Brick, E., and McCarthy, O. T. 2012. Determining bicycle infrastructure preferences–A case study of Dublin. *Transportation research part D: transport and environment*, 17(5), 413-417.

Central Statistics Office 2011. *Census of Population 2011*. [pdf] Central Statistics Office Available at: http://www.cso.ie/en/media/csoie/census/documents/Prelim%20complete.pdf [Accessed 7 April 2014]

Central Statistics Office 2012. *Profile 10 Door to Door*. [pdf] Central Statistics Office Available at: http://www.cso.ie/en/media/csoie/census/documents/census2011profile10/Profile,10,Full,Document.pdf [Accessed 12 January 2014]

Chua, A. Y., Goh, D. H. and Ang, R. P. (2012) 'Web 2.0 applications in government websites: prevalence, use and correlations with perceived website quality', *Online Information Review*, 36, 175-195.

Chun, S. A., Shulman, S., Sandoval, R. and Hovy, E. (2010) 'Government 2.0: Making connections between citizens, data and government', *Information Polity*, 15, 1-9.

Citizens Information Board 2014 *Cycle to Work Scheme.* [online] Available at: http://www.citizensinformation.ie/en/money_and_tax/tax/income_tax_credits_and_reliefs/cycle_to_work_scheme.html [Accessed 22 February 2014]

Citron, D. K. (2009) 'Fulfilling Government 2.0's Promise with Robust Privacy Protections', *George Washington Law Review*, 78, 822.

Copenhagenize Design Company 2013. *The Copenhagenize Index of Bicycle Friendly Cities*. [online] Available at: http://copenhagenize.eu/index/11.html [Accessed 19 May 2014]

Criado, J. I., Sandoval-Almazan, R., and Gil-Garcia, J. R. (2013) 'Government innovation through social media', *Government Information Quarterly*, 30, 319-326.

Cunningham, E. 2012. Nearly half of cyclists ignore rules of road. *Irish Independent,* [online] 27 Februrary. Available at: http://www.independent.ie/irish-news/nearly-half-of-cyclists-ignore-rules-of-road-26825883.html [Accessed 16 February 2014]

Cycling Embassy of Denmark 2013. *Copenhagen City Of Cyclists Bicycle Account 2012* [online] Available at: http://www.cycling-embassy.dk/2013/06/03/6995/ [Accessed 22 March 2014]

Cyclist.ie 2008. *Achieving a Cycling-Friendly Ireland* [online] Available at: http://docs.google.com/fileview?id=0B7v8_RA4nxWrM2E4MjdjNGUtYzJkYS00OTdhLWJjMTUtODA0MjY2NmVmY2I2&hl=en [Accessed 18 February 2014]

DB Bahn 2014. Call a Bike: How it works. [online, in German] Available at: https://www.callabike-interaktiv.de/index.php?id=401&&f=500 [Accessed 16 March 2014].

Deenihan, G., Caulfield, B., and O'Dwyer, D. (2013) 'Measuring the success of the Great Western Greenway in Ireland', *Tourism Management Perspectives*, 7, 73-82.

Department of Transport 2009. *Ireland's First National Cycle Policy Framework*. [pdf] Department of Transport. Available at: http://www.smartertravel.ie/content/national-cycle-policy [Accessed 26 March 2014]

Dill, J., and Gliebe, J.P. 2008. *Understanding and measuring bicycling behavior: A focus on travel time and route choice* [online] Available at: http://trid.trb.org/view.aspx?id=884287 [Accessed February 21 2014]

Di Maio, A. (2009) 'Government 2.0: A Gartner Definition', *Gartner Blog Network*. 13 November. Available at: http://blogs.gartner.com/andrea_dimaio/2009/11/13/government-2-0-a-gartner-definition/ [Accessed 11 January 2014]

Dublin Bike Blog 2014. *Dublin Bike Blog* [online] Available at: http://dublinbikeblog.com [Accessed 13 April 2014]

DublinBikes2Go 2014. *DublinBikes2Go* [online] Available at: http://dublinbikes2go.com/home [Accessed 22 April 2014]

DublinCityCycling 2014. *Area Maps of Cycle Tracks and Bike Lanes* [online] Available at: http://www.dublincitycycling.ie/cycling-facilities/cycle-lanes-and-facilities [Accessed 1 May 2014]

Dublinked 2014. *Dublinked™ . Sharing Data, Information and Ideas* [online] Available at: www.dublinked.ie [Accessed 13 February 2014]

Dun Laoghaire Rathdown County Council 2014. *Cycle Counter Statistics 2012 – 2013* [pdf] Dun Laoghaire Rathdown County Council. Available at: http://www.dlrcoco.ie/media/media,10326,en.pdf [Accessed 3 June 2014]

Eggers, W. D. (2005) *Government 2.0: Using technology to improve education, cut red tape, reduce gridlock, and enhance democracy*. Rowman & Littlefield: Maryland

Eircom 2013. *Ireland – A Tech Savvy Nation that Needs to be Constantly Connected.* [online] Available at: http://pressroom.eircom.net/press_releases/article/ireland_-a_tech_savvy_nation_that_needs_to_be_constantly_connected/ [Accessed 12 February 2014]

Eisenman, S. B., Miluzzo, E., Lane, N. D., Peterson, R. A., Ahn, G.-S., and Campbell, A. T. (2009) 'BikeNet: A mobile sensing system for cyclist experience mapping', *ACM Transactions on Sensor Networks (TOSN)*, 6, 6.

European Cyclists' Federation 2012. *ECF - BikeTrackBike* [online] Available at: http://www.btrackb.eu/ecf [Accessed 22 March 2014]

Fingal Open Data 2014. Fingal *Open Data - Ireland's first Open Data web site* [online]. Fingal County Council. Available at: http://data.fingal.ie [Accessed 30 April 2014]

Flickr 2014. *An Garda Síochána's albums on Flickr* [online] Available at: https://www.flickr.com/photos/gardasiochana/sets [Accessed 24 May 2014]

Flüchter, K., and Wortmann, F. (2014) *Mobile sensors on electric bicycles – a qualitative study on benefits and requirements from user perspective.* [unpublished paper] Swiss Federal Institute of Technology, Zurich.

Gallup 2011. *Future of transport Analytical Report.* [pdf] The Gallup Organisation. Available at: http://ec.europa.eu/public_opinion/flash/fl_312_en.pdf [Accessed 5 March 2014]

Gavin, M., Ghosh, B., Pakrashi, V., Barton, J., O'Flynn, B., and Lawson, A. (2011). A cycle route planner mobile-app for Dublin city. In *Irish Transportation Research Network Conference (ITRN2011), 31 Aug-1 Sep 2011, University College Cork, Cork, Ireland*, Irish Transportation Research Network.

Ginty, C. 2011a. *Bicycle counter launched along the Grand Canal* [online] 27 September, IrishCycle. Available at: http://irishcycle.com/2011/09/27/bike-counter-launched-along-the-grand-canal [Accessed 1 February 2014]

Ginty, C. 2011b. Bicycle counter costing €20k unable to give proper tally of passing cyclists. *Irish Examiner* [online] 11 March. Available at: http://www.irishexaminer.com/ireland/bicycle-counter-costing-20k-unable-to-give-proper-tally-of-passing-cyclists-147840.html [Accessed 18 March 2014]

Ginty, C. 2014, NTA app sends cyclists round bend. *Sunday Times* [online] 12th January. Available at: http://www.thesundaytimes.co.uk/sto/news/ireland/article1361863.ece [Accessed 27 January 2014]

Glaser, B., and Strauss, A. 2012. *The discovery grounded theory: strategies for qualitative inquiry.* 7th ed. Aldin, Chicago

Integrated Trackers 2014. *GPS Tracking Devices for Motorcycle and Bicycles* [online] Available at: http://www.integratedtrackers.com/GPSTrack/Products.jsp [Accessed 22 March 2014]

IPSOS MRBI 2014. *Social Networking 2014*. [online] Available at: http://www.ipsosmrbi.com/social-networking-may-2014.html [Accessed 5 June 2014]

Irish Cycle 2014a. *Cyclist Deaths and Injuries on Irish Roads* [online] Available at: http://irishcycle.com/collisions/ [Accessed 15 January 2014]

Irish Cycle 2014b. *Irish Cycle.* [online] Available at: http://irishcycle.com [Accessed 31 March 2014]

Irish Government 2012. *Supporting Public Service Reform eGovernment 2012 – 2015.* [pdf] Irish Government. Available at: http://egovstrategy.gov.ie/wp-content/uploads/2012/04/eGovernment-2012-2015.pdf [Accessed 4 May 2014]

Jacobsen, P. L. (2003). Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury prevention*, 9(3), 205-209.

Johnson, M., Newstead, S., Charlton, J., and Oxley, J. (2011) 'Riding through red lights: The rate, characteristics and risk factors of non-compliant urban commuter cyclists', *Accident Analysis & Prevention*, 43(1), 323-328.

Kristensen, M. 2013. *New Intelligent Cycle Track Lighting* [online] 8 April. Available at: http://www.cycling-embassy.dk/2013/10/25/new-intelligent-cycle-track-lighting [Accessed 13 March 2014]

LADOT Bike Blog 2014. *LADOT Bike Blog | LADOT – Have fun while traveling, ride a bike!* [online] Available at: http://ladotbikeblog.wordpress.com [Accessed 27 March 2014]

Lawson, A. R., Pakrashi, V., Ghosh, B., and Szeto, W. Y. (2013). Perception of safety of cyclists in Dublin City. *Accident Analysis & Prevention*, 50, 499-511.

Lee, G. and Kwak, Y. H. (2012) 'An Open Government Maturity Model for social media-based public engagement', *Government Information Quarterly*, 29, 492-503.

Liebner, M., Klanner, F., and Stiller, C. (2013, June). 'Active safety for vulnerable road users based on smartphone position data'. In *Intelligent Vehicles Symposium (IV), 2013 IEEE* (pp. 256-261). IEEE.

Linders, D. (2012) 'From e-government to we-government: Defining a typology for citizen coproduction in the age of social media', *Government Information Quarterly*, 29, 446-454.

Lips, M. (2012) 'E-Government is dead: Long live Public Administration 2.0', *Information Polity*, 17, 239-250.

MapMyRide 2014. [online] Available at: http://www.mapmyride.com/ [Accessed 5 May 2014]

Mergel, I. (2013) 'Social media adoption and resulting tactics in the US federal government', *Government Information Quarterly*, 30, 123-130.

Meijer, A. J., Koops, B.J., Pieterson, W., Overman, S. and ten Tije, S. (2012) 'Government 2.0: Key Challenges to Its Realization', *Electronic Journal of e-Government*, 10(1), 59-69.

MerrionStreet 2014. *MerrionStreet.ie Irish Government News Service* [online] Irish Government. Available at: www.merrionstreet.ie [Accessed 7 June 2014]

Mossberger, K., Wu, Y., and Crawford, J. (2013) 'Connecting citizens and local governments? Social media and interactivity in major US cities', *Government Information Quarterly*, 30, 351-358.

Murphy, C., 2013. 93pc of Dublin's cycle routes seriously flawed. *Evening Herald*, [online] 6 September. Available at: http://www.herald.ie/news/93pc-of-dublins-cycle-routes-seriously-flawed-29558508.html [Accessed 13 February 2014]

MyBikeLane Toronto 2014. *MyBikeLane Toronto - Get out of my bikelane!* [online] Available at: http://www.mybikelane.to [Accessed 22 March 2014]

Nam, T. (2012) 'Suggesting frameworks of citizen-sourcing via Government 2.0', *Government Information Quarterly*, 29, 12-20.

National Transport Authority 2011. *Initial findings from Census 2011* [pdf] National Transport Authority. Available at: http://www.nationaltransport.ie/wp-content/uploads/2011/12/Initial-Findings-from-Census-2011.pdf [Accessed 27 February 2014]

National Transport Authority 2013. *Draft Greater Dublin Area Cycle Network Plan*. [pdf] National Transport Authority. Available at: http://www.nationaltransport.ie/downloads/A3_Cycle_Network_Plan_LOW_RES.pdf [Accessed 6 January 2014]

Open Government Partnership 2013. [online] Available at: http://www.opengovpartnership.org [Accessed 31 March 2014]

Open Government Partnership Ireland 2013. [online] Available at: http://www.ogpireland.ie/2013/10/02/final-report-ogp-consultation [Accessed 2 April 2014]

Open Government Partnership Ireland 2014. *Draft National Action Plan Ireland* [pdf] Available at: http://www.ogpireland.ie/wp-content/uploads/2013/06/Published-Draft-OGP-National-Action-Plan-08-05-20141.pdf [Accessed 1 June 2014]

O'Reilly 2005 *What is Web 2.0* [online] Available at: http://oreilly.com/web2/archive/what-is-web-20.html [Accessed 18 March 2014]

Organisation for Economic Co-operation and Development 2002. G*lossary of Statistical Terms* [online] Available at: https://stats.oecd.org/glossary/detail.asp?ID=4752 [Accessed 2 March 2014]

Osimo, D. 2008. Web 2.0 in government: Why and How? *Institute for Prospective Technological Studies (IPTS), JRC, European Commission, EUR, 23358*

Ostergaard, S. D., and Hvass, M. 2008. *eGovernment 2.0 - How can Government benefit from web 2.0?* [pdf] Available at: http://www-05.ibm.com/dk/files/EGovernment08.pdf [Accessed 12 March 2014]

Outram, C., Ratti, C., and Biderman, A. (2010) 'The copenhagen wheel: An innovative electric bicycle system that harnesses the power of real-time information and crowd sourcing'. In *Proc. EVER Monaco Intel. Exhibition & Conf. on Ecologic Vehicles & Renewable Energies*.

Phelan, L. 2014. Dublin *Bus Driver tells me "I'll run you over", "You're gonna die".* [online] Available at: https://www.youtube.com/watch?v=RwqRqIvo4GU [Accessed 2 June 2014]

Picazo-Vela, S., Gutiérrez-Martínez, I., and Luna-Reyes, L. F. (2012) 'Understanding risks, benefits, and strategic alternatives of social media applications in the public sector', *Government information Quarterly*, 29, 504-511.

Professional Engineering (2009) 'Cyclists carry sensors in project to monitor city traffic pollution', *Professional Engineering*, 22(12), 36.

Pucher, J., and Buehler, R. (2012) *Big City Cycling in Europe, North America, and Australia*. MIT Press: Cambridge.

Pucher, J., Dill, J., and Handy, S. (2010) 'Infrastructure, programs, and policies to increase bicycling: an international review', *Preventive medicine*, 50, 106-125.

Pucher, J., Buehler, R., and Seinen, M. (2011) 'Bicycling renaissance in North America? An update and re-appraisal of cycling trends and policies', *Transportation Research Part A: Policy and Practice*, 45, 451-475.

RDW 2014. *Check whether a bike is stolen* [online] Available at: http://www.rdw.nl/Particulier/Paginas/Fiets.aspx [Accessed 23 May 2014]

Reddy, S., Shilton, K., Denisov, G., Cenizal, C., Estrin, D., and Srivastava, M. (2010 April) "Biketastic: sensing and mapping for better biking". In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, (pp. 1817-1820). ACM.

Rich, S. 2011. *Microwave Radar Gun Helps Time Traffic Lights for Bicyclists* [online] 4 August. Available at: http://www.govtech.com/policy-management/Microwave-Radar-Gun-Times-Traffic-Lights-Bicyclists.html [Accessed 10 March 2014]

Road Safety Authority 2014. *Provisional Review of Road Crashes July 31st 2014* [pdf] Available at: http://rsa.ie/Documents/Road%20Safety/Crash%20Stats/Provisional_Review_of_Road_Fatalities_July_31st.pdf [Accessed 7 August 2014]

Saunders, M., Lewis, P. and Thornhill, A. 2009. *Research Methods for Business Students,* Harlow: Pearson Education.

Science Gallery Dublin 2012. *Dynamic Dublin* [online] Available at: https://dublin.sciencegallery.com/hackthecity/dynamicdublin/ [Accessed 18 March 2014]

Short, J., and Caulfield, B. (2014) 'The safety challenge of increased cycling', *Transport Policy*, 33, 154-165.

Smarter Travel Workplaces 2014. [online] Available at: http://www.smartertravelworkplaces.ie/cycle-challenge/ [Accessed 30 May 2014]

Social Bicycles, 2013. *Learn how SoBi works* [online] Available at: http://socialbicycles.com/#how [Accessed 22 March 2014]

Superpedestrian 2013. *Superpedestrain - The Copenhagen Wheel* [online] Available at: https://www.superpedestrian.com [Accessed 22 March 2014]

Surveymonkey 2014. *SurveyMonkey: Free online survey software & questionnaire tool* [online] Available at: https://www.surveymonkey.com [Accessed 5 February 2014]

Tashakkori, A., and Teddlie, C. 1998. *Mixed methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, CA: Sage Publications.

Thepvilojanapong, N., Sugo, K., Namiki, Y., and Tobe, Y. (2011, September). 'Recognizing bicycling states with hmm based on accelerometer and magnetometer data'. In *SICE Annual Conference (SICE), 2011 Proceedings of* (pp. 831-832). IEEE.

Transport for Ireland 2014. *Dublin Cycle Planner* [online] Available at: http://www.journeyplanner.transportforireland.ie/cp/XSLT_TRIP_REQUEST2?language=en [Accessed 28 January 2014]

United Nations 2012. *United Nations E-Government Survey 2012* [online] Available at: http://unpan3.un.org/egovkb/datacenter/CountryView.aspx?ddl=1 [Accessed 24 March 2014]

White House 2009. *Open Government Initiative* [online] Available at: http://www.whitehouse.gov/open [Accessed 31 March 2014]

WillensLaw 2009. *Report Your Accident Willens Law Offices* [online] Available at http://www.willenslaw.com/report-your-accident [Accessed 1 March 2014]

Wireless Machine To Machine 2014. *Bike+ by WI-MM* [online] Available at: http://www.wi-mm.com/ [Accessed 22 March 2014]

Yin, R. K. 2009. *Case study research: Design and methods.* Thousand Oaks, CA: Sage

Appendices

Appendix A Survey Questions and Answers

Question 1 *Do you agree to the Terms and Conditions of completing this questionnaire?*

Answer Choices	Responses	
Yes, I agree	99.05%	417
No, I do not agree	0.95%	4
Total		421

Question 2 *Which most applies to you?*

Answer Choices	Responses	
I mainly use my own bicycle when cycling in the city	93.02%	360
I mainly use the 'dublinbikes' scheme when cycling in the city	6.98%	27
Total		**387**

Question 3 *What type of smartphone do you own?*

Answer Choices	Responses	
Android	47.95%	187
iPhone	37.18%	145
Blackberry	1.54%	6
Windows	2.82%	11
Other	1.28%	5
I don't own a smartphone	9.23%	36
Total		**390**

Question 4 *As an existing city cyclist, please rate the following concerns in terms of how important they are to you.*

	Not at all important	Somewhat important	Very important	Crucial	Total
Risk of bicycle theft	2.32% 9	20.62% 80	38.66% 150	38.40% 149	388
Poor quality or poorly designed bicycle lanes	0.78% 3	10.36% 40	38.34% 148	50.52% 195	386
Health risks from pollution	20.88% 81	46.91% 182	25.00% 97	7.22% 28	388
Risk of collision with cars/trucks/buses	0.52% 2	9.30% 36	29.20% 113	60.98% 236	387
Risk of collision with pedestrians	2.86% 11	31.43% 121	37.14% 143	28.57% 110	385
Lack of weather-proof parking facilities for bicycles	27.65% 107	47.03% 182	18.09% 70	7.24% 28	387
Delays due to traffic and/or pedestrian lights	27.39% 106	45.99% 178	19.90% 77	6.72% 26	387

Question 5 *How often do you use the following social media types?*

	Never	Rarely	Sometimes	Often	Always	Total
Social networking sites e.g. Facebook	15.17% 59	11.31% 44	14.14% 55	28.02% 109	31.36% 122	389
Content communities e.g. YouTube, Flickr	7.24% 28	17.83% 69	34.88% 135	31.27% 121	8.79% 34	387
Blogs e.g. WordPress	37.63% 146	34.79% 135	18.30% 71	7.22% 28	2.06% 8	388
Micro-blogging e.g. Twitter	42.34% 163	22.08% 85	16.10% 62	10.65% 41	8.83% 34	385
Collaborative/crowd-sourced platforms e.g. Wikipedia	10.42% 40	17.19% 66	35.42% 136	27.08% 104	9.90% 38	384
Forums e.g. boards.ie	16.58% 64	25.91% 100	30.31% 117	20.98% 81	6.22% 24	386
Instant messaging e.g. WhatsApp	32.99% 128	12.11% 47	14.95% 58	19.07% 74	20.88% 81	388

Question 6 *A perception in relation to Dublin city cycling is that some cyclists do not always adhere to the law/rules of the road. What do you think is the main motivation for this behaviour?*

Answer Choices	Responses
Traffic/pedestrian lights do not differentiate between cyclists and other road users	26.36% 102
Sharing road space with other traffic is too dangerous	20.67% 80
There is little or no chance of being caught by the Garda	22.22% 86
No harm is done to anyone	14.99% 58
Other (please specify)	15.76% 61
Total	387

Note: The full text of answers in the 'Other' category is contained in the document entitled 'Survey detailed answers.docx' on the CD included with this dissertation.

Question 7 *Which one of the following Information Systems do you think would be most useful in adding to the debate on the topic of cyclists and the law/rules of the road?*

Answer Choices	Responses
An online local authority forum where you could contribute to a discussion on cyclist behaviour and the law in relation to cycling	26.14% 92
A YouTube channel where you could upload video footage of bad or illegal cycling behaviour	7.39% 26
A local authority online forum on the design/redesign of cycling infrastructure	55.11% 194
A sensor on your bicycle that would measure waiting times at traffic lights	11.36% 40
Total	352

Question 8 *Bicycle theft has been shown to be on the increase in Dublin city. How many times have you had a bicycle stolen in the Dublin city area?*

Answer Choices	Responses	
Never	42.70%	158
Once	29.19%	108
Twice	15.95%	59
More than twice	12.16%	45
Total		370

Question 9 *Please rank the following technological solutions in terms of how valuable you think they would be for Dublin city cyclists (1 = most valuable, 4 = least valuable).*

	1	2	3	4	Total	Average Ranking
A smartphone App to rapidly alert other App users if your bicycle is stolen, supplying details of your bicycle make/model/photo and the location from which the bicycle was stolen	11.41% 42	17.39% 64	29.35% 108	41.85% 154	368	1.98
A facility to create an account for your bicycle on the local authority's web site that matches to a unique identifier to be engraved on your bicycle (so called Bike Passport)	21.74% 80	30.98% 114	30.16% 111	17.12% 63	368	2.57
A small GPS device concealed on your bicycle that indicates unexpected movement of the bicycle e.g. if it is stolen	36.96% 136	26.36% 97	22.83% 84	13.86% 51	368	2.86
Secure, covered bicycle parking with real-time info on whereabouts of free spaces	29.89% 110	25.27% 93	17.66% 65	27.17% 100	368	2.58

Question 10 *Government 2.0 can be described as citizens and authorities collaborating together using Web technologies for greater transparency and efficiency. Thinking about this in relation to Dublin city cycling, which statement below do you most agree with?*

Answer Choices	Responses	
The concerns of Dublin city cyclists CAN be addressed by collaboration between cyclists and the local authority using social media & technology	86.11%	310
The concerns of Dublin city cyclists CANNOT be addressed by collaboration between cyclists and the local authority using social media & technology.	10.83%	39
It is not the job of cyclists to address their concerns; it is the responsibility of the authorities only	3.06%	11
Total		360

Question 11 *Have you ever taken it upon yourself to report problems with public services e.g. litter, graffiti, road surface condition, public lighting etc. to the relevant authority?*

Answer Choices	Responses	
No, never	44.14%	162
Yes, once or twice	43.87%	161
Yes, on up to 5 occasions	7.63%	28
Yes, on more than 5 occasions	4.36%	16
Total		367

Question 12 *In terms of sharing information about Dublin city cycling, please rank the following online facilities in terms of how valuable you think they would be (1 = most valuable, 4 = least valuable).*

	1	2	3	4	Total	Average Ranking
An online self-service web site where you can pinpoint on a map faults and issues with the cycling infrastructure	**60.88%** 221	**24.79%** 90	**11.29%** 41	**3.03%** 11	363	3.44
A website where you can plot on a map starting point, finishing point, and streets cycled for your regular route to work/college	**12.67%** 46	**23.97%** 87	**31.68%** 115	**31.68%** 115	363	2.18
A review and rating website showing how safe/noisy/smooth individual Dublin city streets (or sections of streets) are for cycling on	**17.08%** 62	**39.67%** 144	**33.88%** 123	**9.37%** 34	363	2.64
A 'cycling embassy' website for cycling promotion and advocacy	**9.37%** 34	**11.57%** 42	**23.14%** 84	**55.92%** 203	363	1.74

Question 13 *What would be your main motivation to engage with the online platforms listed in the above question?*

Answer Choices	Responses	
To highlight problems and issues and get them resolved faster	**70.83%**	255
To share data with the authorities	**4.17%**	15
To participate in an online community that represents city cyclists	**12.22%**	44
To keep informed on cycling developments in the city	**12.78%**	46
Total		360

Question 14 *How do you feel about controllable environmental factors such as traffic noise and pollution levels and their relationship to the city cycling experience?*

Answer Choices	Responses	
I feel that these factors do affect my experience but I am not concerned about them	37.95%	137
I feel that these factors do affect my experience and I am concerned about them	43.21%	156
I feel that these factors don't affect my experience	18.84%	68
Total		361

Question 15 *Some existing technology initiatives in the area of environmental monitoring for cyclists require a device to be fitted to the wheel, or require the cyclist to interact with a smartphone App e.g. at journey start and journey end. How do you feel about volunteering to use these systems?*

Answer Choices	Responses	
I would be happy to participate for no direct reward	67.41%	242
I would be more likely to participate for some direct reward	15.04%	54
I would not participate	17.55%	63
Total		359

Question 16 *Do you have any ideas of your own for how Information Systems can improve the Dublin city cycling experience?*

Note: The full text of answers to this question is contained in the document entitled 'Survey detailed answers.docx' on the CD included with this dissertation.

Appendix B Interview Questions

Interview 1

Q1 Has your organization previously collected data/information on the concerns of, or issues facing, cyclists? If so, what methods were used to collect it?

Q2 Have Information Systems played a significant role in the data collection?

Q3 A very serious concern for urban cyclists seems to be the risk of collision with motorized traffic/pedestrians/other cyclists; in what ways do you think technology and Information Systems could be implemented to mitigate this risk?

Q4 Another important issue for urban cyclists seems to be that infrastructure such as traffic signals and flow systems are not geared adequately towards them. In what ways do you think Information Systems could be implemented to address this?

Q5 Smartphone initiatives seem to dominate Information Systems use in cycling. Are you aware of any (ITRN) research that used smartphones for research into cycling or other modes of transport?

Q6 Do social media applications play any part in aspects of the research carried out by your organisation, especially the collection of data?

Q7 One of your stated objectives is to inform transport policy; has crowd-sourcing of transport users' opinions using Web 2.0 platforms like Facebook/YouTube/forums/wikis played any role to date in this?

Q8 What do you think about transport users and government bodies collaborating or sharing information using Information Systems and Web 2.0?

Q9 Have you any thoughts on the motivation of citizens to participate in data gathering and sharing using the platforms described or the nature of the data collected?

Q10 Do you think research bodies (or cyclists themselves) could utilize open government data to improve life of the transport user, and if so in what ways?

Interview 2

Q1 Has your organisation previously collected data/information on the concerns of, or issues facing, cyclists?

Q2 Your organization has an active social media presence; has it previously crowd-sourced cyclists' comments and opinions on cycling issues using platforms like Facebook/YouTube/forums/wikis, and what positives and negatives do you see in these methods or the data collected?

Q3 My survey showed that 90% of cyclists own a smartphone. If you could input into the design of a Dublin Cycling Campaign App, what features do you think would be of most use to Dublin city cyclists?

Q4 Do you have any thoughts on the creation of an online database to register bicycles and/or cyclists and which could help address issues such as bicycle theft and breaking of the rules of the road?

Q5 My survey found that the most serious concerns for urban cyclists are the risk of collision with motorized traffic, and infrastructure such as traffic signals and flow systems not catering adequately for them. Do you think Information Systems could help in these areas?

Q6 The Campaign is arguably the most high profile cycling body in the Dublin area. Has it participated in any projects in conjunction with the local authorities, particularly ones that would make use of Information Systems? Do you see potential for such projects?

Q7 My survey results show that 68% of cyclists are happy to participate for no reward in initiatives that would require them to gather data e.g. by fitting a device to their bicycle. What do you think motivates cyclists to participate, and how would you encourage them to participate or engage?

Q8 Your organization has previously highlighted to cyclists the facility to report issues directly on the local authority's web portal. What do you think of this reporting functionality and how the portal in general could be enhanced to be of more use to the cyclist?

Q9 'Government 2.0' is about using Web 2.0 technologies (social media/YouTube/forums/wikis) to make government more open, collaborative and

participatory. Do you think your organization could send a stronger message to government using these platforms versus traditional lobbying methods?

Q10 Do you have any thoughts on how your organization could utilize open government data in its activities?

Interview 3

Q1. Has Cyclist.ie previously collected data/information on the concerns of, or issues facing, cyclists? If so, what methods were used to collect it; were cyclists contacted directly or how was the information sourced?

Q2. Has Cyclist.ie previously crowd-sourced cyclists' comments and opinions on cycling issues using platforms like Facebook/YouTube/forums/wikis, and what positives and negatives do you see in these methods or the data collected?

Q3. My survey showed that 90% of cyclists own a smartphone. If you could input into the design of a Cyclist.ie App, what features do you think would be of most use to Dublin city cyclists?

Q4. Do you have any thoughts on the creation of an online database to register bicycles and/or cyclists and which could help address issues such as bicycle theft and breaking of the rules of the road?

Q5. My survey found that the most serious concerns for urban cyclists are the risk of collision with motorized traffic, and infrastructure such as traffic signals and flow systems not catering adequately for them. Do you think technology and Information Systems could help in these areas?

Q6. Has Cyclist.ie participated in any projects in conjunction with the local authorities, particularly ones that would make use of technology and ICT? Do you see potential for such projects?

Q7. My survey results show that 68% of cyclists are happy to participate for no reward in initiatives that would require them to gather data e.g. by fitting a device to their bicycle. What do you think motivates cyclists to participate, and how would you encourage them to participate or engage?

Q8. 'Government 2.0' is about using Web 2.0 technologies (social media/YouTube/forums/wikis) to make government more open, collaborative and participatory. Do you think Cyclist.ie could send a stronger message to government using these platforms versus traditional lobbying methods?

Q9. Do you have any thoughts on how Cyclist.ie could utilize open government data in its activities?

Interview 4

Q1. Has DCC previously collected data/information on the concerns or issues facing cyclists and/or other road users and if so what methods were used to collect it? Were cyclists contacted directly and/or was ICT used?

Q2. What sort of information/data on Dublin city cycling do you see as most beneficial to DCC in managing the present and planning for the future?

Q3. Do you see Information Systems/technology as playing a significant role in enabling the collection of this data and has DCC any plans to implement anything in this area?

Q4. What do you think is the potential for collaborative projects in conjunction with the cycling community that might require you to equip cyclists with software or hardware sensors to collect data?

Q5. In general what would you see as the advantages and disadvantages of engaging and collaborating with a community such as cyclists on their issues and concerns using Web2.0 technologies (so-called 'Government 2.0')?

Interview 5

Q1. Has Dun Laoghaire-Rathdown County Council previously collected data/information from cyclists or about cycling, and if so what methods were used to collect it?

Q2. What sort of cycling data would be most beneficial to DLRCoCo in managing the present and planning for the future of cycling in its area?

Q3. Does the Council use Information Systems/technology/sensors in any way for its work in relation to cycling?

Q4. Does the Cycling section make much use of social media platforms such as Facebook/Twitter/Instagram, and Web2.0 such as YouTube/blogs/forums?

Q5. My survey results showed strong interest in a self-service portal for cyclists to report issues. What would you think would be the advantages and disadvantages of this from the Council's point-of-view?

Q6. What do you think about the idea of a national register of bicycles or cyclists – would this be a good thing from the Council's point-of-view?

Q7. In general what would you see as the advantages and disadvantages for the Council of engaging and collaborating with a community such as the cyclists using the platforms we have spoken about (so-called Government 2.0)?

Q8. In data held by government departments or public bodies that is of relevance to cycling easily accessible, or is it hard to obtain?

Appendix C Ethics Approval Documentation

TRINITY COLLEGE DUBLIN
INFORMATION SHEET FOR PARTICIPANTS

Researcher: Kieran O'Hare, School of Computer Science and Statistics, Trinity College Dublin.

Background of Research: Cycling numbers are increasing in Dublin city but there are issues that negatively affect the cycling experience. To date, Information Systems have not featured largely in collecting data on these issues or reporting them to parties responsible for the cycling infrastructure. This research project aims to explore how Information Systems can be used to collect useful data on these issues with a specific focus on how citizens and government can collaborate in their use.

Procedures of this study: This research will be conducted via an anonymous online survey of city cyclists.

Declarations of conflicts of interest: I, Kieran O'Hare declare that no conflicts of interest have been identified for the proposed research and procedure.

Participation: The time taken to complete the online survey will be no more than 10 minutes. Participation is voluntary. You may withdraw at any time and for any reason without penalty. You also have the right to omit individual responses without penalty.

All information collected through the online survey and published or presented thereafter is completely anonymous and is not traceable to respondents.

Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised.

TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM

Researcher: Kieran O'Hare, School of Computer Science and Statistics, Trinity College Dublin.

Background of Research: Cycling numbers are increasing in Dublin city but there are issues that negatively affect the cycling experience. To date, Information Systems have not featured largely in collecting data on these issues or reporting them to parties responsible for the cycling infrastructure. This research project aims to explore how Information Systems can be used to collect useful data on these issues with a specific focus on how citizens and government can collaborate in their use.

Procedures: This research will be conducted via an anonymous online survey of cyclists.

Publication: This dissertation is to be submitted to the School of Computer Science and Statistics of Trinity College Dublin in partial fulfillment of the requirements for the degree of Masters of Science in Management of Information Systems. Individual results will be aggregated anonymously and research reported on aggregate results.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHER CONTACT DETAILS: ohareki@tcd.ie
PARTICIPATION: If you wish to participate, click 'Next' below. If you do not wish to participate, click 'Exit this survey' at the upper right corner of your web browser. By clicking 'Next', you consent that you are willing to answer the questions in this survey.

TRINITY COLLEGE DUBLIN
INFORMATION SHEET FOR PARTICIPANTS

Researcher: Kieran O'Hare, School of Computer Science and Statistics, Trinity College Dublin.

Contact Details: ohareki@tcd.ie

This dissertation is to be submitted to the School of Computer Science and Statistics of Trinity College Dublin in partial fulfillment of the requirements for the degree of Masters of Science in Management of Information Systems.

Background of Research:

Cycling numbers are increasing in Dublin city but there are issues that negatively affect the cycling experience. To date, Information Systems have not featured largely in collecting data on these issues or reporting them to parties responsible for the cycling infrastructure. This research project aims to explore how Information Systems can be used to collect useful data on these issues with a specific focus on how citizens and government can collaborate in their use.

Procedures of this study:

This research will be conducted via short face-to-face interviews with key stakeholders in Dublin city cycling.

Declarations of conflicts of interest: I, Kieran O'Hare declare that no conflicts of interest have been identified for the proposed research and procedure.

Participation: You were selected to participate because as the Chair of the Irish Transport Research Network promoting transport teaching and research and informing policy, you can make a valuable contribution regarding research in the area of cycling, the requirements for sustainable transport, and how information systems may assist in this regard.

The time taken to participate in the interview will be no more than 20 minutes. Participation is voluntary and you may withdraw at any time and for any reason without penalty. You also have the right to omit individual responses without penalty. On request, participants will be debriefed at the end of their participation.

The interview will consist of a series of questions relating to the use of Information Systems and technology in city cycling with a focus on collaboration between citizens and government. The interview will be recorded on an audio recording device for transcription and analysis by the researcher. The participant may opt out of the recording at any time. No recordings will be made available to anyone other than the researcher and the recordings will not be replayed in any public presentation of research.

The anonymity of the participant will be preserved in analysis, publication and presentation of resulting data and findings. In the extremely unlikely event that illicit activity is reported I will be obliged to report it to appropriate authorities

TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM

Researcher: Kieran O'Hare, School of Computer Science and Statistics, Trinity College Dublin.

Background of Research: Cycling numbers are increasing in Dublin city but there are issues that negatively affect the cycling experience. To date, Information Systems have not featured largely in collecting data on these issues or reporting them to parties responsible for the cycling infrastructure. This research project aims to explore how Information Systems can be used to collect useful data on these issues with a specific focus on how citizens and government can collaborate in their use.

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- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE: DATE:

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.
RESEARCHER'S CONTACT DETAILS: ohareki@tcd.ie 0876771726