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Empowering citizens in the development of smart cities: The Cork case

Thesis presented by

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For the degree of

Doctor of Philosophy

University College Cork

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DECLARATION PAGE

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism.

Signature _____ Date _____

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ABSTRACT

Cities around the world are piloting combinations of technologies to develop smart cities. As an urban management and governance trend, the smart city idea has moved from concept to mainstream within the past decade. As end-users of public services, interactive subjects of physical systems, and generators of data and information, citizens/residents should also be key contributors of ideas for policy-making processes and co-creators of city solutions.

However, citizens/residents are not always empowered to engage in the development of smart city initiatives. Greater engagement, with timely input from citizens, can be achieved with the development of more efficient and effective mechanisms for the collection and analysis of stakeholders' feedback. Gaps around the involvement of citizens in all the steps of smart city initiatives have been identified as key challenges in successful scaling up of the smart city initiatives in pioneering cities

Using Cork City, the second largest city in the south-east of Ireland, this thesis establishes the key components and factors in how to effectively engage and empower local citizens in the development of smart city through the Cork Smart Gateway (CSG) initiative. Within the CSG, the researcher generated primary data sets to set up a baseline of Cork citizens/residents' participation practices and perceptions, digital skills and usage and awareness of the smart city projects and local infrastructure.

From city-wide surveys of inclusive citizen/resident groups, the baseline showed that (1) local citizens/residents (N=3600) value a shared and collaborative vision of their participation in public issues; they believe that they have positive impact on their city, but they don't have many opportunities to participate in the local decision-making. Other findings include (2) two-thirds of the citizens/residents volunteer in community and public activities and those who volunteered in the activities have high willingness to participate in smart city projects; (3) citizens/residents use and want to be contacted via email and mobile text message; and (4) hardware access (i.e. tablet or computer) is still a problem for both urban and rural areas, and the problem can be solved by better investment in public libraries and offices. The research also shows that (5) self-reported digital skills of urban residents are not as proficient as their peers in rural areas and the need for computer/tablet access is high in both areas.

A qualitative analysis of the research shows a strong awareness about challenges and solutions to address them among the movers and shakers of the city, including members of the CSG steering group. An experiment carried out during the data collection process shows that crowdsourcing could work as an instrument to activate people's participation in public good activities. This is replicable, cheaper than using professional services, and effective to engage and raise awareness among local people.

Overall, the findings provide Cork City leaders with empirical evidence to develop strategies and tools to stimulate, engage, and maintain citizen engagement in their smart city initiative. Besides the key factors, the research also uncovers some challenging issues around the engagement and empowerment of citizens/residents, some contradicting with the existing literature. The research contributes new learnings for empowering citizens/residents in the development of smart city – new ICT and technologies enabled contexts – while identifying areas for future research such as institutional requirements, data management, and citizens' data privacy and security for further research.

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LIST OF ABBREVIATIONS

CASP	Cork Area of Strategic Plan
CCC	Cork City Council
CCoC	Cork County Council
CorkCitiEngage	Cork Citizens' Engagement
CIT	Cork Institute of Technology
CSG	Cork Smart Gateway
CSO	Central Statistics Office
EU	European Union
EC	European Commission
GAA	Gaelic Athletic Association
ICT	Information Communication Technology
IERC	International Energy Research Centre
LCDC	Local Community Development Committee
LECP	Local Economic and Community Plan
LGRA	Local Government Reform Act
OECD	Organisation for Economic Cooperation and Development
RAPID	Revitalising Areas through Planing, Investment, and Development
PC	Personal Computer
PPN	Public Participation Network
SPSS	Statistical Package for Social Sciences
UCC	University College Cork
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization

Chapter 1

INTRODUCTION

1.1 The Thesis Introduction

Using Cork City, the second largest city in the south-east of Ireland, this thesis is looking at the urban management and governance trend that is known as Smart City. Cities around the world are piloting combinations of technologies to develop smart cities. As end-users of public services, interactive subjects of physical systems, and generators of data and information, citizens/residents should also be key contributors of ideas for policy-making processes and co-creators of city solutions.

However, citizens/residents are not always empowered to engage in the development of smart city initiatives. Greater engagement, with timely input from citizens, can be achieved with the development of more efficient and effective mechanisms for the collection and analysis of stakeholders' feedback. Gaps in the involvement of citizens in all the steps of smart city initiatives have been identified as key challenges in successful scaling up of the smart city initiatives in pioneering cities.

The analysis in this thesis identifies key components and factors to how to effectively engage and empower local citizens in the development of the smart city through Cork Smart Gateway (CSG) initiative. Within the CSG, the researcher generated primary data sets to set up a baseline of Cork citizens/residents participation practices and perceptions, digital skills, and usage and awareness of the smart city projects and local infrastructure.

The findings provide Cork City leaders with empirical evidence to develop strategies and tools to stimulate, engage, and maintain citizen engagement in their smart city initiative. Besides the key factors, the research also uncovers some challenging issues around engagement and empowerment of citizens/residents, some contradicting with the existing literature.

1.2 Background

Smart city as an urban development trend motivates cities around the world to take advantage of Information and Communication Technologies (ICT) and other key conditions to redesign cities to cope with new global challenges. Smart city uses ICT-enabled tools and solutions to boost economic activity, enhance the quality of life, and promote the protection of the environment and natural resources. It does so by collecting and analysing relevant data and providing authorities and citizens with relevant information and evidence to make

informed decisions regarding policies and daily life activities (Albino, Berardi, & Dangelico, 2015). With ICT as enablers, citizen engagement plays an important role in smart city projects (Degbelo *et al.,* 2016; Pham, 2014). However, citizens and other stakeholders are not always fully empowered to engage in the planning and development of their cities. While greater engagement and improved outcomes could be achieved with timely inputs from citizens, the development of more efficient, cost-effective and inclusive mechanisms for the collection and analysis of stakeholder feedback are required. Especially, citizens today are using mobile phones and smart devices on unprecedented scales and instances.

Within less than a decade, smart city has gone from concept to mainstream. Cities around the world are ever increasingly piloting new technologies to improve the effectiveness and efficiencies of the physical infrastructures in the cities such as transport and traffic systems, waste management, water management, and public lighting systems, among others. ICT tools, sensors, actuators, mobile phones, global positioning systems, and other technologies are providing data for new management platforms, informing authorities, businesses, and citizens with relevant information for informed daily decisions from travel planning to city parking, from new businesses to new services.

Cities also have other important structures of economic and social environments (Lynn, 1994). At the heart of all these physical, economic, and social environments, citizens are the key stakeholders as end-users of the public services, interactive subjects of the physical systems, generators of data and information, and contributors of ideas and policy-making processes. There is currently untapped potential within citizens that has not been proactively pursued within the context of planning and developing smart city initiatives. Involving citizens in all the steps of smart city initiatives has been identified as a key challenge in the successful scale-up of the smart city initiatives in the pioneering cities in America and Europe (Degbelo *et al.,* 2016). Thereby, it is important to identify key factors for ensuring meaningful engagement and involvement in smart city projects of major sectors of society – public bodies, private business, academic institutions, and citizens – in consultation, feedback, decision-making, and implementing projects. This is mentioned in a new smart city model: the quadruple helix-model. Within the quadruple helix-model, a fourth helix is added to the traditional triple helix-model: besides industry, universities and public authorities, citizens or end-users are also deeply involved as important stakeholders in the innovation process (Schuurman *et al.,* 2012).

Technically, a city is a superordinate complex system of systems. For practical purposes, a sustainable city is categorised as one with the people in the centre surrounded by three major interlinked social, economic, and physical environments. A smart and sustainable city has the people in the centre with the three major environments, which are being continuously informed by smart digital technologies to create integrated smart city solutions.

During recent years, smart city solutions have been focusing on the application of technologies (i.e. sensors, actuators, ICT enabled monitoring systems…) in the physical environment and mostly at their own silo systems (Figure 1.1). This approach is being characterised by city, technology research communities, and city solution providers as 'the early stage' of smart city development. The first wave also includes living labs where real small scale and mostly silo physical systems are instrumented with sensors and other tools to generate data for analytic purposes. These living labs are driven by technology giants to test combinations of technology components so they can generate software and monitoring products. There is little investment in research and development of core technologies in these experiments (Townsend, 2014). It is also evident that the drivers of this approach make decisions about technology, business and governance models with limited inputs from other impacted stakeholders including citizens. However, despite some criticism and initial shortcomings, evidence from initial evaluations by the European Commission (EC) shows that smart city solutions, including those tested in the living labs, result in positive gains in physical systems' efficiency and improved quality of life for people.

The EC assessments also find, however, that there are numerous conditions, including the vision of the city, the people inhabiting it, and the processes by which successful deployment of smart city programmes and initiatives are established and maintained, that may well be significant in achieving all the benefits smart city initiatives may bring about. The people (social) component, especially citizen/resident engagement, is one of the most critical conditions for the effective operation of all smart city programmes/initiatives because citizens/residents are end-users and demand generators of the smart city solutions, and they can be co-producers, and co-creators of locally generated solutions. This is a workable approach and one of the ways forward in the development of smart cities as the EU and other researchers believe (Townsend, 2014; Schuurman *et al.,* 2012; Harding, 2015). Especially, Townsend (2014) argues that "smart cities could also evolve from the bottom

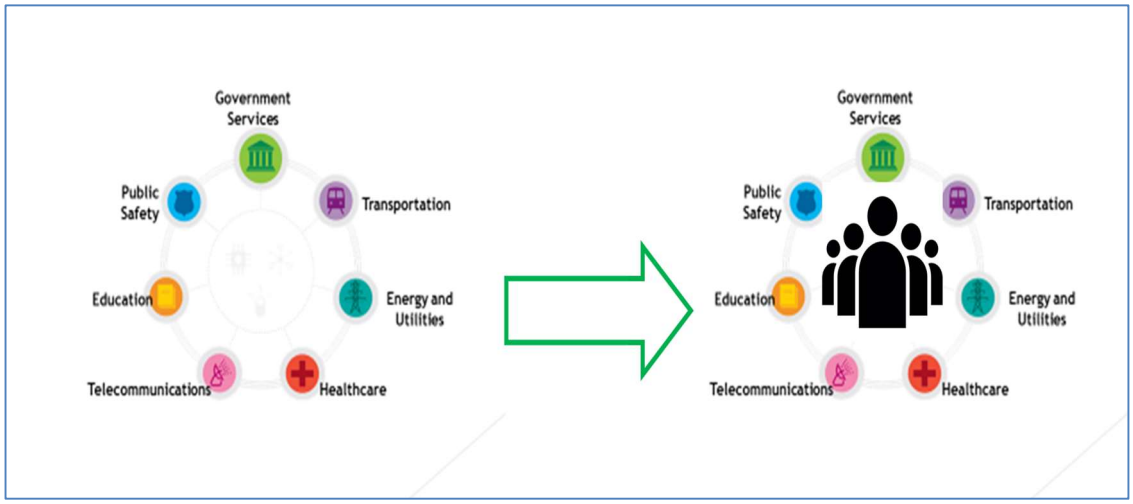
up, if we let them. Both the evolution of the Internet, and the history of city planning, shows us that."

Figure 1.1. The first wave of smart cities focuses on the instrumentation stage of silo physical systems. Those in the red boxes are the most invested systems during the first wave. Source: Self-generated illustration from smart city literature.

The involvement and participation of citizens/residents become a key topic in the research and practice of smart city when scholars and policy makers identify that only with a strong involvement of local citizens should the smart cities be successful. By acknowledging that, there is a need for research on effective strategies for mobilising citizen participation and collectively using their intelligence together with others from business and societal societies (Schaffers, Kominos, and Pallot, 2012). Ideas for the involvement of people into early stages of development of smart cities are not new. They inherit the principles from earlier city development trends such as digital cities, intelligent cities, and ubiquitous cities. They are all used to address the long term but challenging desire to develop sustainable and participatory citizen communities that integrate the mutual shaping perspective between society and communication technologies (Lievrouw, 2006). With smart cities, it holds stronger and wider potential than just the interaction with communication technologies. Townsend (2014) argues that "We have seen that putting the needs of citizens first isn't only a more just way to build cities. It is also a way to craft better technology, and do so faster and more frugally. And giving people a role in the process will ultimately lead to greater

success in tackling thorny urban problems and greater acceptance of the solutions smart cities will offer." Such schools of thoughts pay a solid ground for the smart city concept to move from the first wave into a more inclusive and people centric model presented in the Figure 1.2.

Figure 1.2. An ideal smart city system should place people at the centre. All technologies, processes, and city systems including the local governments should enable and empower people to interact with them with feedback loops. The interactive collaboration will harness collective tangible and intangible resources to move the cities forward and improve quality of life for all people. Source: self-illustrated from literature.



1.3 Research Justification

Cities are facing series of challenges such as aging infrastructures and shrinking financial resources, especially after the global economic downturn since 2008. They are competing against mega cities – cities with tens of millions of people – to attract both inward and outward investments, to revitalise local economies. Meanwhile, their responsibilities in delivering public services are on the rise due to growing population in urban areas and in other cases as results of amalgamations (Teles, 2014) and centralisations. Furthermore, the physical infrastructure systems in cities are ageing rapidly, especially in the post-2008 economic recession due to inadequate investment in repairs and maintenance. Economically, cities are struggling to support local businesses to grow and this, in return, is putting cities in the downward spiral because of the limited revenues generated from businesses. Socially, cities are being criticised by their own citizens/residents for the limited quantity and quality of public services to the local people. People are growing distant from local communities and local affairs. They become more and more disconnected from local

authorities, thus, frustration and distrust grow larger (Copus, 2003). Cities have to cope with all of the challenges even when some of the issues are out of cities' authority to resolve. As the results, city governments, as the closest level of local governments to the people for their daily demands, take most of the blame.

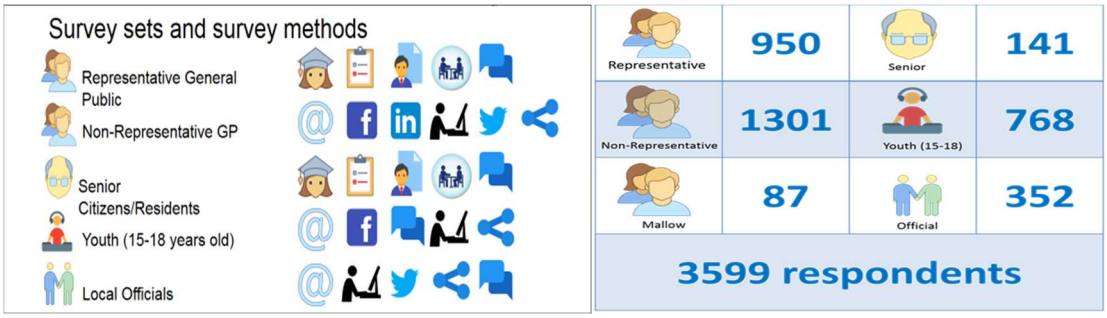
Against these backdrops, the revolution of sensing technologies, ICT tools and solutions emerges as important conditions and contexts for cities to innovate and to cope with physical, social, and economic challenges. Smart city arises as a new strategy context that utilises the emergence of technologies in combination with existing conditions and resources of cities. Smart city promises new ways for cities to improve efficiency and effectiveness of the physical infrastructure systems, governance systems, and tools to promote stronger involvement of stakeholders via public participation. As mentioned above, while initial results show some positive outcomes, policy makers, city leaders and researchers realise the challenge of how to effectively engage and empower citizens/residents to successfully develop smart cities together. Furthermore, research about smart city from technology adoptions grew really quickly from 2009 but there is very limited research about how to effectively engage with people, what are the motivations for the people to participate in local affairs, how people get information and communicate these days, what interests them and how their interest sustains within the smart city contexts. Especially, empirical research into the nature and characteristics of the citizen engagement and participation remains scarce (Schuurman *et al.,* 2012).

Meanwhile, the development of smart cities increasingly attracts larger attention of cities, intergovernmental organisations, national governments, corporations, and research communities. Cork is joining the trend, which moves into mainstream of current affairs in less than a decade. Since January 2014, Cork City Council (CCC) and Cork County Council (CCoC) have been collaborating with research partners to form the Cork Smart Gateway (CSG), a variation of the smart city concept adoption in an area covering the Cork city boundary and its extended areas. The researcher was invited to lead the collaboration from the International Energy Research Centre in University College Cork with the CSG to exploring the citizens/residents engagement challenges.

The researcher gauged the literature, planned, developed and implemented a data collection project for Cork, the CorkCitiEngage, which is the short name for the Cork Smart Gateway Citizen Engagement. The CorkCitiEngage project, as a collaborative project, demonstrates

the collaborative character of successful smart city projects (Schuurman *et al.,* 2012). The CorkCitiEngage project focused on three major categories of ***public participation in public issues, digital skills, and key public infrastructure access and usage***. The categories were selected for measurement as they are associated with smart city key characteristics (Alawadhi *et al.,* 2012; Giffinger *et al.,* 2007) and to align with the specific objectives of the CSG initiative. The surveys were the first step to define where Cork's citizens/residents with their perceptions, practices and willingness are in public participation. By setting up a baseline with the collected data, CSG can identify the key factors and evidence, which this research also captures. Next, this research analyses the views of the CSG leaders to verify their perceptions and understandings about Cork's baseline and challenges, and to evaluate the leaders' solutions to overcome the challenges in leading the CSG forward. Overall, by outlining the key components from both quantitative and qualitative analyses, the research enables Cork to be clearer on its route to a successful engaged, empowered and involved local citizens/residents in the smart city initiatives. Figure 1.3 shows all the surveys that were designed and implemented in Cork. The collected respondents were the primarily generated data that are used for all analyses within the scope of this thesis.

Figure 1.3. Survey methods used and the number of respondents in each and totals.



1.4 Aims of the research

Citizen engagement is a big challenge for cities to successfully adopt and develop smart city programmes and initiatives. This is a practical challenge. Citizen engagement has been researched intensively under topics such as public participation, political participation, civic engagement and others. However, the emergence of the smart city concept, which highlights the collaboration potentials of all stakeholders – including citizens; and the use of technologies – including the ICT platforms and tools, opens up new dimensions and contexts for a better understanding of how local governments can enhance citizen participation in

public issues. This makes the citizen engagement in smart cities a new area of academic research.

Therefore, the aims of this research, based on a case study with embedded quantitative and qualitative analysis, are threefold:

1. Tackling the challenges of citizen engagement in smart cities by identifying key factors and conditions that enable and empower citizens to become involved early in these programmes.
2. Providing evidence and practical lessons for cities, especially those small and medium size cities in Europe, to innovatively applying in the processes of building smart cities.
3. Contributing to the current academic discourse of how citizen engagement has been shifting in a new context of more open collaboration and ICT-enabled platforms and tools. In other words, this research is an effort to enrich the limited empirical evidence on the nature and characteristics of citizen engagement and participation in smart cities. Particularly, the research attempts to provide a better understanding of aspects regarding digital collaboration with citizens, how to facilitate the collaboration, and how to optimise citizen participation. These are essential aspects to develop smart cities (Schuurman *et al.,* 2012).

Largely, citizen engagement and participation is crucial for democratic systems, especially at local levels (Teles, 2012; Copus and Erlingsson, 2013; Sweeting and Copus, 2013; Fung and Wright, 2001; and Fung, 2006). In the new context of smart cities, citizen engagement and participation can help to reboot local democracy if it is positioned, designed, and implemented with a mixture of bottom-up and top-down approaches. This approach may gradually narrow the growing disconnection and distrust between citizens/residents and their governments. The effective and sustainable citizen participation, therefore, can bring ordinary people back to the common discourses, helping them to feel less marginalised. By being empowered and having a better understanding of the complexity of developing and governing cities through citizen participation, people could have a better understanding of the negative impacts of the recently emerging trends of nationalism and populism damaging to the democratic systems.

1.5 Research Objectives

The research is set to be a highly practical exploration because it is associated with an actual strategy being developed and implemented by a medium size European city, Cork. Therefore, research objectives are set to address the real challenges facing the city. Besides, the objectives are also crystallising learnings about strategies, processes, tactics, and instruments of citizen engagement and participation. The learnings can contribute to the theories and literature of citizen participation in the development of smart cities, with understandings of a few aspects of citizen engagement and digital participation. The objectives are:

- Set up a baseline about public participation, digital skills, access and usage of public infrastructure for Cork Smart Gateway.
- Establish key digital divide challenges facing CSG in between rural and urban areas.
- Identify key characteristics in public participation, digital skills, access and usage of public infrastructure of the youth.
- Explore awareness, perception and readiness of leaders of the CSG to determine their ways forward in driving citizen engagement and participation using smart city initiatives.
- Experiment crowdsourcing technique in the collection of public data at large scale.

These objectives aim at responding to the overarching research question of this study, whilst, the findings and outcomes of those objectives can also help to foster digital participation, an important aspect of citizen engagement in smart cities.

1.6 Thesis Structure

The thesis starts with an introduction in Chapter 1 and is followed in Chapter 2 by an intensive literature review of three interrelated topics: smart city, local government, and citizen engagement. Smart city is developed and refined from various branded types of cities. The review of smart city includes key parts of city development throughout recent centuries, its roles, functions, and the adoption of technologies in the city development. The smart city review also consists of the most recent development of the new trend, its characters, critiques, challenges, and the way forward. From the review, it will be clear that there is no agreed definition of what smart city is. However, scholars and practitioners seem

to agree that ICT plays an important role in the development of smart cities, and this research follows the idea that smart city is not a target destination. The development of smart city is a journey and ICT tools enable cities to utilise and gather collective resources to serve the common cause of building cities that can provide good quality of life for its citizens while developing their economies sustainably.

Cities are the closest governmental system to the people for daily interactions and engagement demands. Therefore, a thorough review of local governments (i.e. city, county, and/or municipal governments) brings about the roles, the functions, and the challenges facing them in the past two decades. The economic crisis, globalisation, and growing competition nationally and regionally provide context and insights on innovations and choices that local governments have to make. One of the key challenges is the budget constraints forcing local government to seek ways to cope with increasing demand for public services. They adopt new management styles from the private sector to increase their efficiency, effectiveness, and public trust. They seek ways to collaborate with citizens/residents and other stakeholders. Local governments also adopted technologies in their transformations in governance, management, and development of the cities. The review also highlights one of many challenges facing the local government: bridging the digital divide between rural and urban areas in order to maximize the participation, access, and benefit from public services and issues for all population that the local governments are responsible for.

The review of citizen engagement and participation provides insights on the reasons why the trend has been in the spotlight recently. Like any other topics, citizen participation has its ups and downs with pulls and pushes from governments and citizens. Technologies, especially ICT tools play an important role in facilitating and/or shifting the topics toward interesting directions. Within citizen engagement and participation, there are hard-to-reach groups of population and the review provide a brief understanding about how these groups have been reached by the governments and other public authorities and organisations. And of course, there are demographical factors that have been long proven as the keys to citizen engagement and participation. However, they may shift and differ when technologies are applied.

Chapter 3 presents justifications of the applied methodologies in this research. It includes the overall research question, which sets the scope for the five specific questions that this

thesis is trying to address. Employed methods, samplings, data and analysis techniques for each of the research questions are presented.

Chapter 4 sets out Cork as the case study of this research. The chapter opens with a review of Cork profile including an overview of demographical, economic and social context of the city and its impacted areas. Policy context, the organisation of local authorities, the 2014 Local Government Reform Act set the legal background for Cork, especially in relation to citizen engagement and participation. The introduction about Smart Gateway is then followed by the formation of its subproject of CorkCitiEngage. CorkCitiEngage is the source of primary data to be analysed in this research. The chapter re-presents the overarching research question and its specific research questions with justifications for them to address the overarching question. Each of the specific research questions employs different statistical analysis with their own data profiles. All of the analyses and tactics is explained in details so that a systematic approach can be formed and followed. The chapter concludes with a summary that also includes some practical considerations about why those methods were used.

Chapter 5 presents research findings for each of the specific questions. The three quantitative questions report the baseline, key factors, and findings in the topics of public participation perception and practice, digital skills and access and usage of public infrastructure. The two qualitative questions report leaders' views and the results of crowdsourcing as the tested instrument that can be utilised in the generation of solutions for public issues. A summary section completes the chapter.

Chapter 6 presents analysis and conclusions of the overall research. All of the questions are discussed with relevant literature and contexts of the topics and current developments. The overarching question is answered by the combinations of findings from the specific questions. The very last section of the chapter puts forward a few points regarding contributions, limitations, and recommendations for further studies. The last sections of the research also include references used throughout the thesis while appendices incorporate all related instruments and procedures used to carry out both quantitative and qualitative data collection processes. Sets of questionnaires are included to show how the data were curated, collected, and validated within each of the surveys. The CorkCitiEngage full report is added for fuller quantitative analyses, thus providing a more holistic baseline of Cork Smart Gateway.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

Chapter 2 evaluates theoretical frameworks and literature of the three related areas: smart city, local government, and citizen engagement including deliberative democracy at local levels. Despite an effort to categorise those key themes related to the central question of effective citizens/residents engagement in the context of building smart cities, the literature will see overlapping arguments and intertwine issues. When the citizens/residents take action of engagement, participation and involvement in political, civic, or public issues, they have to interact with authorities, who are on the other side of the interaction. The interactions are based on legal grounds, communications methods, cultural norms and practices, and the specific characters of the people from both sides. All of the related topics appear to be interrelated and complex. Therefore, as an effort to frame topics that directly related to this research, the reviewed literature will discuss those that set a context for this research.

The chapter starts with an examination of the concept of 'smart city'. It presents definitions, concepts, and terminologies of smart city, from both academic works and current practices of pioneer cities. Contemporary research in the smart city section assesses academic research and policy works especially in North America, Europe and Asia as well as elsewhere. The reviews also include a comprehensive development of a city in historical views; modern development, state of the art stages; and apparent gaps in those areas. The smart city review highlights some learnings that make it the newest trend for cities to adopt and promote.

The second part of the chapter is about local government. Depending on context and structure of governmental systems in different countries, local governments are usually the closest level of government to citizens and residents. Local governments include city governments, where smart city can provide context that envelops almost all administrative operations and democratic propositions. However, local governments faced series of challenges including budget cuts, reduced revenues, and rising public service demands, lower public trust, and urges for reforms and innovations. They utilise different mechanisms to deal with the challenges and those mechanisms, including co-production and crowdsourcing, is reviewed with their drivers, conditions, and key features. The local governments also have to provide services to the regional areas outside their own city boundaries therefore, they also have to deal with rural and urban differences. Since smart cities also incorporate the application of digital tools, consequently, digital divide become

one of the key subjects that local governments have to find solutions for in order to successfully adopt the smart city concept in their city development.

The review of citizen engagement and participation examines a series of topics that relate to the key characteristics of smart cities and local government. The analysis demonstrates its theories, practices, and possibilities while rationales, characteristics, conditions, and tools of the citizen engagement and participation are investigated to identify trends, challenges, and the way forward. Also in the context of smart city, ICT tools provide important venues and newer methods for the topics, yet, they too have their own challenges and gaps in both research and practice in the past few decades of development and application. The lessons from related literature expose those variances that SC may be able to tackle. SC places the importance of ICT tools as enablers for citizen engagement and participation. One of the most proficient groups of population in using ICT tools is the youth. They are also the hard-to-reach group when it comes to engaging and involving in public issues. However, within the context of SC, their active participation becomes fundamental because of their roles as future workforces, owners of cities, creators of local solutions, and much more. The analyses of the youth's participation offer insights on what worked, what did not work, how they are different from other groups and how they could be involved in public issues? These determine the needs for a particular consideration in engaging and involving them, especially in the processes of developing smart cities.

A summary of the chapter concludes the literature review, identifying research opportunity for this study and its framework.

2.2 The Smart City Concept

2.2.1 Development of the concept of 'Smart city'

The concept of 'smart city' has been emerging since the second half of the 2000s as a global movement that offers great potential for cities to improve the quality of life for residents, to promote economic competitiveness, and to stimulate sustainable growth. In a first wave, pioneering cities have adopted various advanced digital and other technologies to address urban challenges such as traffic and transport management, waste management, energy and distribution grids, water management, and buildings.

Motivations for these pioneering cities come from increasing urban challenges and threats such as population growth, aging infrastructures, scarcity in natural and financial resources, and climate change. For instance, a group of cities known as the C40 cities have established innovative programmes to solve their pressing challenges regarding the reduction of greenhouse gas emissions and who share the lessons they have learned across their network.

Among the C40 cities, Amsterdam, Barcelona, Boston, Rio de Janeiro, and Stockholm are the first cities to also deploy smart city programmes, and are globally recognised for their initial successes. In Europe, Amsterdam started its journey toward becoming a smart city in 2009; Barcelona launched the first smart city project in 2010; whilst Stockholm invested in e-services as the foundation for smart city programmes in 2007. Across the Americas, Rio de Janeiro set up a smart city operation centre in 2010, using real data feeds from all data sources including cameras, sensors, actuators and vehicles' global positioning systems (GPS). Boston launched its first CRM system (citizen/constituent relations management, a modified adoption from commercial usage of client relations management) in 2008 after nearly two years of development (Pham, 2014). Singapore is the first to adopt smart city concepts in South East Asia and it began its smart city journey with an ambitious information technology plan in the late 1990s (Mahizhnan, 1999).

The emerging trends in, and discoveries by, cities deploying smart city programmes motivates both academic research and policy institutions to keep revisiting the smart city concept, which was first mentioned in the form "smart community" in 1997 (Eger, 2000). And now policy institutions, such as the European Commission, have begun to publish their own research to provide background information and advice on how these smart city programmes perform (Manville *et al.,* 2014).

For the purpose of this study, which is concerned especially with academic research about the smart city, the observation by, Marsal-Llacuna *el al.* (2014) that, despite earlier smart city development recorded in the literature, the smart city concept only became widely known after 2009, has been used as the starting date for the starting point of the definitive literature survey.

Quantitatively, academic research about the smart city was originally and not surprisingly very limited. Less than five articles appeared annually during the 2000's, before the number jumped in 2010 and subsequently. An analysis of two popular academic databases

(ScienceDirect and Academic Search Complete) shows that the number of academic research papers on the smart city has doubled annually since 2011, reaching 311 in 2014 (ScienceDirect). The same pace is recorded in Academic Search Completed, with 31 publications in 2013 doubling to 64 papers in 2014.

Publishers of the papers vary from computational science journals, such as *Procedia Computer Science* and *The Institute of Electrical and Electronics Engineers'* journal family, to social science journals including *Innovation: the European Journal of Social Sciences* and *Government Information Quarterly*. The majority of the papers are published by the information sciences journals, focusing strongly on advanced technology adoptions, technology models, and technology roadmaps in smart city programmes or initiatives.

The strong focus on technology is found in a number of researches, of which Alawadhi *et al.* (2012) and Chourabi *et al.* (2012) are particular examples. However, smart city encompasses more dimensions than just technology (Nam and Pardo, 2011; Angelidou, 2014; Neirotti *et al.,* 2014; Caragliu *et al.,* 2011; Hollands, 2008; Athopoulos and Tougountzoglou, 2012; Kominos, 2009; Lind, 2012; Aurigi, 2006; Schuurman *et al.,* 2012; Chourabi *et al.,* 2012).

Examples of researchers taking a more sociological perspective include Hollands (2008), Glaeser and Berry (2006), Chourabi *et al.* (2012), who identify that the human dimension and social capital are very important for the development of smart cities. Bria (2012) indicates that human-centred approaches in dealing with urban challenges are an indispensable aspect of smart city development. Such research emphasises the requirement that smart cities should put technology at the service of their residents and not the other way around.

Despite the academic dissension in the attempts to set initial frameworks for actionable smart city development (Alawadhi *et al.,* 2012; Chourabi *et al.,* 2012), it is agreed among researchers that a definitive statement of what a smart city is is a work in progress, with various concepts introduced and analysed over the past five years. The balance of the debate revolves around whether technologies or human processes are the main focus of enquiry, especially information and communication technologies, to build and integrate critical infrastructures and services of a city (Nam and Pardo, 2011; Alawadhi *et al.,* 2012; Neirotti el al., 2014; Angelidou, 2014).

2.2.2 Definitions and concepts of smart cities

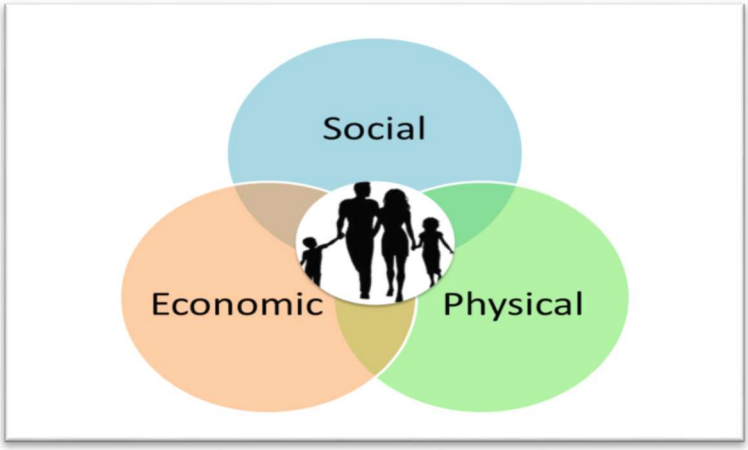
Since there is no universally agreed definition of what constitutes a smart city, it is useful to look back at the roles of cities and their development over the past century with a particular perspective on the adoption of technologies. Observations on various cities' historical development will lay the ground for a deeper understanding of the evolution towards smart city concepts, models, and practices. That evolution will set a context for modern current working definitions of 'the smart city'.

2.2.2.1 Roles of cities

Every city comprises social, economic, and physical (both natural and manmade) environments (Gospodini, 2010) and is visualised in the Figure 2.1. The manmade physical environment includes complex systems for sanitation, utilities, land usage, housing, and transportation. Cities usually incorporate and are surrounded by the natural environment (Lees and Lees, 2007) which includes rivers, beaches, mountains, hills, lakes, forests, plants trees, wetlands, bush lands, parklands, waterways, wildlife, and air.

Together, the physical environment provides a habitat for humans to interact. With increasing population density, the inhabitants continue to extend their social and economic environments. Whilst in the literature the physical environment is considered as hard infrastructure, the social and economic environments are considered as the soft infrastructure of cities (Angelidou, 2014; Eger, 2003; Paquet, 2001).

Figure 2.1. Three environments of a city



Source: Ideas from Gospodini, 2010, author's illustration.

The physical environment of cities falls into the research, professional and environmental fields of urban designs, urban planning, urban development policies and the like. In the past two centuries, the investment in and quality of the physical environment has been seen as key outcomes of the economic development of cities (Gospodini, 2002). In consequence the economic environment of cities has been a major focus in research.

In reality, however, all cities are multifunctional. Their size and dynamism derive from the many ways in which they operate within economic, political, social and cultural networks. They are simultaneously markets, service centres, and site of production. Cities are the sites of institutions that attract resources, people, goods, and information from near and far (Lees and Lees, 2007). Cities' economic functions also include financial services and a wide variety of exchange sites for establishing all kinds of trading links (Lees and Lees, 2007).

Cities also need administrative systems and local governments to provide services and facilitate the meeting of the various needs of their residents. Employment in these systems includes those in legal, military, and bureaucratic centres and in courts, jails, tax offices and policing. For cities to thrive they require strong economic bases (Lees and Lees 2007).

The American economist and ecologist Jane Jacobs has argued for a view that suggests that cities' economies have five great forces of development: city markets for new and different imports, absolute increase of city jobs, technology for increasing production and productivity, transforming city works and city-generated capitals, (Jacobs, 1984: 47): and that all five are important for economists to observe not only for getting a grip on the reality of urban life but also are of the essence where practical attempts to reshape economic life are concerned.

Cities are also especially good at generating wealth and especially skilful at some kinds of production and services, she observes (Jacobs, 1984: 193). However, that is not, in her view, why cities are uniquely necessary to economic life. Their vital functions are to serve as primary developers and primary expanders of economic life. For the cities to fulfil those functions they require regular inputs from human insights and human capacity to adapt while mitigating the adverse effects of constant changes. She then goes on to defend the role of cities in providing contexts in which those inputs can be successfully injected into everyday economic life. She sees cities as open-ended types of economies in which our human, open-ended capacities are able to create new things, bringing them into real life.

Sharing a view as to the importance of city economies, Glaeser (2011) also argues that city density provides a vibrant route from poverty to prosperity. He points out that the great prosperity of London, Tokyo and Bangalore comes from their ability to produce new thinking, reflecting human progress. And cities are great environments for new ideas, inventions, and innovations because cities are the absence of physical space between people and companies. Cities have density, proximity and closeness and their success depends on creating and satisfying a demand for physical connections.

Glaeser (2011) suggests that cities in the developed world (Europe and North America) expanded innovation by connecting their smart residents to each other. In the developing world, he observes, cities have the especially vital role of being gateways between markets and cultures. Similar to the developed world, cities in the developing world are also places for innovations that are spread from person to person across crowded streets. So cities depend on their ability to innovate in high density circumstances.

Still stressing the importance of the economic environment in cities, Glaeser (2011) also found that successful cities attract smart entrepreneurs and together they make up urban populations. For Glaeser (2011) urban centres are defined by the fluid and flesh of citizens rather than by concrete buildings.

Rising from the juncture social and economic activity, cities have always been the most effective way of transferring knowledge between civilisations because they are tools for reducing the complex communication of human capital. Echoing Jacobs (1984) in the role of the city in education and training, Glaeser (2011) notes that skilled people are better at adapting to new circumstances and, like people, skilled cities also seem to be better at reinventing themselves at crossroads.

However, cities are not only of the rich but they are also of the poor (Jacobs, 1984; Hall and Pfeiffer, 2000; Glaeser, 2011). Cities do not make the people poor but they attract poor people because of advantages the poor people could not find in their previous homes (Glaeser, 2011). This is where public policies come in to alleviate the cost of social and economic disparity, which is an issue for the social environment resulting from the interaction of people within the physical, economic and social environment of the city itself.

Through the physical infrastructure and provision of public services, an effective and capable city government can provide clean water, safe neighbourhoods, good schools, and

streets for fast-moving traffic. The public policies enforced by city government in these areas can focus on helping poor people, not poor places (Glaeser, 2011), and cities should be judged not by their poverty but by their track record in helping poorer people move up.

City culture and life styles are also a part of the social environment and cities offer spaces and venues for people to gather and enjoy themselves. Urban amenities help determine a city's success. Glaeser (2011) pinpoints the fact that that talent is mobile and it seeks out good places to consume and produce. Cities have been cross-continental channels for food and drink, creating a variety of living styles and enriching cultural diversity. They are also great places for single people because urban density increases the odds of meeting a prospective partner. The same logic that pulls workers and firms together in dense areas pulls men and women together in cities. People living in cities can connect with a broader range of friends whose interests are well matched with their own (Glaeser, 2011). Their interactions create numerous groups that continue to attract the like-minded as fellows, with the possibility of not necessarily limiting themselves in one or two areas of interest such as hobbies but also in creating business opportunities.

Glaeser (2011) claims that smart, entrepreneurial people are the ultimate source of a city's economic power: and that as these people become more prosperous they care more about their quality of life. They will look for cities with safe and flowing streets, good schools for their children and abundant activities and amenities for both business and personal leisure.

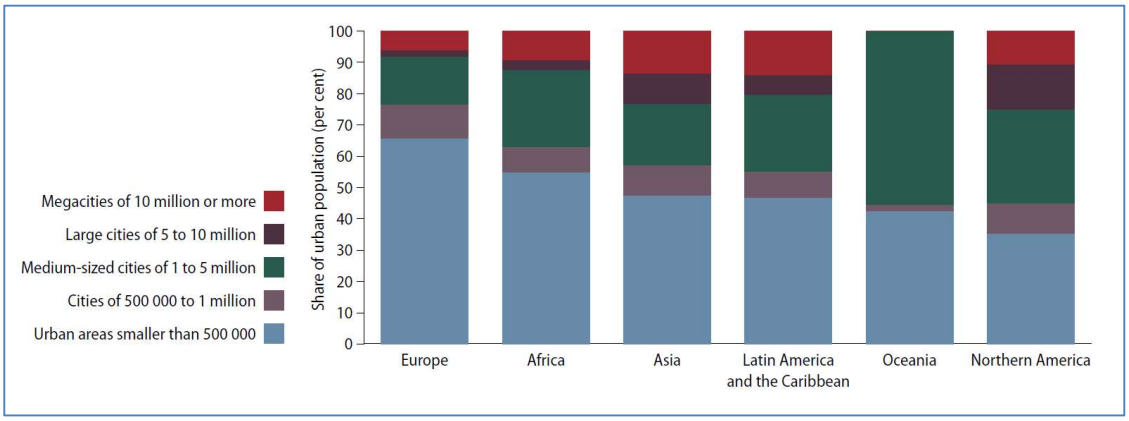
While the multifunctional role of cities can be seen to be operating in the three domains - the physical, social and economic – it is clear that those environments are for, created by, and exist with and through the continuous involvement of city residents. Therefore, the environments are not truly separated; they are interconnected, intertwined and interdependent to make cities thrive and vice versa.

2.2.2.2 Development of cities

The 20th century witnessed many milestones including the two World Wars, the invention of information and communications technology (ICT), globalisation, and rapid population growth. Cities have both benefited from and been affected by all those major milestones. By 2007 cities had become home for 50% of the world's population; and by 2050 they are expected to be home for two thirds of the whole world's population (UN, 2014). Figure 2.2

demonstrates that Europe has the highest share of small urban areas (less than 500,000) among all continents.

Figure 2.2. Population distribution by city sizes across main continents in 2014



Source: World Urbanisation Prospect, UN, 2014.

Cities went through great changes in 20th century, especially as industrial buildings adopted the widespread use of structural steel and reinforced concrete, the development of production machinery, and the adoption of techniques of scientific management in the production process.

The changes in the structure of Britain's domestic buildings came about, especially with the introduction of high-rise blocks of flats, which were developed from intensive experimentation with new materials and more scientific methods of construction. In 1906, a steel-frame and reinforced concrete building plan was brought to London by an American businessman. The building of the giant department store Selfridge's in the world's largest city depended on technical expertise of American architects and engineers. The building scale brought to the attention of the regulators the need to consider technological innovations and the prevailing conditions affecting their implementation in cities.

By the 1960s, a multitude of new building forms had changed the landscape of British cities. Traffic congestion became a serious urban issue, which came from neglected urban planning for several decades (Goodman, 1999). Trams, underground and over-ground railways were used as systems of urban transit in London.

Due to the increasing number of cars, Paris experienced heavy congestion on its streets. Again, the issue was attributed to neglect of effective planning. In the case of Paris, these

unforeseen traffic problems and a growing recognition of the inadequacy of Parisian streets stimulated decades of urban planning from the rejected visionary schemes of Le Corbusier in the 1920s to the adoption, in the 1950s, of the idea of a peripheral motorway.

Inheriting ideas from the industrial revolution in the two previous centuries, by the early 20th century, city governments began to introduce new energy technologies much more vigorously which promoted changes in the housing supply (Lees and Lees, 2007). Together with water supply works introduced in late 19th century, gas works and electrical works were also considered monopolies and often run as public utilities. The public ownership of utilities effectively made their operations municipal enterprises, where municipal leaders could make a fair return on investment from collecting fees for those utility services (Lees and Lees, 2007). Excessive accumulated funds could then be used for other purposes such as payments for other non-profit services. The practice of establishing municipal enterprises was seen to enhance public wellbeing, enabling cities to create competitive environments. Most areas of such cities had an economy based on individual responsibility and permitted entrepreneurship.

While gas services in cities experienced some privatisation in early 20th century, most cities took control over electricity because of the role it could play in the development of mass transit, which is a key hard infrastructure in cities (Goodman, 1999). Major European cities have introduced various systems of transit as solutions to deal with the increasing mobility demand of the more concentrated populations in urban settings.

However, planning and infrastructure challenges of population concentration in cities are more than just mobility issues. Public transport was not the only solution as personal ownership of cars grew sharply. Consequently, cities have to cope with congestion, overused infrastructures, pollution, social issues, economic disparity, and the like.

In addition, globalisation puts cities in unprecedented competition. Ewen and Hebbert (2006) see globalisation as placing cities under a continuous ordeal by SWOT (strength, weaknesses, opportunities, and threats), continuously having to redefine their strengths, weaknesses and opportunities and deal with competitive threats.

Competitiveness and comparative advantage being the key words, effective city governments have to transcend locality and national context. The established backgrounds and individuality of cities are comparative advantages and they are also the source of their

diversity and economic resilience. Cities' histories give them a collective personality and a historical memory for their continuing existence in time and space.

Nevertheless, the world environment is experiencing a new international division of labour, the dynamics of a new international digital economy, the emergence of new creative classes, new urbanism and mobility, new regulatory regimes and new relations of multilevel governance. Cities are coping with all that with limited resources. In addition, civic democracy, identity, wealth-creation, and solidarity continue to offer a common language all cities would like to speak (Ewen and Hebbert 2006).

In Europe, the process of economic globalisation, along with the process of integration within the European Union, has altered the functioning of the European urban system (Gospodini, 2002). European cities are increasingly linked to forces external to their national boundaries and they appear to function as unified networks of urban settlements. Castells (1993) believes that as the core national states fade in their roles, the cities will emerge more as a driving force in the making of new European society. Other scholars go as far as to argue that "Europe is becoming a community of cities rather than a community of nations or/and countries" (Simioforidis, 1998).

The key factors to success in European cities are: a diverse economic base and qualified human capital; services with high technology and strong local linkage to knowledge-based institutions; developed and modernised infrastructures (transport links and telecommunications, etc.); a high quality of urban built environment, public open space, and urban life; and the institutional capacity to develop and implement future-oriented development strategies (Gospodini, 2002).

One of the key factors affecting the competitiveness of a city for new investments and resources within the global urban system of Europe appears to be the quality of urban space. In this era of globalisation, the history of urban forms seems to be in reverse. While for centuries, Gospodini (2002) argues, the quality of the urban environment has been an outcome of economic growth of cities, nowadays the quality of urban space has become a prerequisite for the economic development of cities. And urban design, in consequence, has acquired an enhanced new role as a means of promoting economic development.

Congestion, environmental pollution, social conflicts, and loss of identity and sense of communities are common issues in large cities. Along with those factors, many are

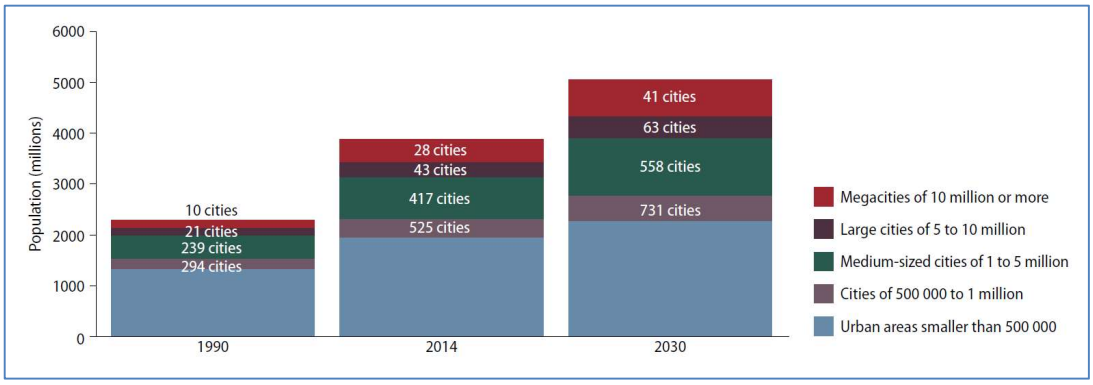
struggling for economic development due to lack of space, expensive land, expensive overheads and services, and dated infrastructure. They become less attractive as an entrepreneurial or residential location. Gospodini (2002) sees the mission of making cities attractive again as upgrading the urban quality of their built environment.

However, city leaders have also learnt that it is insufficient to focus on just the hard infrastructure of improved sewers, water supplies, housing, supplies of energy, and means of transport. They are the basics. City leaders recognise that maintaining human capital requires as much effort as investment in the hard infrastructure (Lees and Lees, 2007). Cities are targeting to provide direct assistance through social welfares to the young, the sick, the poor, the unemployed and those who have special needs. The fund for social welfare comes from utility services and tax. However, a more effective and sustainable solution is needed because resources for social welfare are not endless. And education is identified as a key measure to nurture the fitness of as large a portion of the city population as possible. Cities start investing in public education and with help from central governments they continue to expand to health care services to ensure the best conditions of their human capital (Lees and Lees, 2007).

Human beings have numerous needs and rights including their political rights. The transformation of European society under the impact of on-going urbanisation encourages political action on a larger scale than previously. Gradually, cities have continuously growing groups who are able to vote for city councils and, in some states, mayors. The loosening of legal limits on organisation permits the founding of workers' political parties, which push for greater democracy via electoral campaigning and demonstrations. A city's density and dense networks are perfect for critical mass to form and a place for demonstrations, which require audience. Cities become centres for mass political movements, collective actions, full political participation, political equality, political conflicts and compromises, and incubators of political modernisation and social and cultural change (Lees and Lees, 2007).

Against all these backdrops, cities are entering the 21st century with a number of issues to deal with, but they also have new technologies, such as ICT tools and solutions, which they can utilise. Cities have a history of networking (Ewen and Hebbert, 2006) to learn how to maximise their resources and share best practices to become a home to more and more people coming to them.

Figure 2.3. Global urban population growth is associated with the growth of cities



Source: World Urbanisation Prospect, UN, 2014.

2.2.2.3 Evolution toward smart city concepts

The absence of a universally accepted definition of what constitutes 'smart cities' reflects a work in progress within academic research and the adoption of practices toward a true smart city. The proliferation of research about the smart city and its related concepts over the past five years indicates a longer evolution and different roots. This section presents smart city related concepts and their accumulation towards smart city concepts, mainstream working definitions of 'smart city', and a few models that have been used to test or have been considered as applying by some cities.

Chronologically, research has found that smart city concepts were partly developed from a 1987 concept of 'wired cities', 'networked cities' in 1996, 'smart community practice' in 1997 (Nam and Pardo, 2011; Hollands, 2008; Angelidou, 2014) and 'smart growth' in 1998 (Eger, 2000; Neirotti *et al.,* 2014; Nam and Pardo, 2011). Other related concepts are digital city, intelligent city, ubiquitous city, hybrid city, information city, creative city, learning city, humane city, and knowledge city.

These root concepts reflect the fact that they are not only focusing on technology infrastructure but also on the wider operating and performance aspects of cities.

'Wired' and 'networked' cities were defined by physical optic fibre connections facilitating cities during the 1970s and 1980s, with the development of telecommunications technology (Dutton, 1987). Growing strongly in the 1990s, the 'smart community' concept promoted pervasive connection to the internet by citizens in villages, towns, and cities in using networked activities – ranging from electronically accessed government services, tele-

health and distance learning to e-commerce (Moser, 2001). Smart community represents a strategy to attract, engage, and train the broad base of users identified as integral to success in an information economy. Essentially, it depends on the citizens of communities for success as Moser (2001) emphasises; and technology usage is only a means of reinventing cities for a new economy and society. These characteristics are also necessary in smart city concepts defined by numerous studies in the preceding sections.

An ‘intelligent city’ is a territory in which local systems of innovation are enhanced by digital collaboration spaces, interactive tools, and embedded systems (Komninos and Sefertzi, 2009). It focuses on creating environments that improve people’s cognitive skills and ability to learn, foresee, and innovate. In the literature, ‘intelligent city’ is the concept most often used as interchangeable with ‘smart city’ (Hollands, 2008).

Meanwhile, ‘digital city’ is seen as a foundation from which an intelligent city can grow (Yovanof and Hazapis, 2009). It comprises infrastructures that connect local communities and drive growth, efficiency, productivity and competitiveness. It does so by having a connected community that combines broadband communications infrastructure; a flexible, service-oriented computing infrastructure based on open industry standards; and innovative services to meet the needs of governments, their employees, citizens and businesses. Yovanof and Hazapis (2009) recognise that a digital city is flexible in scope, ranging from a city district to a whole region; and it concentrates on providing digital information and services offered by government to citizens and business in a virtual life.

A ‘hybrid city’ results from the integration of virtual life, which reproduces urban elements by visualising them within the virtual space, with the real life of human interaction via both the digital world and physical world. It serves as a transitional form from a digital city to a smart city (Streitz, 2010).

An ‘information city’ focuses on providing information in digital format for people to access through the internet (Sproull and Patterson, 2004). The information is locally relevant in terms of commerce, social and civic services and social interactions of various population groups, business and government institutions. However, Sproull and Patterson (2004) also identify a limitation of the information city in limiting participation or interaction among those who use the available information.

Leaning toward the soft infrastructure of city, the human capital, creative city emphasises the important aspect of the creativeness of its residents and the city's ability to attract a creative class of workers. Florida (2002) argues that creative cities facilitate growth of the creative class, who work in a wide range of knowledge-intensive industries including high-tech sectors, financial services, legal and healthcare professionals and business management. For the creative class to succeed, creative cities invest in education, training, and making knowledge networks available whilst ensuring the presence of necessary environments such as safe streets and abundant amenities and social activities.

The 'humane city', as its name implies, focuses on the inclusion of all population groups of city residents, addressing their needs, abilities, desires and their continuously improved quality of life. The humane city is where people enjoy everyday life and work and have multiple opportunities to exploit their human potential and lead a creative life (Streitz, 2010).

'Knowledge city' means a city with a strategic mission to firmly encourage and nurture locally focused innovation, science and creativity within the context of an expanding knowledge economy and society. Yigitcanlar, O'Connor and Westerman (2008) define a knowledge city as an integrated city, which physically and institutionally combines the functions of a science park with civic and residential functions.

The associated concepts and successful practices of pioneering cities in their efforts to become smart cities motivate researchers to study more about smart cities. Therefore, numerous definitions of smart city are being generated, depending on different city assessments including roles, functions, performance, aspiration for development, and the challenges of the variety of cities.

Table 2.1 reviews some of the working definitions coming from both academic research and in practice by advocating organisations and pioneering cities. The collection of the working definitions shows both pragmatic and theoretical approaches but they all agree on one respect: a smart city is a complex concept and might be treated as the open-for-definition of urban settlement globally (UN, 2014).

Table 2.1. Major working definitions of smart city

Academic research	In practice
Smart cities are places where information technology is combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic and environmental problems (Townsend, 2013). The use of Smart Computing technologies to make critical infrastructure components and services of a city – which include city administration, education, healthcare, public safety, real estate, transportation, and utilities – more intelligent, interconnected, and efficient (Washburn, 2010). A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens (Giffinger *et al.,* 2007). A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimise its resources, plan its preventive maintenance activities,	A smart city is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholders, municipally based partnership. – European Parliament. Smart cities combine diverse technologies to reduce environmental impacts and offer citizens better life. This is not, however, simply a technical challenge. Organisational change in governments and indeed society at large is just as essential. – Smart Cities and Communities Cities [should be seen as] systems of systems, and that there are emerging opportunities to introduce digital nervous systems, intelligent responsiveness, and optimisation at every level of system integration. – MIT Cities are made up of vast networks of people, businesses, technologies, infrastructure, consumption, energy and spaces. In a Smart city, these networks are linked together, supporting and feeding off each other. – Copenhagen Cleantech Cluster A city striving to make itself "smarter" (more efficient, sustainable, equitable and

and monitor security aspects while maximising services to its citizens (Hall, 2000). A city that gives inspiration, shares culture, knowledge, and life, a city that motivates its inhabitants to create and flourish in their own lives (Rios, 2008). A city where the ICT strengthen the freedom of speech and the accessibility to public information and services (Partridge, 2004). A City is smart when investments in human and social capital and traditional and modern communication infrastructure fuel sustainable economic growth and high quality of life, with a wise management of natural resources, through participatory governance (Caragliu, Del Bo and Nijkamp, 2009). A city combining ICT and Web 2.0 technology with other organisational, design, planning efforts to dematerialise and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and liveability (Toppeta, 2010). A smart city is where the ICT strengthens freedom of speech and accessibility to	liveable) – National Resources and Defence Council. Smart city is used to describe a city with "smart" industries in the field of ICT and regard the education of its inhabitants and the relation between the city government administration and its citizen. Smart city is furthermore used to discuss the use of modern technology in everyday urban life. – Vienna University of Technology An instrumented, interconnected and intelligent city. Instrumentation enables the capture and integration of live real-world data through the use of sensors, kiosks, meters, personal devices, appliances, cameras, smart phones, implanted medical devices, the web, and other similar data-acquisition systems, including social networks as networks of human sensors. Interconnected means the integration of those data into an enterprise computing platform and the communication of such information among the various city services. Intelligent refers to the inclusion of complex analytics, modelling, optimisation, and visualisation in the operational business process to make better operation decisions – IBM (Harrison *et al.,* 2010). Intelligent communities are those that have realized the importance of the enormous

public information and services (Anthopoulos and Fitsilis, 2010). Smart cities are about leveraging interoperability within and across policy domains of the city (e.g. transportation, public safety, energy, education, healthcare and development.) Smart city strategies require innovative ways of interacting with stakeholders, making resources, and providing services (Nam and Pardo, 2011). Any adequate model for the smart city must therefore also focus on the smartness of its citizens and communities and on their well-being and quality of life, as well as encourage the processes that make cities important to people and which might well sustain very different – sometimes conflicting- activities (Haque, 2012). Smart cities use information and communication technologies (ICT) to be more intelligent and efficient in the use of resources, resulting in cost and energy savings, improved service delivery and quality of life, and reduced environmental footprint—all supporting innovation and the low-carbon economy (Cohen, 2012).	challenges to achieve a broadband economy, and have taken conscious steps to create an economy capable of prospering in it. – Intelligent Community Forum A smart city provides ubiquitous connectivity, future-proof broadband capacity and total wireless fidelity, with IP-enabled devices communicating and being managed through a control centre, allowing tenants, residents, and visitors' real-time access to key information about their environment from anywhere. – International Data Corporation A smart city provides an advanced ICT infrastructure to enable residents and organisations to make good and independent use of these technologies. To be "smart" the use of technology must be interactive or must lead to a transaction, that is, online activity must be more than a passive act. – International Federation for Library and Information Associations

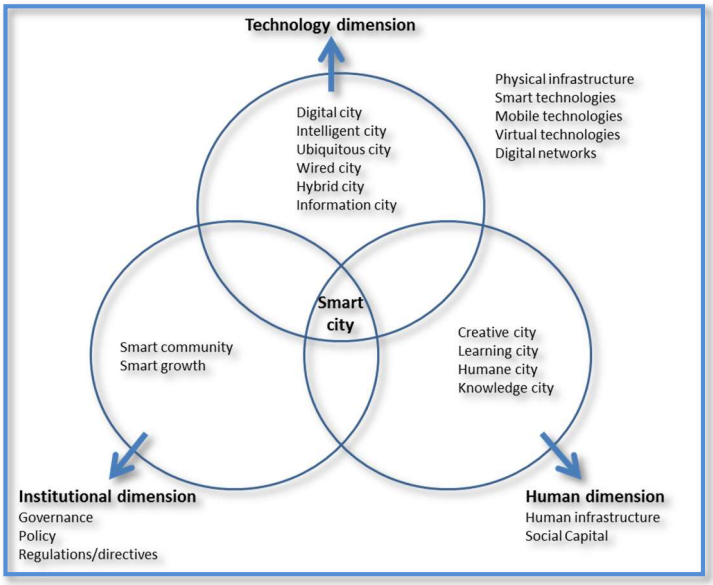
Source: Adopted from Nam and Pardo, 2011; Chourabi et al., 2012; Pan, Chuang, and Cao, 2011; and author's editing.

Along with the presence of these working definitions, a few researchers have also come up with some frameworks for the development of the smart city, identifying fundamental components and factors. Nam and Pardo (2011) lead the way mapping out the fundamental components of the smart city (Figure 2.4). Their research categorises the components by

technology, human, and institution dimensions, which are inherited from the literature of the conceptual roots of smart city. The technology component includes infrastructures of hardware and software; the human component contains creativity, diversity, and education; the institution component comprises governance and policy.

This proposes that a city is smart when investments in human/social capital and IT infrastructure fuel sustainable growth and enhance a quality of life through participatory governance (Nam and Pardo, 2011). Among the components, the researchers recognise that social factors other than smart technologies are central to smart cities. Therefore, it is necessary that future research should embrace a socio-technical view, exploring the interactions between human factors and institutional factors toward new initiatives leveraging new technologies and vice versa.

Figure 2.4. Fundamental components of smart city

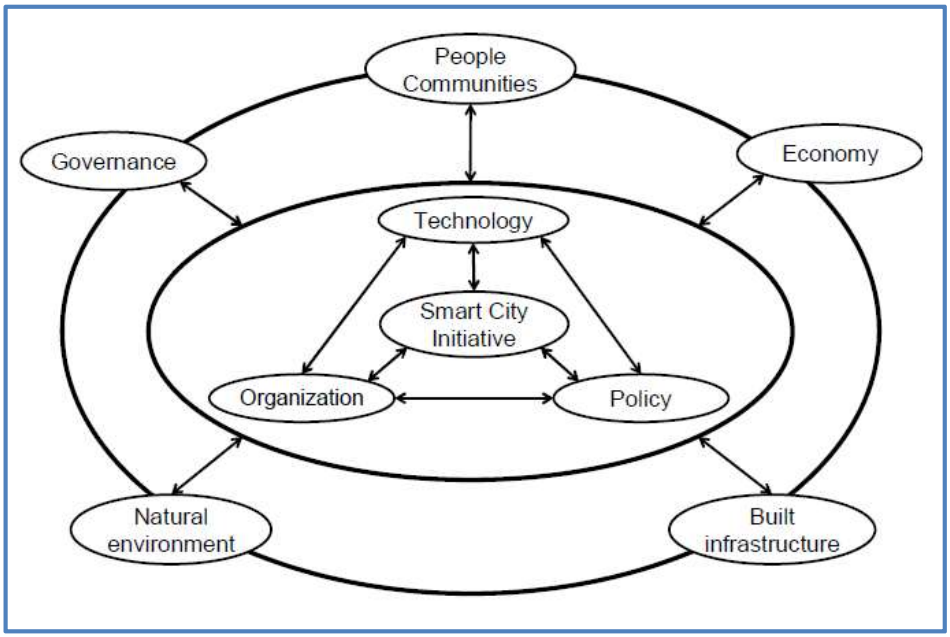


Source: Nam and Pardo, 2011

One of the routes for cities to become smart is by deploying smart city initiatives or programmes in areas most applicable for them. For a better understanding of the factors vital to success in pursuing a smart city initiative, Chourabi *et al.* (2012) develop a framework to explain the relationships and influences between these key factors and smart initiatives. The factors are people and communities, economy, built infrastructure, natural environment, governance, organisation, policy, and technology.

It is suggested that, while all factors have a two-way impact in smart city initiatives, at different times and in different contexts some are more influential than others. The factors are presented at two levels of influence: outer factors (governance, people and communities, economy, natural environment, and built infrastructure) are filtered or influenced more than the influential inner factors (technology, policy, and organisation). The influence and impact are two-way. However, technology may be seen as meta-factor in smart city initiatives because it could heavily influence each of the seven factors. Chourabi *et al.,* (2012) also note that cities are currently deploying smart city initiatives that are technology-intensive; therefore, it could influence all other success factors in the proposed framework (Figure 2.5).

Figure 2.5. Smart city initiatives framework

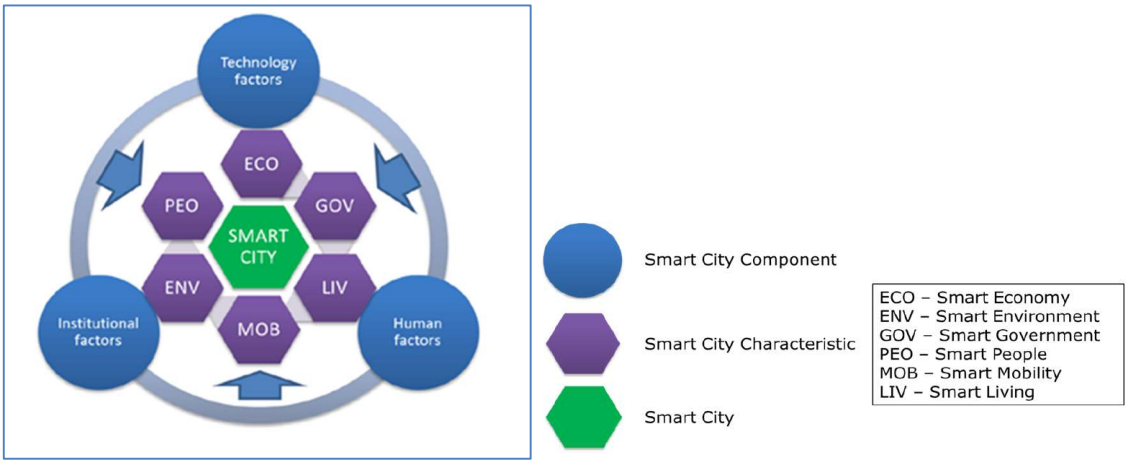


Source: Chourabi et al., 2012

In an effort to help cities to evaluate their starting points before deploying smart city initiatives or programmes, the European Parliament and the European Commission (EC)'s Directorate General for Internal Policies issued a reference model for European cities in early 2014 (Manville *et al.,* 2014). The model was developed from the work of Giffinger *et al.,* (2007) and Nam and Pardo (2011) to provide cities with an understanding of the major components and characteristics of smart cities. The model also offers areas that cities could consider as priorities and their interactions and influence on other characters in the making of the whole city.

Rather than advocating the purely academic model arising from the research of Giffinger *et al.,* (2007) (Figure 2.6) or Nam and Pardo (2011), the EC model includes definitions of each characteristic associated with the European economic development, energy, technology, and transport objectives. There are proposed standards that European cities should apply, especially in those programmes receive funding from the European community, such as Horizon 2020. A few pioneering European cities deploying smart city programmes and initiatives are mapped against the characters and components of the model. The analyses of those cities are intended to provide other cities with ideas as to how to start their own analyses; and to which characters and components it is that their own ideas for smart city programmes fall into.

Figure 2.6. The relationship between components and characteristics of smart cities



Source: Mapping Smart Cities in the European Union and Giffinger et al., 2007.

2.2.3 Contemporary research

2.2.3.1 North America

America and Canada are leading the rest of the world in the number of cities who are deploying self-claimed smart city programmes, with initiatives in at least 65 cities. However, systematic research about the smart city from this part of the world is very limited and uncorrelated with a wider, international, city management or academic view of the smart city adoption progress.

Nam and Pardo (2011) have made the first attempt to provide a systematic analytic conceptualisation of the smart city. They use a literature of concepts related to the smart

city, as mentioned in the previous section, analysing those concepts in three dimensions of technology, people and institutions.

By scoping within the three mentioned concepts, Nam and Pardo (2011) discuss a set of fundamental factors that constitute a smart city. In their view, technology factors are key to building smart cities because the use of ICT can transform life; but, without real engagement and willingness to collaborate and cooperate between public institutions, citizens and private sectors, there is no smart city. Then come the human factors that highlight the creativity, social learning, and education. Together with education, training and networks of knowledge, human capital is becoming smart people who will continue to embrace life-long learning, social and ethnic plurality, flexibility, creativity, cosmopolitanism or open-mindedness, and participation in public life.

The institutional factors, according to Nam and Pardo (2011), indicate a need for much more support from government and policy for governance. There must be smart governance that enables various stakeholders, especially citizens, in decision-making processes and public/social services. E-governance is essential in bringing citizens to, or vice versa, a smart city initiative and keeping the decision and implementation process transparent. In order for all three dimensions to work well together, Nam and Pardo (2011) recommend an integration of technology factors; social learning and education for the human factors, especially in digital skills training; and smart governance for the institutional factors, which also emphasises leadership champions within government and with citizens.

Also stressing the importance of smart governance, Chourabi *et al.* (2012) identify it as one of the eight critical factors that they use to build a smart city initiative framework. The factors of smart city initiatives are management and organisation, technology, governance, policy context, people and communities, economy, built infrastructure, and natural environment. They propose the framework in a hope that it could be used to examine how local governments are envisioning smart city initiatives. The people and community factor is critical in the sense that smart city initiatives have impacts on the quality of life for citizens and aim to foster more informed, educated, and participatory citizens. People should be as inclusively engaged as possible in working out how to have their respective needs and wants met from smart cities.

Testing the framework, Alawadhi *et al.* (2012) use smart city initiatives from North America and Mexico to establish the relative dominance of the elements of technology, management and organisation, policy context and governance factors. Based on semi-structured interviews with city managers and government officials, they identified that technology challenges are mostly of an organisational rather than technical aspect, while interdepartmental collaboration and cooperation are essential through sharing information, resources, and managerial power.

Under the governance factor, the researchers also discovered a strong requirement for inter-sectoral and interagency collaboration, while citizen participation is vital in decision-making, monitoring city services, and providing feedback. The smart city initiatives recognise that the individual citizen is as important as civic groups and other stakeholders such as schools, companies, and governments in other jurisdictions.

Departing from the major factors, Allwinkle and Cruickshank (2011) offer an overview about creating smart cities by analysing a series of papers presented at the *2009 Trans-national Conference on Creating Smart Cities*. They recap both the possibilities and barriers for those cities to really develop meaningful smart city initiatives rather than self-congratulatory noise when claiming to be smart. The researchers also find that for many people, including some academics, there is no difference between intelligent and smart cities. The conference proposed that intelligence is not so much about the computational power, memory, databases, information systems, or knowledge-transfer capabilities of cities but the means such innovations offer city residents to learn from the application of these technologies. Overall, the presenters collectively began to uncover what it means for cities to be smart and to offer alternative ways for cities to grow smart, starting from a critical awareness of knowledge-based and more realistic understanding of critical conditions in the physical, economic, and social environments.

Revisiting the important role of human capital in smart cities, Winters (2011) found that the greater in-migration to smart cities is mostly due to persons enrolled in higher education; and that they often stay in the city after completing their education. This phenomenon reflects why smart cities are growing, especially when they are centres of higher education. He concludes that the growth of smart cities largely involves an intra-state brain drain from areas without higher education opportunities to areas with higher education opportunities.

Looking at a theory of the smart city from a smart city solution provider, IBM researchers Harrison and Donnelly have introduced IBM's Urban Information Model, which is usually displayed in a Geographic Information System. The model includes five groups of layers (bottom-up): natural environment (topography, environment resources); infrastructure (land use, roads, buildings, utilities); resources (water, air, oil, minerals); services (energy, water, transport building services); and social systems (people, commerce, culture, policy). The researchers claim that the model is evolving and it might move toward placing the people system, in the very top layer, at the centre of every other system because of their interaction within other systems in the same layers or making impacts in other layers.

Also aiming at developing a theoretical framework, Aldama-Nalda *et al.* (2012) want to build a structure that guides smart city service integration, providing success factors, major concerns, challenges, and barriers in cities' use of smart technologies for service integration. Interviewing chief information officers and government officials, the researchers have established that information is seen as a key element that may enable transparency, citizen participation, and government efficiency, thus making cities more live-able. Analysed cities are receptive to receive feedback from users of government services through the use of social media, which city governments see as a way to improve relationship between themselves and citizens.

2.2.3.2 Europe

Sharing the importance of citizen involvement in developing smart cities, researchers in Europe have examined the human factor in its social environment along with technology drivers and solutions for smart cities. Europe is also home to many living labs which, together with the internet, act as enablers of smart cities and generate open innovation ecosystems for smart cities (Komninos, Pallot and Schaffers, 2013). European cities have been developing strategies towards becoming smart cities by developing new types of innovation approaches in urban areas especially those that have high population density enabling, in consequence, a high level of citizen participation in co-creating internet-based applications in all sectors of the economy and society. Komninos, Pallot and Schaffers (2013) evaluate policies through four city case studies (Barcelona, Thessaloniki, Manchester, Helsinki) and a series of innovative programmes that were deployed across Europe. They learn about drivers and bottlenecks that influence the transformation toward a smart city; strategies and planning approaches; necessary conditions; and necessary

structural and process changes. They report a tendency towards more decentralised and bottom-up approaches to planning and innovation in these cities, which in turn lead to networking and collaboration among stakeholders. Gradually, it is envisaged, real innovation communities will be formed when citizens, private sector, and local government act as the proactive instigators of smart city programmes.

Also discussing bottom-up and top-down approaches in defining smart city issues, Breuer, Walravens and Ballon (2014) investigate the smart city concept and what it can mean to different stakeholders and the consequences of their interpretation. The findings come from examining an extensive overview, analysing definitions, illustrations and operations from policy, industry, and academia while identifying major trends and approaches in developing smart cities. The researchers argue that both top-down and bottom-up approaches contain major constraints such as danger of authoritarianism for the former and chaos via short-term vision for the latter. They propose a middle way approach where collaboration is key between the public sector, private sector, and citizens; and amongst all those players themselves. To these researchers, a smart city is serious about innovation and it should be collaborative, collective and contextual with active participation and benefit for all stakeholders.

One of the conditions for such a smart city to become real is policy. Angelidou (2014) explores factors differentiating policies for the development of smart cities, providing views on strategic choices during any mapping and planning stages. The strategic choices are national versus local strategies, strategies of new versus existing cities, hard versus soft infrastructure oriented strategies, and sector-based versus geographically-based strategies. The choices are analysed following advantages and disadvantages against what has been presented in the smart city literature. Angelidou concludes that before making strategic choices, it is important to review what is already available and how it can be improved. Cities should select a few priority domains or areas that need urgent upgrade. Stakeholder engagement can provide valuable insights about the current assets and needs of the city. The bottom line in redesigning toward smart cities, in Angelidou's (2014) view, is that matters should be shaped under local features, priorities and the needs of the cities and their people.

Also emphasising the need to have inputs and contributions of various groups of people in the city, Hollands (2008) criticises the current smart city trend as an urban labelling phenomenon that has a self-congratulatory tendency. He provides a critical polemic against

some of the rhetorical aspects of smart cities including technologies and high-tech variation of the entrepreneurial city

Hollands (2008) makes it clear that ICT, though having great impacts on urban form, is not necessarily the most critical factor in defining the smart city. He cites many researchers following this direction. The strong focus on technology, especially ICT, can lead to disparity and social issues, including digital divide and class inequality (in cities that attract creative class). All these are continuing urban problems and cities have to address them seriously rather than hiding behind a self-congratulatory surface of self-designed smart cities. However, Hollands (2008) is positive about the art of the possible for those cities that are serious in becoming progressive smart cities. They have to start with people and the human capital rather than blindly believing that IT itself can automatically transform and improve the city. The IT is there for people to utilise socially, in ways that empower and educate people and get them involved in a political debate about their own lives and the urban environment in which they live. The progressive smart city, in Hollands (2008)' terms, needs to create a real shift in the balance in the power to use and leverage IT by business, government, community and ordinary people. Such shifts would address the urban issues of power difference, accountability, credibility and inequality in city life. Therefore, real smart cities will have to take on a number of challenges as previously named but they also have opportunities to redefine the real meanings of smart city that they are pursuing.

For smart cities to form and evolve, they need a common scale to assess and track progress. Caragliu, Del Bo and Nijkamp (2011) provide a focused and operational definition for smart city; and present consistent evidence on the geography of smart cities in the 27 countries in the European Union. They utilise statistics and graphical data in the Urban Audit data set to investigate a set of factors determining the performance of smart cities. The factors are the presence of a creative class; the environmental quality and dedicated attention to the urban environment; the level of education; the accessibility to and the use of ICT for public administration; and the quality of urban transportation network. They find that the urban wealth is positively correlated with major factors that have been identified in the literature. These findings are stimulating a new strategic agenda for European cities to shape their policy and approaches for implementation of smart city concepts (Caragliu, Del Bo and Nijkamp 2011).

Following the discussion on policy, Komninos, Schaffers and Pallot (2011) propose a smart city technology roadmap framework and recommendations for urban development enabled by the future of the internet. The roadmap framework aims to support the innovation policies and strategies of cities toward becoming smart. Using various methodologies including case studies, discussions within special communities and literature review, the researchers build the roadmap based on four dimensions (technological change, industrial change, social changes, and policy change); and three time periods (short, medium, and long terms). The roadmap is useful for cities that are planning to develop or deploy strategies for smart cities, e-infrastructure, and e-services to address the current challenges for competitiveness and sustainable development. Komninos, Schaffers and Pallot (2011) also believe that the roadmap allows formulation of policy recommendations for practicing interdisciplinary planning for smart cities, and interlinked layers of digital technology, people-driven innovation ecosystems, urban activities, and infrastructure.

Policy aspects cover a larger spectrum than just the technology factor, especially during any planning process toward smart cities. Zygiaris (2013) offers a *Smart City Reference Model* as a planning framework that helps city executives and policy authorities to self-analyse a holistic ecosystem of their city. The model consists of seven layers starting from the city, the green city, the interconnection, the instrumentation, the open integration, the application, and the innovation. Each layer has its own characteristics, requires certain types of associated policy, offers different operational mode, and results in different outcomes. The author claims that the model could be adopted and utilised in a range of smart policy paradigms that embrace the green, broadband, and urban economies. Using the reference model, city planners could outline a conceptual layout of a smart city and name associated innovation characteristics, regardless of the city's shape and size (Zygiaris, 2013).

In most of this review of research, exemplar cities tend to be of larger size, over 500,000 inhabitants, while in Europe, the vast majority of the urban population lives in medium-sized cities, from 100,000 to 500,000 residents. Those cities are also deploying smart city agendas and their challenges can be rather different than the metropolitan (Giffinger *et al.,* 2007). The medium-sized cities have to cope with competition of larger cities in their own states and regions. Meanwhile, they appear to be less equipped in terms of critical mass, resources, and organising capacity. They have to identify their strengths and opportunities for development and good positioning, especially among those of similar level. Giffinger *et*

al., (2007) offers a city-ranking tool for those cities to classify key resources and assets. Employing aspects of smart city research, the ranking tool has six characteristics, 31 factors and 74 indicators. Using the tool, cities can position themselves against a benchmark and compare with their peers. The cities can have their own profiles and understand their areas of good performance and those for further improvement.

Given the radical changes in the global economic setting, city economies are facing growing competition for investors, tourists, qualified labour or international events. Giffinger and Gudrun (2010) go a step further to introduce their smart city ranking-tool as an effective instrument for the positioning of cities. They argue that the approach and corresponding experiences of different cities reacting on their 2007 work's dissemination show a possibility for the instrument to be used as an effective benchmark, helping cities to locate their strengths and weaknesses and to improve a city's competitiveness through strategic planning.

Other research deals with a wide range of subjects including monitoring of progress in smart city deployment (Marsal-Llacuna, Llinas and Frigola, 2014) and assigned weights for considered indicators and the subjectivity influenced by decision makers (Lazaroiu and Roscia, 2012). A worldwide smart city evolution roadmap represents a history of ICT-enabled forms of development in cities (Anthopoulos and Fitsilis, 2012). Strategic management of technological learning and societal embedding can help to address IT-based smart city challenges (Carvalho, 2014).

Social and political inclusion topics discuss the fact that smart cities need smart citizens, including smart children (Hennig, 2014); and the impact of e-governance on citizen attitudes towards and participation in local government (Baldersheim, 2013).

Expanding to horizontal empirical trends in smart city thinking, Neirotti *et al.,* (2014) provide policy makers with a catalogue of smart city application domains. The six domains are natural resources and energy, transport and mobility, buildings, living, government, and economy and people. The spread of smart initiatives is analysed against a data set of economic, urban, demographic, and geographical information from 70 cities who claim to have developed projects and best practices in one or more of the domains.

Results show that the evolution of a smart city depends especially on its local contextual factors. For instance, economic development and structural urban variables are likely to

influence a city's digital path while the geographical location affects the smart city strategy, and density of population. The reasons for such correlation are because the density of population is closely associated with congestion problems and they might be an important component to determine the routes for the smart city implementation. Neirotti *et al.,* (2014) believe that their research would provide policy makers and city managers with useful guidelines to define and drive their smart city strategy and planning actions toward the most appropriate domains of implementation.

2.2.3.3 Asia and Elsewhere

The number of cities pursuing smart programmes and initiatives is increasing sharply, from less than five in 2009 to at least 25 in 2014. India has announced plans to build 100 new smart cities starting from 2014. However, there are a limited number of studies about the smart city in Asia, especially research available in English. Leading researchers are mainly from Korea and Singapore.

Singapore is the first smart city in Asia (Mahizhnan, 1999; Marsal-Llacuna, Llinas and Frigola, 2014) after persistently following vigorous investment in technologies, especially ICT, since it became officially independent from the Britian and then Malaysia in 1965. Singapore is a state island having little advantage from any natural resources. It has to import drinking water from neighbouring Malaysia. However, it is located at the intersection of international air and sea routes and Singapore knows how to best exploit the geographic position with its only available resource, humans. Mahizhnan (1999) finds that it is people who make IT work and work for the good of people and the final goal for technology adoption is not just economic growth but an improvement of the quality of life for all people. He analyses a series of policies and programmes followed by the Singapore government to utilise computers in early 1980s and then complicated IT and telecommunications systems. In 1992, the National Computer Board implemented a new vision to move Singapore from its information age focus during the 1980s to Intelligent Island. The vision leads to consistent priorities for investment in IT education and IT infrastructure. The government takes a driving role in issuing the necessary policies and attracting major investments whilst it also calls for partnership with private sector and other entities to invest in the IT-enabled economy for growth. After two decades operating the IT economy, Singapore has become the Asian centre for high value services including finance, trade, and logistics: and it retains

its competitiveness against many other cities and states in the highest economic growth regions of the world.

Neighbouring Singapore, Malaysia also seeks ways to employ IT in its local governments for economic development. Salin and Abidin (2011) find a strong influence of ICT on developmental, strategic and promotional trends of the smart city in Malaysia. Using the case study method, with face-to-face interviews and content analysis, the researchers have found three governance trends helping the city to promote its human development in (i) knowledge improvement, (ii) facilitating commercial development to serve local communities, and (iii) responding to social changes. In promotional governance, the city successfully uses IT to market itself to attract tourists, improving related support for tourism and for promoting information sharing among stakeholders.

Famous in Asia for setting up a brand new smart city New Songdo, Korean researchers follow the main stream research that focuses on the technologies of smart cities. Lee, Phaal and Lee (2011) introduce an integrated road mapping process for services, devices and technologies capable of implementing a smart city development in Korea. They apply a quality function deployment method in a case study to establish interconnections between services and devices, and between devices and technologies. The integrated roadmap for smart city development emphasises classification systems, roadmap formats, and data accumulation related to smart devices, technologies and services necessary to develop the roadmap. It provides the first comprehensive and unified view of current and future trends in technology for smart city development in Korea.

Also concerning smart city services, Lee and Lee (2014) propose a new typological framework for classifying smart city services based on citizen-centric approaches rather than bureaucratic perspectives. The typology contains four dimensions: mode of technology (automate, informative, transformative); service purpose (hedonic, utilitarian); service authority (voluntary, mandatory); and delivery mode (passive, interactive). The application of this typology is suitable to smart city services because it can be used across different functions, enabled by ICT, to best respond to the actual and precise needs of citizens. Lee and Lee (2014) see the typology as their first step in providing a new approach and perspective in developing and implementing smart city services.

Also advocating the trend toward service-oriented city governance, Pan *et al.* (2011) introduce the idea of developing a *Smart City Evaluation Index* based on the concept of leveraging ICT to make a better life for cities in Taiwan. The Index promotes the idea of matching the citizens' needs with services provided by cities based on the readiness of the ICT infrastructure, the status of ICT application and the delivery capabilities. The Index also suggests that even with the lower levels of ICT, cities could still improve citizens' satisfaction by meeting their needs in appropriate public services.

Other than needs, citizens in cities have other resources to offer and their participation is critical in local governance, local growth, and especially in the development of smart cities, suggest Fu and Lin (2014), who introduce a participatory innovation model in the context of smart city developments in China. Using practices from design thinking, living lab and maker space, they set up integrated co-design process that facilitate interdisciplinary professionals, open communities and citizens to become involved in smart city design. The participatory frameworks allow participants to explore territory, integrate stakeholders and issues, share their ideas, co-create experiments, and work toward collaborative solutions to resolve problems and evaluate outcomes. Fu and Lin (2014) believe that the participatory model can help smart city planners, designers, and managers to better understand the planning and renovation of the existing urban systems with participation of people through open and collaborative approaches.

Following a similar track, Sadoway and Shekhar (2014) argue for re-prioritising citizens in smart city governance, using case studies from India. Their arguments are based on the concept of smart citizenship that was derived from existing concepts including civic intelligence, smart communities, ICT-enabled communities, wiser cities, and sharing cities. They see these concepts as supportive of enabling or enhancing collective forms of local knowledge and extracting the wisdom embedded in local communities, movements, associations, organisations and urban neighbourhoods. Sadoway and Shekhar (2014) introduce a smart citizenship framework that puts citizens, civic organisations and participatory as drivers for ICT-linked adoptions and applications. This approach values local democracy and fairness while prioritising local civic knowledge and needs along with addressing political accountability and civic decision-making processes, which in turn respect community knowledge and needs. The authors believe that smart citizenship should be considered seriously, especially when India is planning to build 100 new smart cities.

Though citizens may be smart and have local knowledge to share, in smart cities digital skills are necessary for them to be able to provide their understandings to a wider audience and learn new knowledge reciprocally from others. Partridge (2004) explores the digital divide in a city given the fact that people live in a society where information is fundamental to the workings of everyday life. Smart cities enable more information and communications to take place in the digital or electronic environment. Governments, business and people are using the internet as a public face to disseminate, obtain, use, and exchange a variety of information with targeted groups and the general public. Partridge (2004) explores the psychological barriers that prevent people from integrating information and communication technology into their lives. She uses social cognitive theory to examine the psychological divide in a population in Brisbane, Australia.

Bajracharya, Cattel and Khanjanasthiti (2014) use the medium sized city of Gold Coast, one of the first cities pursuing the smart agenda in Australia, to test their proposed conceptual framework for smart cities. The framework integrates five equally important factors of cultural and natural amenities; technology; governance; knowledge and innovation precincts; and people and skills. From the case study analysis, they conclude that attracting and retaining knowledge workers, public safety, housing affordability, and employment opportunities are crucial matters. Data privacy, security and availability are important aspects but they should be made available in safe forms for collaboration innovations between academic, business and local people. They also observe that active engagement and participation of the local community in early planning process would help ensure the success of smart city developments, rather than just letting the smart city being driven by private and public sectors.

2.2.3.4 Post-technology focus research

Since 2014 to 2017, there was a shift from technology-based smart city programmes into human-centric approach. It was also moving away from advocating new and utopia cities (i.e. Songdo or Saudi Arabia) supported by ICT systems to the 'actually existing smart city' where data are generated and used by the people with skills and knowledge support (Shelton el al., 2015).

Still emphasizing the generation and usage of data, Shelton et al., (2015) argued that the actually existing smart city lies the potential for challenging the dominant neoliberal

framings of data. Especially, the data should be at the command and demand of local residents rather than outside actors, and the data collection and/or analysis systems are designed in a way as to emphasise the community's understanding and use of the data. Under this approach, the researchers emphasise alternative possibilities that are opened up by these new forms of data-driven governance. However, they note that only when these data policies are being designed and implemented by the existing cities, territories and rationalities could one understand the promise and the peril of the smart city model.

On the topic of smart urban governance, Meijer and Bolívar (2016) argue that smart city needs to be governed and they are for "a comprehensive perspective: smart city governance is about crafting new forms of human collaboration through the use of ICTs to obtain better outcomes and more open governance processes." As matter of fact much could be learned from the success and failure of e-government, which was considered as a close and relevant topic to the examination of smart city governance. A better understanding of smart city governance can then be built up sophisticated theories of socio-technical change.

In addition, Meijer and Bolívar (2016) indicate that "smart city governance is not a technological issue: we should study smart city governance as a complex process of institutional change and acknowledge the political nature of appealing visions of socio-technical governance." The call for more sophisticated socio-technical analyses of smart cities, in the researchers' view, can enhance the theoretical understanding of the (contextual and specific) interactions between social/governmental structures and new technologies. The better understanding could help to position smart cities as a fuel for transformation rather than being seen as a mystifying issue.

Also on the smart cities governance, Castelnovo et al., (2016) detect the need for a holistic approach to assessing urban participatory policy making. In which, citizen engagement is a fundamental foundation of smart city governance. They recognise that scholars, experts, and leaders are beginning to agree that a new form of public participation is both valuable and necessary. It is partly because the traditional methods for governing the complex interplay of technological knowledge, political constraints, and value conflicts underpinning public value creation and management are no longer sufficient for the current demands of public decision making.

Castelnovo et al., (2016) find that citizens' needs and institutional settings drive the decision-making process that underpins the—optimal—allocation of resources for public value services. The cities have different levels of adoptions of technologies and smart city solutions, depending on the achieved outcomes and impacts on beneficiaries that generate public value. The beneficiaries' perceptions and satisfaction also influence the perceptions of stakeholders (including citizens) of the public value associated with the services provided and hence the level of trust in government.

In order to help cities to have better ideas about how to influence citizens' needs, creating a continuous improvement process underpinning smart city governance -- which is coherent with the changing needs of the citizenry, the availability of resources, and a smart city's overall strategic vision -- Castelnovo et al., (2016) proposed a five dimensions' holistic framework. The first dimension is community building and management, which aims at assessing urban stakeholders' engagement in smart city governance and decision-making processes. The second dimension is vision and strategy formulation that focuses on assessing a smart city's capability of using strategic planning and implementing monitoring and evaluation techniques to generate evidence to inform future strategic plans. The third dimension is public value generation, which measures the outcomes and/or the long-term impacts of the initiatives implemented. The fourth dimension is asset management which assesses the generation of knowledge to benchmark the city's performance and provide an evidence base for the enhancement of current interventions and the development of future plans. The last dimension is economic and financial sustainability, which assesses a smart city's long-term sustainability and its ability to attract investment and manage change.

In an effort to address the shortcomings in understanding smart cities, Rob Kitchin (2015) identifies "the lack of detailed genealogies of the concept and initiatives, the use of canonical examples and one-size fits all narratives, an absence of in-depth empirical case studies of specific smart city initiatives, and comparative research that contrasts smart city developments in different locales and weak collaborative engagement with various stakeholders." Tackling those limitations would enhance the comprehension and the transition of smart city agenda, which had begun to make some conceptual and political involvements.

Moving from the effort of conceptualising smart cities, Komninos et al. (2016) analyse the current smart city applications with the aim to improve their effectiveness and to close the

gaps in understanding of their impacts on cities. They evaluate the applications in economic development and e-commerce, e-government and e-administration, and transportation and energy optimization because they are the most frequently targeted areas by smart city solutions.

They conclude that the smart city applications have to be able to change the daily routines and practices of the key stakeholders of citizens, organisations, and governments while being able to introduce novel and more effective ways of doing things. In addition, the limited effectiveness of smart city applications and the fact that smart city applications are unable to help cities to tackle bigger challenges and dreadful problems hinder a possible radical change in city competitiveness, sustainability, or inclusion.

Komninos et al. (2016) suggest that "city intelligence is a product of citizen engagement rather than of smart city technology." Therefore, designers and makers of smart city applications should include the input and advice of urban and innovation experts, user involvement, experience design, and crowdsourcing, to enhance the effectiveness and impacts of those innovative ideas.

Exploring smart cities from data analytics, Rathorea et al., (2016) employ the fact that physical systems (i.e. buildings, infrastructures…) are being increasingly embedded with devices including sensors, actuators, and smartphones, leading to a considerable business potential for the new era of the Internet of Things (IoT). IoT means all of the devices are capable of interconnecting and communicating with each other over the Internet.

The researchers propose a combined IoT-based system, containing sensors for homes, vehicles, weather, water, parking and surveillance objects, for smart city development and urban planning using Big Data analytics. The system is designed as a four-tier architecture starting from data generation and collection, to all types of communication between the devices (i.e. sensors), relays, base stations, and the Internet, to data management and processing, and the application and usage of the data analysis and the results generated. Their system aims at providing evidence for stakeholders to make informed decisions regarding the building and planning of cities in all short, medium and long terms. This is very much technology-driven and big data approach in the whole spectrum of smart city's agenda.

As mentioned previously, smart cities also use the data generated by the citizens via their personal devices including smartphones. While it is important to have the data source, Burak Pouryazdan and Kantarci (2016) analyse the trustworthy of the citizen-generated data in the form of crowdsensing, a form of getting the sense of what is going on by the data provided by the people with smart devices. The authors emphasize on a key question in smart city crowdsensing is "how to ensure the usefulness or value of the data collected from citizens in a participatory manner." They experiment the by redesigning the smart citizens and vote-based trustworthiness application and identify a certain proportion of the crowdsensing population as anchors. Although the determining the anchor proportion is a grand design challenge in the testing system, the authors find that no more than 5 percent of users are malicious. In other words, data generated by the crowdsensing are trustworthy and can be used for making sense of the activities and happenings that the people provide.

While admitting the role of technologies, Vestergaard et al., (2016) are not fully supporting the technology-driven approach, which has proven not to reach its expected impacts because it lacks a bottom-up approach where the city stakeholders have a much closer involvement in this process. They start to initiate smart city activities by approaching citizens, and from those activities, they begin to gauge a citizen participation paradigm.

The shift to citizen participation into the making of smart cities is a response to a gap between smart city deployments and citizen empowerment. In the context of technology-enabled environment, the citizen empowerment emerges through transparency, flexibility, and adaptation to individuals' needs. Citizens are users of those technologies and their empowerment denotes that they should be able to understand what is going on, the technology should be capable of taking into account the heterogeneity of the environment, and it should be possible for them to adjust a specific technological deployment. All of those empowerments are not being supported by highly automated systems in many of the smart city initiatives.

Therefore, Vestergaard et al., (2016) argue for larger and stronger citizen empowerment because they had seen that citizens actually care about their city, and like participating in the making of the city if the citizens know they can create an actual impact. The scholars believe that by giving citizens a voice in the city, they become more engaged.

Sharing the same argument for stronger citizen participation, Sherali Khatoun and Zeadally (2016) argue that "a city's "smartness" greatly depends on citizens' participation in smart city projects, through multiple communication tools (such as a municipality's Web portal, social networks, and smartphone applications). Smart cities need citizens to be continuously connected—in public places, in public transportation, and at home—in order to share their knowledge and experience."

In their views, citizen participation, as a part of social dimensions, must be taken into consideration at all stages of developing smart cities. And the smart city applications and tools should share the objective of effective management of natural resources and a higher quality of life for citizens. However, Sherali Khatoun and Zeadally (2016) also recognise that adequately maintaining this social dimension is a challenge and it is a vital aspect of a smart city's functionality. They think that once the smart city, with a strong social inclusion, is being exploited correctly, it generates huge benefits for both citizens and the city.

Other than the social inclusion, Sherali Khatoun and Zeadally (2016) name other challenges facing cities in their journey to become smart cities. The challenges include lack of investment -- despite some initial positive results in efficiency and effectiveness, high cost -- as the ICT tools and devices are still pricy, and privacy -- in terms of cyber securities for devices, systems and networks.

Along those lines, Angelidou (2015) justifies for a smart city "integrated smart city strategies help urban citizens become more informed, participatory and networked than ever. They help businesses become innovative, productive and agile. They forge an entire sphere of intelligence and sustainability." Smart cities can yield those outcomes because they can connect the physical space of cities with the economic and social sphere – a connection that although clearly existing, has always been troublesome for scientists and policy makers. The ICT tools (i.e. networks, sensors, actuators, cameras…) are proving to be more and more available and being infused into those physical spaces, thus enabling the cities to embrace forward-looking visions about their future. The knowledge and innovation economy that present in the economic and social realms show that the technological advancements, including those infused in physical spaces, have presented a whole new level of knowledge management and innovation capabilities in the city context.

Therefore, Angelidou (2015) supports the emerging approaches for smart and intelligent cities based on advancing and realizing both urban futures and the knowledge and innovation economy. Especially, there are four people-centric approaches should be considered strongly to build and nurture the desirable future smart cities having strong a knowledge and innovative economy. The approaches are advancement of human capital – citizen empowerment (informed, educated, and participatory citizens), intellectual capital and knowledge creation; advancement of social capital – social sustainability and digital inclusion; behavioural change – sense of agency and meaning (i.e. the feeling that we are all owners and equally responsible for our city), and humane approach – technology responsive to needs, skills and interests of users, respecting their diversity and individuality

Aiming towards a comprehensive and human-centred characterisation of smart cities, Lara et al., (2016) propose a new definition of a smart city "is a community that systematically promotes the overall wellbeing for all of its members, and flexible enough to proactively and sustainably become an increasingly better place to live, work and play". The authors highlight that this definition places people at the heart of smart city concept, however, it does not undermine the role of infrastructure, economy and sustainability—the four domains Nam and Pardo (2011) identify in their concepts.

Lara et al., (2016) argue that their new definition is being deliberately neutral in relation to the use of specific technologies or strategies, it implicitly incorporates the main approaches in literature, since that intelligence obviously manifests itself when the city promotes economic development with social justice and environmental sustainability. The definition also emphasizes the development of appropriate technologies for its local reality and applies governance processes that help build a community associated with the cultural values and lifestyle its residents desire to retain or embrace, which Neirotti et al. 2014 argue for.

The new definition is an effort to provide city policy makers with a common and context-free smart cities view that clearly explains what a smart city is. The clearer views can improve the current fuzziness of the smart city concepts, which are a major obstacle in convincing urban policymakers and administrators to invest further in smart city initiatives to transform their cities.

Sharing a similar aim of making the smart city concept clearer, Zubizarreta et al., 2016 conduct this a multidisciplinary analysis of smart cities, identifying applications from

different areas and also studying the level of integration among them. Using 61 applications employed in cities in South America, Asia, Europe and North America, the authors identify their common and distinctive characteristics in order to better understand how smart cities are evolving. The analyses show that apart from the people application, which has the lowest percentage, the most popular applications are those focus on business or marketing investments, not on a service for the citizens, managing a more sustainable way of living, a more stable economic growing, a way of working with faster, more comfortable, nor cleaner technologies. Also, the applications are working in silos rather than being integrated into local service applications, which will yield benefits of time, money, and resource savings for all involved citizens, companies, and governments.

Therefore, Zubizarreta et al., 2016 highlight a holistic approach of communication, the total interconnection between applications, people, and government. It is clear, in the authors' view, smart cities are not only an aggregation or a merger of some applications, they represent a new cultural idea of cities. The idea includes technology as a driver, a facilitator for the city development. The technologies should be used with clear strategies and good purposes to avoid catastrophic disorders.

The authors indicate that the holistic approach can enhance democracy, participation, urban design, ICT, and telecommunication components of the new strategic vision for cities. While there are many strategic choices, it is important to choose the correct approach involves the culture and idea of the city for tomorrow. Which city do we want for tomorrow? Zubizarreta et al., (2016) believe that "for answering this question, the necessary approach is to shift the focus from technology to the people."

2.2.4 Lessons learned

The smart city is a relatively new, international, conceptual urban development trend. It motivates cities around the world to capture the advantage of information technology and other key conditions to redesign cities to cope with new global challenges. The literature shows that agreement about what a smart city is and how it can be created is limited and still largely unexplored systematically. Part of the reason for this is the 'smart city', a definitive concept pulling earlier formulations together, has only been an emerging subject in academic research since late 2000s (Nam and Pardo, 2011; Alawadhi *et al.,* 2012; Neirotti *el al*., 2014; Angelidou, 2014). The newness of the subject creates a wide open opportunity

for academic research and for practical resolutions in helping cities to triumph in the 21st century (Glaeser, 2011).

Since a city is a complex system of systems operating in its intertwined economic, social and physical environments, it is hard to separate each of the environments as subjects for research because they are interdependent and interconnected. In addition, cities are of all shapes, sizes, stages of development, geographical positions, competitive advantages, needs, and aspirations. Therefore, the first wave of research about smart city opens up the needs and possibilities for interdisciplinary research that can both provide deeper understanding about smart city while generate new paradigms for cities leaders and stakeholders to apply in their quest to become smart cities.

A summary of the major lessons learned are below:

- There is no universally agreed definition of smart city among leading researchers and those cities that are pursuing a smart city agenda.
- Cities are embracing a smart city agenda to address their urban challenges including increasing competition at global scale for investment, talents and economic development.
- Smart city is being criticised as a trendy self-congratulatory process with its rhetorical aspects. Smart city is a nice label with high-tech variables and an apparent entrepreneurial emphasis that every city wants to see itself as being branded with.
- ICT is a key factor among the variables making cities smart or apparently smart. It is now used in many smart city initiatives deployed by pioneering cities. It has huge potential to help cities addressing their urban challenges in new collaborative, collective and contextual approaches.
- Current research focuses mainly on technology and its roles and applications in hard infrastructure of city physical environment. Policy for technology is also a research theme but has received very limited attention.
- Human capital, the empowerment of people, human interaction and involvement in the development toward smart cities are crucial. They are appearing as the most important factor in all factors that lead cities to a successful journey to become smart.

- There are some models developed for smart city initiatives and the smart city's core dimensions and the interactions of those dimensions, but they are yet to be properly researched for validation and relevance.
- There are very few empirical research, case studies and evaluation research about smart city initiatives that cities are applying all over the world.
- Researchers are using data from large cities around the world while the medium sized cities are not being analysed.
- The quantity of the research in different geographical areas is highly variable and not correlated with the number of cities that have been called 'smart'. For instance, there are very few studies of smart city in Asia Pacific, where the number of smart city projects is high, compared to North America and Europe.

The lessons show a wide range of areas for further research. For instance, cities are at different levels of development and in different geographical locations, how they are successfully developing smart city initiatives, what are the common success factors and what are the differences. Given that cities are operating in interrelated economic, social and physical environments, how should cities prioritise domains for smart city initiatives? Many cities are facing a series of urban challenges, how do the new technologies, including ICT, empirically help the cities to cope with the challenges?

Given the growing number of smart city initiatives that are under deployment, case studies, empirical and evaluation research can add to the understanding of smart city phenomena. The topic requires many research disciplines to come together for possible learning and solution for our cities to thrive.

Although human capital is widely recognised as one of the key variables in smart city studies, the literature on how to understand, address, capture, and mobilise it, has hardly been developed. The research reported here makes a particular contribution to that field, both methodologically and in the results obtained. Methodologically, the approach used created the largest number of participants and consequent data set ever reported in a smart city research. The results are therefore substantial, permitting analyses that carry statistical weight. As will be seen, this thesis explores how a city can engage, empower, and involve its local residents with their local knowledge and concerns in the process of recreating the city using smart city initiatives. The city citizens/residents are key stakeholders. Cities have

their services for and the responsibilities to address the citizens/residents' needs. Advanced ICT tools and solutions can help accelerate the process of connecting local residents' needs, concerns, understandings, and aspirations with cities' governments and other stakeholders of the similar city cause. The models for a smart city initiative can be tested to see their relevance in the actual delivery of a smart city programme in a particular city. It will help to track and validate the progress of the programme and lessons learned along the way. All of these would be possible when insights about citizens/residents of cities were established. These insights can later be used by local governments to include, empower, and steer the potential contributions of their citizens/residents for sustainable development of cities using the smart city context. This is the special relevance of this research.

2.3 Local Government

Local government refers to governmental levels at municipalities, counties, cities and towns. Depending on the levels of decentralisation and administration settings, governmental systems can be divided into two, three, or four levels. The Organisation for Economic Co-operation and Development (OECD) defines "local government units are institutional units whose fiscal, legislative and executive authority extends over the smallest geographical areas distinguished for administrative and political purposes". The OECD comprises major democratic systems that this thesis refers to in literature and practices including the United States, United Kingdom, France, Germany, and Ireland.

While local government performs a role of extended administrative functions for the central, state, or federal governments, local government also plays an important role in the everyday lives of citizens. People have direct interactions with local government whether it is administrative demands or other public services that they are entitled or seeking (Pina and Torres, 2001). Citizens and residents show up at local government offices or use the local governments' websites and other newer ICT tools to register for different types of administrative procedures such as registration for birth, death certificates, paying taxes, social housing, construction permits, and many other services.

In addition, local government is also the first frontier for democratic participation (IDEA, 2001; Musso *et al.,* 2000). Local government provides venues for concerns and involvement of the grassroots (Copus and Erlingsson, 2013) and ordinary people to be heard while it is also the intersection that deals directly with the citizens on behalf of the state, thus, it is

being scrutinized for governance (Gaventa and Valderrama, 1999), efficiency, and effectiveness. Local government is also where current processes for strengthening participatory democracy become more evident (Licha, 2002), and that participatory decision making has greater usefulness at the local level (Fung and Wright, 2001; Irvin and Stansbury, 2004; and Mizrahi *et al.,* 2010).

While the subsequent reviews of citizen engagement and participation, in the section Citizen Engagement, will provide relevant literature about how the citizens are using different ways in which they can participate in democratic practices and systems including local government (Yetano, Royo and Acerete 2010), it is now necessary to understand the challenges facing local government in the past few decades.

2.3.1 Challenges

Local government are facing growing pressure from budget cuts, revenue restructures, changes in service responsibilities, and growing demands of the people for public services. As the closest level of authorities dealing with daily demands of the people, the pressures for local government to find ways to cope with the situation becomes imperative. Furthermore, local governments have to compete within the context of global trends, urban developments, and economic developments (Cudden, 2015; Copus and Steyvers, 2017). While local governments have to adapt to the consequences of the economic crises, there is a stronger focus on supporting local economic development, with a new emphasis on action planning with robust monitoring and impact measurements. Amid the global economic growth push, cities are competing toughly for inward and outward investment, talent, and tourism. A lot of the time, the investment decisions are being made between cities rather than at country level, especially when it comes to unified policies for those activities like those in the EU.

In the past few decades, there is an extensive literature setting out the advantages of an urban setting with associated concentrations of knowledge and innovation, which leads to increased productivity and economic performance (Glaeser, 2011; Krugman, 1991; OECD, 2006; Porter, 1990; Sassen, 2011). Successful cities are ones that are able to differentiate themselves through their infrastructure offering and liveability (National Competitiveness Council, 2009). These trends are visible in almost all democratic systems in North America, EU and elsewhere.

In the US, Martin *et al.* (2012) argued that the bursting of the housing bubble, the banking crisis and the resulting great recession of 2008 altered the landscape for local government negatively and significantly. Property taxes and sales taxes that flowed throughout the local government decreased significantly. The decreased values of housing cost the US some estimated $240 billion (Martin *et al.,* 2012) in consumer spending, consequently, relevant taxes were slashed, causing great revenue loss for local governments. Moreover, local governments had to suffer from a continuous decrease from federal funds, while the situation got worse when state-shared revenues also underwent huge reduction. The consequences of the financial drops forced local elected officials and administrators to handle those business-as-usual services differently. Martin *et al.* (2012) pointed out that there should be a 'new normal' as there was no way local governments could return to the levels of operations that they did before the crisis. Furthermore, they could not recover the finances, employment, and services because of impacts from globalisation trends, which they had little influence of but suffered quite badly in terms of destabilised labour markets, communities and revenues. Whilst, many of the local governments had to use the recession to undergo what some had called as long overdue reforms (Buntin, 2010; Davy 2010; Greenblatt, 2011; Maher and Neumann, 2010; and Rauh, 2011).

Apart from the revenue losses, local government went through serious human resource cuts. Public sector job reductions in the US reported at 850,000 cases, with local governments lost the biggest shares because they accounted for 65 percent of the total public sector jobs (Martin *et al.,* 2012). In addition, those who were lucky to still keep their jobs had to experience their salaries and benefits reduced, resulting in serious issues including employee efficiency and their public engagement at local governments.

Consequently, local services also were reduced in the number of services offered, in the quality of the services and in the increased costs for the services to be delivered. Cities had to cut expenses on public lighting, libraries, parks, and recreation activities while more serious services such as policing or firefighting also faced cutbacks (Martin *et al.,* 2012).

The situation was similar in the EU. Warner and Clifton (2013) reported severe cutbacks across EU cities, and it was particularly critical in cities located in the EU's periphery. In one of the most comprehensive surveys of the impact of the crisis, which included responses from 131 EU cities, it concluded: "cities have often been the last to be consulted about major decisions" and yet are "on the frontline of the crisis" (Warner and Clifton, 2013). Like the

American cities, European cities faced rapid and severe decreases in tax revenues, and huge cutbacks allocated budgets from the national and EU levels. These force the cities to cancel or defer without further notice on many projects. The funding scarcity also caused gridlocks for cities to access European financing schemes that required co-financing or cost-sharing in operation and management of those programmes, leaving the cities in a vicious circle.

In addition, European cities went through severe declines from the central governments in the name of austerity (Copus and Steyvers, 2017; Teles, 2012). Warner and Clifton (2013) reported that the situation was most serious in the cynically named 'PIIGS' (Portugal, Ireland, Italy, Greece, and Spain). The austerity measures were applied at stricter rules in exchange for a series of Troika bailouts to Greece, Ireland, Portugal, and Spain. Along with deep cuts across all levels of public spending, the measures also involved some public services traditionally offered by the local governments to third party service providers under privatisation programmes. Similar to their peer cities in the US, many cities in Southern Europe had to cut back on public services including public health clinics, social housing, and libraries, whilst controversial extreme measures were planned such as privatising hospitals in Spanish cities of Madrid and Valencia.

While it is true that austerity measures resulted in hardship for many including the local governments, they could be sources for innovations and tests for creative and resourceful ideas for all. Warner and Clifton (2013) saw that cities ride along austerity measures to become market makers, they argued that, increasingly, cities joined together in new forms of cooperative contracting—creating public markets with other local governments to gain scale and cost efficiencies (Holzer and Fry, 2011). A more detailed review about how the local governments innovate under such circumstances will follow in the discussions of co-production with crowdsourcing as an innovative adoption method from other disciplines.

In the meantime, local government in Ireland was not exempt from the mega trends facing the American and European local governments. Serious cutbacks in revenues; allocated funding from central government (Considine and Reidy, 2015); and human resource caused serious disruptions not only on the daily operations but also on the strategic developments of many cities, towns, and regional areas in Ireland. For example, in human resource alone, Irish local authority staffing decreased by 24.2 percent nationally in five years to 2013 while gross savings of €839 million were achieved in the period 2008–12 (Quinn, 2015).

In Ireland, local governments exist for two essential reasons: as a manifestation of local democracy and as a provider of local public services (Weeks and Quinlivan, 2009). What was even more extreme happened in local government was the elimination of a huge number of the local level authorities. Before 2014, there were 114 local authorities that comprised county councils (29), city councils (5), borough councils (5), and town councils (75). In 2015, all the town councils were abolished while some of the city and borough councils were merged to make up a total 31 local councils. The move expanded the local service coverage of Irish local governments. Following the Local Government Reform Act 2014 (LGRA 2014) and prior reshuffles, a number of functions that were usually taken care of by the local governments were redirected and removed from the local governments' responsibilities. For instance, water supply and waste water were removed from the management of local authorities to form a national state company, Irish Water. Education funds that used to be assessed by local authorities before being granted to students based on their economic status, are now under business operation of a centralised system controlled by an agency set up by the central government. Local governments were left with housing and public buildings; local road transport and safety; sewages, development incentives and control; environmental protection, recreation and amenities; parts of agriculture activities; limited education funds; welfare; public lighting, and miscellaneous. Irish local governments receive funds from commercial rates, charges for goods and services, and transfers from central government; however, they were all underperformed or underfunded compared to the periods before the economic crisis.

Local governments in Ireland also followed the post-crisis of reforms (Reidy and Buckley, 2017). Quinn (2015) pointed out that the form, functioning, and financing of local government were recurrent reform subjects in Ireland. Restructures and changes were evident in political, administrative and decision-making arrangements. For instance, the scope of existing functional programmes and the approaches of implementation had changed noticeably following the LGRA 2014 and other policies. Whilst local funding sources were partly resolved, including 80% of local property tax which was retained locally in 2015 and 2016 to fund vital public services. The centralised financial domination from Dublin is still quite strong. Being the unit of public action closest to the citizen, local government is the level at which people expect their concerns to be acted upon. It is true that some of the people's concerns remain traditional in some sense (i.e. registration, taxes). However, their concerns are also changed quite a lot because of newer contexts and

challenges facing the people in modern days. These, consequently, require local governments to not only serve for the democratic, developmental and delivery functions but also transform their own systems, whether operational or strategically, by continuous reforms with the intention of achieving the most relevant and effective arrangements for the people.

In addition, the motivations for reform also initiated from internal catalysts such as political concerns, financial concerns, territorial issues, a drive for efficiency or a desire for democratic renewal, while external influences such as international trends, global pressures, Europeanisation, changing patterns of participation and technological opportunities have also shaped reform efforts (Quinn, 2015). Among the reforms, the trends identified below are under implementation in full or in parts, depending on priorities and resources available:

Territorial and Functional Reforms

- Implementation of new layers of government
- Functional and financial decentralisation/devolution/deregulation
- Boundary reforms/Amalgamation
- Inter municipal cooperation

Management reforms

- Budgeting reforms, output orientation, global budgeting
- Intra-organisational decentralisation
- Customer Orientation
- Privatisation and public private partnership

Local political reforms

- Changes towards more direct participation
- Direct election of mayors, executive mayors
- Local referendum
- Changes in local representative democracy
- New electoral laws
- E-government, E-voting
- Introduction of governance structure (advisory boards)

- Neighbourhood councils, round tables, forums, future conferences.
- Changes in the role of the local councillors

Within these reforms, local governments saw opportunities to do their business differently by engaging and collaborating with non-state partners (Copus and Steyvers, 2017), and citizens to participate in different stages of developing and delivering public services. By involving citizens/residents and other stakeholders in the whole processes of public services delivery, local governments can meet multiple goals including legal requirements on citizen participation; diversified financial resources; shared responsibilities; reduction of operational costs; and many others. Local spheres, including cities, become market places that could be fertile for marketization. And as Warner and Clifton (2014) noticed mixed market solutions were on the rise, and cities, playing the roles of local governments, recognised that they must play a critical market management role (Girth *et al.,* 2012).

Along the flows, there is now an urgency for proactive collaborative work in both administrative and political areas in city and county boundaries, and citizen engagement is no longer optional (Nalbandian *et al.,* 2013). Despite the fact that local governments consistently earn more trust from people than central governments and political parties in the Standard Eurobarometer 78 (EC, 2013), at 44% versus 27%, local governments are still struggling to increase the public trust. In the meantime, researchers argue that direct citizen participation at high levels increases trust (Kim, 2010) and that the levels of trust are directly correlated with the ethical performance of the local governments (Halvorsen, 2003). In a separate study, Maesschalck and Bertok (2009) found that citizen participation is an embedded element in the key four functions (i.e. defining, guiding, monitoring, and enforcing) of the integrity management. Whilst facing the budgeting drops, the local governments are looking into the participation of the public via citizen engagement to provide public services in new business co-production models.

2.3.2 Co-production

The basic meaning of co-production is the action that requires at least two parties (i.e. people, organisations, institutions…) to come together to create something together. Therefore, in public policy, administration, and management, co-production and co-creation are sometimes used interchangeably (Voorberg *et al.,* 2014). The new technical terms (i.e. co-production and co-creation) were adopted under a larger theme of innovations in public

policy, administration, management and renewed democracy. Ideas were explored and experimented to revive the attentions about public goods and thus democracy. In addition, there is a recognition that government can no longer work alone (Teles, 2013).

As reviewed above, given fiscal constraints, citizens are asked to collaborate and help to ensure the quality of life in their city. The past decades have witnessed increasing pressures on urban government to provide more and better quality services while at the same time holding the line on (or reducing) costs. Local government officials, therefore, must strike a delicate balance between the fiscal capabilities of the city on the one hand, and the service expectations of the citizenry on the other. While the response of many municipalities has been to resort to drastic solutions such as the elimination of certain types of services, the assessment of service user fees (or increasing existing fees), or adopting broad cut-back management programmes, academics as well as some city officials have identified another alternative: "co-production" of municipal services. Co-production is an emerging conception of the service delivery process which envisions direct citizen involvement in the design and delivery of city services with professional service agents. In this manner, co-production proposes an answer to the more services-less cost dilemma: by supplementing-or perhaps supplanting-the labours of paid public officials with the service-directed activities of urban dwellers, co-production has the potential to raise both the quality and the efficiency of municipal services. The first is predicated on the idea that citizen participation is involved in the provision of any service co-production may be understood as "the active involvement of the general public and, especially, those who are to be the direct beneficiaries of the service" Sharp (1980). In addition to the assistance, voluntary, and self-help activities described by Whitaker (1980), citizens engage in co-production by setting the social and/or physical conditions in which services are delivered.

In short, "the co-production concept is based upon the recognition that public services are the joint product of the activities of both citizens and government officials," wrote Sharp (1980).

Co-production requires a "critical mix" of regular producer and consumer (citizen) activities. These activities are positive (rather than negative), voluntary (rather than compliant), and active (rather than passive) in nature. Through the implementation of individual, group, and collective co-production programmes, the quantity and/or quality of

city services may be enhanced. Because the city as a whole may accrue considerable benefits under collective co-production, this type may be of special interest to local officials.

Within public services, co-production and co-creation conceptualise service delivery as both as an arrangement and a process, in which citizens and governments share and join responsibility in producing public services (Marschall, 2004). As Sharp (1980) explains: "urban services are created through the interaction of citizen behaviours and the activities of public officials and both contribute to the resulting quality of urban services." Meanwhile, other schools of thought highlighted the aspect that co-production focused on the role of citizen involvement in the provision of local public goods and in the ways in which institutional arrangement foster this participation (Pammer, 1992; Sharp, 1980).

There are many aspects of the co-production ranging from objectives of the processes, factors that influence the process, to outcomes of the processes. Also, because the processes involve at least two parties (i.e. citizens and public authorities), there are complexities in understanding the differences, intentions, and factors that define the parties, especially the citizens, before joining the processes. Amid the complexities, a few researchers have pointed out that co-production, therefore, depends on both the voluntary actions of citizens and the existence of meaningful opportunities and arrangements for their participation (Gittell, 1980; Pammer, 1992; Sharp, 1980).

The existence of meaningful opportunities is one of the most challenging issues given the various settings of different democratic systems and administrative establishments. As the Citizen Engagement section (Page 73) will provide a deeper literature about this topic, there is an overall agreement of a serious decline in citizen engagement and participation in political processes. However, there are chances for the citizens to engage and participate in issues that are more relevant, practical, and closer to the citizens, especially at local government levels. For instance, opportunities for civil actions could range from institutionalised or formal roles, such as community policing in charter schools in the US, to more informal and supportive roles including some neighbourhood activities of keeping their outside lights on at night or parents volunteering to help out at their local school. Despite the fact that there are various forms, modes, and arenas for citizens to participate, the co-production requires active citizen participations and involvements. Only when the active participations are present should the capacity of government to provide public goods and services be improved and enhanced.

In fact, the active participation attitudes of the local citizens and residents associate with the information and awareness of the happenings, locally, regionally or nationally, that they become more aware of, attentive and communicative among themselves and with the local authorities (Brudney, 1984; Rosentraub and Sharp, 1981; and Marschall, 2004). As Marschall, (2004) wrote "for co-production to work citizens must be informed about important aspects of local public services, the responsibilities and duties expected of them, and the environmental factors that may affect the provision and quality of these services. For example, in order to assist police officers to fight neighbourhood crime, residents should know how to contact their local police department or neighbourhood watch group if they have a problem or important information to report. The key point is that the provision of public goods and services depends upon the attentiveness of both citizens and public officials and this characteristic further distinguishes this type of citizen participation from other more traditional behaviours."

In addition, it is necessary to acquire understandings about a broader range of behaviours and practices of participants toward the co-production processes, such as their involvement in non-political organizations, and participation in activities that are more supportive and volunteerism. While it is important to mobilise and recruit citizens for the co-production processes, the same is true of governmental and organizational participants. Since co-production also aims at the implementation stage of public policy and the interdependent relationship between citizens and governmental participants, it requires even deeper understandings in the interactions of individuals acting with the broader institutional and contextual settings in which individuals are positioned. In other words, the interactions are more complicated and should be analysed in different layers to harness the best behaviours for co-production to function.

In a separate research, Bovaird (2007) argued that co-production in the planning and delivery of services resulted from citizen co-creation efforts, in which citizens were involved early on and shared the responsibilities with the local governments to solve the challenges in the delivery of the public services in their locals. The researcher viewed citizens and residents as public service users. The users and their communities should be enabled to be at the centre of the decision-making processes. The processes reflected as emergent strategies for the front line in public services while it also required politicians and professionals to work in new ways to interface with service users and their communities.

This means policy makers and politicians have to consider co-creation and co-production with citizens as a necessary condition to create innovative public services that actually meet the needs of citizens. The needs came from a number of localised societal challenges, like ageing and urban regeneration, and all of this within the context of austerity, that happened in a number of countries including the US and the EU. Therefore, citizens should be perceived as an important partner in developing and redesigning of public services. They could be co-initiator, co-designer, and co-implementer of the public services and each of levels of citizen participation requires specific opportunities given formal or informal arrangements.

Sharing similar view about the role of citizens, Brudney and England (1983) wrote “co-production is considered the critical mix of activities that service agents and citizens contribute to the provision of public services. The involvement of the former consists of their work as professionals, or "regular producers," in the service process. Citizen co-productive activities, or "consumer production," are voluntary efforts of individuals or groups to enhance the quality and/or quantity of services they receive. Based on this definition, three types of co-production are distinguished according to the nature of the benefits achieved: individual, group, and collective.”

Jing and Besharov (2014) saw another driving force for co-production in a larger context of countries. They wrote “despite their varying contexts and conditions, countries have jumped on the bandwagon and embraced the idea of thinner, more adaptive, more entrepreneurial, and more collaborative government. This, in turn, raises the overarching question of how government can adopt and manage collaborative processes that are sustainable and vital. Although this demand creates strong momentum toward innovation and synergy in the public sector, it challenges existing values, processes, and institutions of the government.”

However, from the country level, it is too large to adopt the co-production models effectively; therefore, there is a need for decentralisation and multiple centres. This could be seen in the rising model of polycentric governance, which reflected perceptions about the appropriate functions and manners of government that maximize the good of public intervention and re-establish a natural order of mutual dependence in highly developed human societies. As mentioned previously, governance at those decentralised and multiple levels in its various forms, required a fundamental rethinking and reform, especially in the fast urbanisation and globalisation context.

Sharing this school of thought, thinkers such as Tom Kuotsai Liou (2007) and Osborne *et al.* (2013) argued that today's collaboration can be based on different intellectual traditions like classical public administration, new public management, and good governance. Market-based collaboration prefers competition, efficiency, and incentives for innovation and success, while stakeholder-oriented collaboration and strategic user orientation favour participation, networking, and long-term goals. And government roles include preventing a simplified strategy of going collaborative co-production and trying to complete a missing link of effective service delivery.

However, the widespread adoption of collaborative methods in the world had also raised a real challenge to the capacity of government, especially the local government with limited resources, to manage such cross-boundary relations. As a part of seeking areas for improvement for governments to cope with the challenge, Jing and Savas (2009) proposed four major areas of capacity development for governments, including the local governments, in order to manage collaboration: contract management, market/civil society empowerment, social balancing, and legitimization.

Analysing empirical research in Canada, Graham and Phillips (1997) found that one of the key developments in the government reforms in the past two decades was the dramatic increase in co-production: "an arrangement between a government and a voluntary or private sector partner for (some combination of) joined policy making, funding, production, delivery and management of a service or good to a particular constituency or the public at large." While the trends were apparent, there was little understanding of how they work best and how they interact with contemporary points of conjunction between the individualist and collectivist citizenship regimes. It is necessary to understand that citizen engagement had to balance the individualised and collectivised perceptions of citizenship and that citizen engagement should be transparent (Graham and Phillips, 1997). The researchers suggested an additional principle of openness and flexibility in the processes for engagement and collaboration with citizens. In particular, the processes should incorporate opportunities for both education and engagement and they should be integral to the involvement of both citizens and government personnel. In order for governments to utilise the collaboration effectively, they have to enhance their capacity for governance by addressing the democratic deficit and beginning to restore their legitimacy as political institutions (Graham and Phillips, 1997). Among the first steps, governments could consider new forms of sustained

relationships with citizens by identifying and cultivating trusted relationship towards the development of new citizen-centred practices. It also was proven that the citizen-centred governance depended on involving citizens very early on in the engagement processes with regular reviews and tests for relevance while sharing the driving wheels based on the agreements.

In an analysis from a democratic renewal angle, Papadopoulos and Warin (2007) viewed co-production of public policies as an indication of the quest for more effective political choices through the establishment of participatory mechanisms. While it was related to the upsurge of the service economy and service society in the US in the 1970s (Fuchs, 1968; Gartner and Riessman, 1974), co-production was taken up and developed in the theory of public choices (Whitaker, 1980). Then it evolved toward debates on administrative reforms and the measurement of public performance, with a focus on the key question of transformation of the role of the state. In Europe, where Germany led the way, the co-production models had ensured success both in theory and practice for the reason that debates on social policies and public services had attracted positive attention to citizens' role in the production of the public welfare (Wirth, 1986). Co-production of public policies was addressed extensively by administrative officials as ways to improve the quality of services and solutions to mitigate budgetary restrictions. Co-production requires active and effective participatory of citizens and other stakeholders. Therefore, well-designed and well-organised participation arrangements throughout the policy processes could favour a 'win-win' reasoning because policies would be increasingly perceived as the outcome of a 'co-production' including their beneficiaries. Numerous researchers had demonstrated that citizens are capable of producing efficient services through participation (Ostrom, 1981; Tu, 2013) and that citizens' input as a new element should be considered as another important dimension of capacity. The co-production, in principle, also ensures there would be a partnership between government agencies and citizens to achieve valued outcomes for both.

Along the topic of co-production, Nabatchi et al., (2017) define coproduction as an "umbrella concept that captures a wide variety of activities that can occur in any phase of the public service cycle and in which state actors and lay actors work together to produce benefits."

They believe the definition is sufficiently broad to maintain the generalizability of the concept and ensure its usefulness to a range of scholars and situations. In addition, it allows

for the specificity scholars need to categorize activities, position and compare findings, and ultimately improve research validity.

Nabatchi et al., (2017) introduce a new coproduction framework that includes the three levels (individual, group, collective) and the four phases of the service cycle (commissioning, design, delivery assessment). The framework creates a 3 x 4 matrix that indicates the levels and phases of coproduction; they also differ by characteristics related to the who, when, and what of coproduction.

The scholars call their framework as the typology which provides terminological clarity by acknowledging coproduction as an umbrella concept and offering the vocabulary for defining and describing its variations. They believe the typology sets the platform for stronger empirical research on co-production. Specifically, distinguishing among variations in co-production will ease the challenges associated with explanatory analyses and comparative research.

Also on co-production, Eijk and Steen (2016) use socio-psychological factors (i.e. perceived salience, ease, internal efficacy, external efficacy, and trust), socioeconomic variables and social connectedness, and self-interested and community-centred motivations work together to identify one's decision to participate in co-production.

While coproduction can yield benefits for all participants, only a small number of citizens respond to governments' initiatives to engage a broader range of citizens. The situation might improve if there is knowledge about why some citizens are willing to actively take part in the co-production of public services while others do not. This understanding can help to improve the methods of participant recruitment and the design of co-production processes.

Eijk and Steen (2016) realise such gaps of why do citizen engage in the coproduction of public services, in both theoretical and practical knowledge, and decide to investigate with the aim to improve the current situation to a better stage of more engagement and stronger co-production, especially in a city context. They find that networks turned out to be important, for instance, a member of their network already became aware of the possibility of engagement, can influence their network member as they feel committed, and perceive the council to be something relevant and important. People engage when there are actual problems that need to be addressed. For instance, citizens detect abnormal things or face

troubles themselves can become aware that they can contribute to the solution of these problems. Also, people are curious and care about their surrounding environment, they want to know what is going on in the organisation that has a strong influence on their community and that they can get good information directly from the management. It is necessary for a presence of a feedback loop because they would decide to continue to engage when they have a good experience during the process and know that their voice does matter.

Eijk and Steen (2016) conclude by offering three sets of factors to impact on citizens' decision to engage in the co-production of public services: "perceptions of the co-production task and competency to contribute to the public service delivery process, individual characteristics in terms of socioeconomic profile and social connectedness, and self-interested and community focused motivations."

On the topic of social media and citizen engagement Skoric et al., (2016) prove that social media use has a positive relationship with engagement and its three sub-categories of social capital, civic engagement, and political participation. Using data from social network and media-sharing sites including Facebook, MySpace, YouTube and Flickr, the researchers find small-to-medium size positive relationships between expressive, informational, and relational uses of social media and the indicators of citizen engagement. For the users who focus on identity- and entertainment-oriented uses of social media, there is a little evidence supporting their relationship with citizen engagement.

The findings indicate a positive role of social media in promoting citizen engagement especially among those users who focus on informational, expressive, and relational uses of social media.

Also on the use of social media, Díaz-Díaz and Pérez-González (2016) analyse a case study of the platform Santander City Brain, managed by the City Council of Santander (Spain) with an aim of contributing to broadening the knowledge on ambitious social media projects implemented by local public administrations for e-Government. The analyses come from a fact that some governments have proven social media's potential to generate value through co-creation and citizen participation, and municipalities are increasingly using these tools in order to become smart cities. However, the authors see a few public administrations have taken full advantage of all the possibilities offered by social media and, as a consequence, there is a shortage of case studies published on this topic.

By studying the case in details, Díaz-Díaz and Pérez-González (2016) prove that virtual social media are effective tools for civil society, as it is able to set the political agenda and influence the framing of political discourse; however, they should not be considered as the main channel for citizen participation. They also discover other required elements for citizen participation. They are the determination and involvement of the government, a designated community manager to follow up with the community of users, the secured privacy of its users, and a technological platform that is easy to use. Also, the Public Private Partnership model contributes some advantages to the success of the case study, such as opening new sources of funding.

Overall, co-production responds to the emerging needs of both governments and citizens in crafting and implementing good public services. While there are many associated variables and factors to make co-production work and work effectively and efficiently, instruments and tools can be explored to bring two sides of authorities -- representing the governments, including local governments -- and citizens, who also can form their various forms of association. One of the instruments or techniques is crowdsourcing which has been proved working in the co-production strategy.

2.3.3 Crowdsourcing

Crowdsourcing is mostly used in computer science domain, mainly in software developments where specific and sometimes rare skills are needed. The concept comes from principles that more ideas and minds put together are better than one single idea and one mind, and that shared goals could be met by shared resources including human resources, expertise, and budgets.

From business strategy and innovation literature, Seltzer and Mahmoudi (2012) argue that crowdsourcing is an open innovation format that refers to the conscious effort by firms to incorporate ideas originating outside the firm in innovation processes within the firm or to send internally created ideas outside of the firm for commercial application. They see the key technique of ‘‘crowdsourcing’’ could yield positive results by issuing a challenge to a large and diverse group in hopes of arriving at new solutions more robust than those found inside the organization. In the early 2000s, the term ‘‘crowdsourcing’’ was identified with a series of articles written by Jeffrey Howe in *Wired* magazine (2006), where Howe reported the rise of what he identified as a counter-current to the outsourcing of problem-solving to

firms in India and China from North America and Europe. Crowdsourcing was then defined as a ‘‘collective intelligence system’’ characterised by three components: an organization that directly benefits from the work of the crowd, the crowd itself, and finally a platform able to link the two together and to provide a host for the activity throughout its lifecycle.

Detailing the platform for crowdsourcing to work, Aitamurto, Leiponen, and Tee (2011) identify crowdsourcing as an open innovation mechanism based on and enabled by information and communication technologies. They find that a community-based and crowd-sourced approach is best used when innovations are based on past advances. In other words, crowdsourcing utilises local understandings, common practices, and sometimes the habits of the potential end-users of the innovation outcomes. They suggest that there are multiple ways for crowdsourcing to take root including collaborative community-based approaches, competitive market-based approaches, those relying more on competition among participants for creating the ‘‘best’’ solution. Among these mechanisms, those which enable widespread and parallel experimentations should be prioritised and highly considered. However, they also warn that crowdsourcing could be problematic if the problem sent to the crowd is poorly defined, and when feedback enabling the crowd to better-fit solutions to needs is poor to non-existent. A lot of the time, crowdsourcing is used as a one-time experiment, whereas, like any other techniques, it requires repetition and fine-tuning with strong ongoing stewardship and applications.

From software development and scientific problem-solving perspectives, Zheng, Li, and Hou (2011), Leimeister *et al.,* (2009), and Lakhani *et al.,* (2007) find that motivation for participation in crowdsourcing is a mixture of intrinsic and extrinsic factors. To most of the investigated solvers, the motivations to participate in an idea competition include opportunity to learn, direct financial compensation, self-marketing or skills demonstration, and social motives. These motives highlight their extrinsic factors of opportunity to make money, the potential to find additional work and job opportunities, and the positive attitudes toward the community involved together with the intrinsic factors such as the opportunity to develop one’s creative skills (Leimeister *et al.,* 2009; Zheng, Li, and Hou, 2011; and Lakhani *et al.,* 2007).

Within government and public policy analyses, Warner (2011) argues that crowdsourcing can be an extremely useful resource for government; “it supports transparency, promotes participation and has the potential to bring together wide areas of expertise to allow for real

collaboration. Investment is relatively low." Again, crowdsourcing needs ICT tools to enable participants to actually collaborate. The ICT tools are mainly software applications to support crowdsourcing. The choices of software are available, inexpensive, and scale well although they need some modifications depending on the selected applications to encourage various levels of collaboration and linkage among moderators, participants, and others. Warner (2011) identifies that the main investment to support crowdsourcing is in knowledge workers who are trained to fully leverage the wealth of information they might gain by initiating a crowdsourcing project. It is important to support these knowledge workers to be comfortable in interacting using social media, and dealing with rapid change given the complexity of the projects they involve. That is why crowdsourcing attracts not only experts who are able to analyse and synthesise diverse contributions effectively but also enables them to acquire new skills and knowledge, especially those in the public services. From those activities, they can be developed to master more demanding jobs which usually are very attractive to the best and brightest citizens. Those who experienced crowdsourcing projects also learned to continuously and effectively keep tabs on their friends, colleagues, local issues, and global issues through a variety of rapidly changing information resources and social networking tools.

Additionally, Koch *et al.,* (2011) argue that Internet-based crowdsourcing and co-creation platforms had changed the way how firms implement open innovation. From the private and for profit sectors, the technique allows new participatory problem solving and value-creation processes. However, Koch *et al.,* (2011) detect that the current discussion on open innovation had hardly touched upon the public sector, where the researchers decided to examine if crowdsourcing platforms could be applied in the governmental context, and under which conditions. Their results showed that crowdsourcing may generate strong interest among citizens and may serve as source of new high-quality input. However, their findings also indicated that design principles derived from open innovation projects in the corporate world may not be directly applied in the governmental context; they need to be adjusted and complemented.

In a wider general science, crowdsourcing refers to a method of gathering and/or analysing data that is led by non-experts. It is used in situations where the amount of data that must be dealt with is so large that it is not feasible or economical to employ experts, but which the task also cannot feasibly be automated. It has been used successfully in many different areas,

for example, gathering data on habitats of insects and animals (Silvertown *et al.,* 2015), classifying high fidelity photos of deep space (Tinati *et al.,* 2015), and DNA analysis (Khatib *et al.,* 2011)

Researchers that have successfully used crowdsourcing to gather useful and valid data emphasise the importance of designing and managing the process through which data is gathered. People will engage willingly and usefully in crowdsourcing if the task assigned to them is simple and clear, and they can see how their work is contributing to science (Tinati *et al.,* 2015).

The European Union (EU) emphasises the importance of citizen engagement in smart city projects, to empower EU citizens at the local level, to improve success rates and foster citizen ownership of programmes (Pham, 2014) and to improve quality of life for citizens. It is considered that the programmes would be more likely to invite residents within the project boundaries to become strong advocates for the projects.

More generally, there has also been a growing recognition in recent years of the importance of collaboration and dialogue between design teams and stakeholders at all stages (design, development, testing, implementation, evaluation) of projects that have the potential to affect those stakeholders (Wright and McCarthy, 2010). This is the case with SC projects, but also in any context where IT is introduced in order to improve services, from work design (Greenbaum and Kyng, 1992) to mental health services (Hagen *et al.,* 2012). The practice of designing products and services in close collaboration with potential users is referred to as Participatory Design.

Research is also increasing in an area called ‘digital civics’, which aims to understand how technology can be used to promote and improve community participation, political engagement and democracy (Olivier and Wright, 2015). For example, projects have examined how data can be gathered (Taylor *et al.,* 2012) and displayed (Koeman *et al.,* 2014) on a hyperlocal scale to improve participation in local decision making. Research in this area often follows participatory design principles where the community is encouraged to not only engage in dialogue with designers, but to drive decisions about how technology is designed and implemented (Wright and McCarthy, 2015).

In contrast with the participatory community focused design studies mentioned above, it is often the case that existing SC initiatives focus on technology testing rather than directly

addressing practical and immediate problems with the information infrastructure of a city. While these studies aim to prove that certain technologies could work in real world and scaled-up settings, such an approach rarely takes advantage at the outset of the potential contribution of resident engagement in ensuring the success of initiatives when real-time adoption of the solutions is proposed (LSE, 2015).

By and large, the reviewed literature of local government, co-production and its technique of crowdsourcing reveal a fact that innovations from private sectors could work in the public sector. Many researchers have argued and proved that modifications and innovative adoptions of those strategies and techniques could work well in crafting solutions that address public issues. While the review of applications of ICT in citizen engagement section highlights conditions, factors, motivations, and other provisions, local governments also face another set of challenges in order to facilitate co-production and especially the crowdsourcing technique to work. The set of challenges arises in digital provisions that are associated directly or indirectly with ICT infrastructure, levels of ICT adoptions, and perceptions that promote or hamper the ICT applications by the end users who are ordinary citizens/residents. These challenges are evident at national, regional, and local levels. Remedies are being identified in order to address the challenges at all levels of government. However, given the juxtaposition of local governments with their citizens and residents, the challenges should be explored systematically to help local governments, including cities' governments, to limit their impacts while promoting better settings for locally generated innovative ideas to thrive.

The use of ICT is becoming an apparent and inevitable part of the social and economic progression of countries inside the OECD (Selwyn, 2004) and the developing world. The role of ICT is also analysed as a fundamental aspect of citizenship in the prevailing information age (Dahalin, 2016). Countries, especially those in the OECD, have initiated ICT based programmes which intend to ensure that their citizens can enjoy the connectivity and utilise the strengths of ICT in the new global era (Selwyn, 2004). However, the connectivity is just only one element of the use of ICT, which is an overarching phase for a wide range of technological applications including computer hardware and software, digital broadcast technologies, telecommunications technologies such as mobile phones and smart phones and their applications, and electronic information resources such as the World Wide Web, the Internet applications, and CD-ROMs (Selwyn, 2004). Within each of the ICT

technological applications, it requires different conditions that allow the applications to be really useful for users. The key conditions are access, skills and participation of people or users. Each of the conditions has extensive challenges in order for the ICT applications to reach their full potential in enabling people, thus one of the widely researched and popular discourses is the digital divide and digital exclusion.

The digital divide is a part of an emerging wider theme: social inclusion. The digital divide was initially intended to refer to the technological gap between developed and developing nations (Selwyn, 2004). Nonetheless, the digital divide was then redirected towards the technological disparities within individual countries (Selwyn, 2004), with geographical separations of rural and urban areas, with 'information haves' and 'information have-nots' (Wresch, 1996), and with 'information and communication poverty' (Balnaves *et al.,* 1991). And again, the key conditions of access, skills, and participation became the emerging themes of digital access, digital skills and digital participation in many discussions that aim to make ICT as the transformative enabler to overcome the existing social divisions and inequalities. Research shows that ICT can empower people (D'Allesandro and Dosa, 2001), increase levels of social interactions and civic involvement (Katz *et al.,* 2001), and make public services and opportunities for education more available at global scales.

2.3.4 Digital access

Digital access can be considered from both a technology and a non-technology perspective. As a technological consideration digital access encompasses various aspects ranging from the broadband connection, wireless broadband connection, hardware (computer and digital devices), and software to electronic information. In the non-technological space, for example, policy, digital access inclines to make ICT equally available to all citizens in terms of physical objects (Wise, 1997). With users, access includes all of the connection, hardware, software, their own digital skills, knowledge of how those systems work, and support to use them effectively. With the complexity of the people as users of the ICT, the digital access discourse moved toward a more multifaceted discussion of 'access rainbow' that includes physical devices, software tools, content, services, social infrastructure and governance (Clement and Shade, 2000). Other work discusses 'various shades' of eccentricity between 'core' accesses and marginal access and non-access issues (Wilhelm, 2000). For instance, the marginal access and non-access issues can come from the 'haves' and the 'have-nots' polarity, which had been echoed by statistics and academic research in

all settings, including the rural-urban divide. People's access to ICT is mixed and unequally distributed both socially and spatially (Warf, 2001). Disparities are clearly reflected in the digital access space particularly in association with the individuals' socioeconomic status, ethnicity, income, and gender, levels of education, age, and geography.

Encompassing all of the digital access topics, the discussion of the rural-urban divide has emerged because rural areas suffer from double "jeopardy" (Park and Kim, 2015) where low population density caused higher costs in installing and improving the connectivity (i.e. broadband, and wireless broadband or wireless networks). As a consequence, rural residents pay more for similar services while most of the residents often have lower incomes, and typically (though not always) lower levels of education than their peers in the urban areas (Eardley, Bruce, and Goggin, 2008). Since rural residents have less financial resources and require less from online services (Horrigan, 2010), there is less benefit from the economy of scale inherent in the ICT model, thus, the underprivileged cycle of the digital access in rural areas seems endless. Meanwhile, the residents in urban areas enjoy better connection advantages in terms of cost and quality of the services; they also have more devices connected to the Internet; and they are increasingly making the most use of their mobile devices by engaging in so many types of online activities and services such as short message services (SMS), instant message (IM) and file sharing (Park and Kim, 2015).

Along with the technical and core digital access challenges, there are challenges that hinder the digital participation of the people, enabling them to fully benefit from the digitally connected economy and society.

2.3.5 Digital participation

Using various measurements, researchers have demonstrated the overall positive benefits of digital participation in Internet usage, engaging in the production of ICT contents, communication and participatory activities. Like the access issues, the popular measurements of digital participation are based on: racial issues, a combination of race and socioeconomic status, evaluation of the effect of participation via access to computers at home or in public places; social groups; education levels; ages; gender; and the role of the local government in driving the participation (Light, 2001). Digital technologies and the rise of social media platforms with dynamic and interactive facilities are reshaping citizen expectations, including interactions with government.

While the focus on the hardware and technology access is seen as a short-term technical fix (Light, 2001), digital inclusion needs more long-term strategies due to the complexity of the stakeholders involved. Local governments play a key part in the development of digital spaces for civic participation on the issues that directly impact citizens' daily life. And the current practices show that local governments in democratic systems are placing high priorities on disseminating information and providing online services rather than real engagements through open dialogues with citizens (Light, 2001). Local governments are encouraged by central governments and their citizens to reassess their approach to digital participation by taking into account the purpose of the citizens' participatory space and embedding best practices into their daily operations. Freeman (2016) recommends that greater government receptivity and responsiveness is needed to enable civic participation to inform local decision making and such involvement would facilitate citizens to develop a sense of connection with their local government. In turn, this can create a sustainable engagement model. Failure to address the issues from the government side would continue to distance the hope for ICT to enhance the grassroots development process. Genuine engagement is the co-production of policy and services and requires a major shift in the negotiation and collaborative culture within government (Zappala *et al.,* 2000; Charleson, 2012; and Bartoletti, 2016). It also demands of citizens a willingness to engage and to provide capabilities for deliberate participation all in a spirit that focuses on the public good (Holmes, 2011).

Gordon (2011) showed that allowing public digital participation alongside traditional physical settings would help to: harness a wider audience by including people who are unable to attend physically; include younger citizens/residents; provide the opportunities for those who are usually less involved in the traditional venues to contribute to their own comfortable time, space, place and formats; ease the dependence on physical resources and thus the public participation processes would be more effective in terms of labour, costs, and spaces for the stakeholders, especially the local government (Fredericks and Foth, 2013).

From the citizen's perspective, digital participation provides platforms, space and convenience for staying in touch, being connected (sometimes in real-time mode, with current events), and facilitating interactions that are not always possible in the physical sphere (Fort *et al.,* 2009). Digital participation provides an opportunity to access

information, networks and communities, which in turn enables the participants with diverse knowledge to contribute. In research on digital participation by the usually digitally marginalised group of older adults, Newman and Frank (2013) and Rubinelli *et al.* (2008) found that the older adults can learn how to manage health disorders when empowered to manage and share their health related practices. Ala-Mutka (2010) identified opportunities for older adults to share and develop knowledge on a particular topic. Also, the sharing of information has shown to contribute to positive relationship development through connecting with other people, which might be of physical challenge in rural or remote areas or within older groups with mobility limitations (Steijn and Schouten, 2013). People's participation in informal online networks and communities can ease their learning opportunities that contribute to their own well-being, personal growth, and collective activities and outputs (Ala-Mutka, 2010). When people participate more online with higher frequency and in more activities, Wei (2012) argues that they have the tendency to engage in more sophisticated and participatory uses, as well as enhance their own personal creativity. Helsper *et al.* (2015) showed those participatory and creative behaviours can lead to a tangible outcome in the offline world in the economic, cultural, social and personal spheres.

Despite the fact that not everyone can equally participate digitally, the digital participation of citizens plays an important part in strengthening local communities. It is because people participate in digital services and platforms in two modes of supplying data and generating new products, services in relation to future aspiration (Wessels, 2013) or their own local needs. Research has shown that community-oriented digital participation promotes offline civic engagement and intergroup conversations (Ognyanova *et al.,* 2013), consequently, this dynamic relationship among storytellers of various groups resulted in positive outcomes including being well-connected to the local media, organisations, and other residents. Kim and Ball-Rokeach (2006) found that when citizens engaged in digital participatory activities they developed a sense of belonging, collective efficacy, and increased level of civic participation.

Despite the positive gains reported in research on digital participation, there are on-going challenges that need further investigation. These challenges include: the participation of the digitally disadvantaged groups including the growing numbers of seniors in Europe, ethnic minorities, lower income groups and rural residents; the outcomes of the digital

participation; the gaps between individuals, households, businesses, and geographic areas at different socio-economic levels; digital participation in political and democratic activities; digital participation in new applications of ICT such a social media platforms; behaviours and attitudes toward the digital participation.

A key condition for successful digital participation among citizens is the digital skills of those key stakeholders who are the driving force in their roles within government especially as they relate to the participation of the constituency.

2.3.6 Digital skills

Certain skills are required for effective utilisation of ICT applications, including the basics of internet access and traversal. In some studies, the digital skills of various population groups are being measured with a focus on technical and operational levels, while others focus on critical and social skills in working with the communication technologies (van Deursen, 2010). Other researchers have turned their attention to the creative use of ICT applications and consider such level of usage is central along with other skills such as the abilities to evaluate trustworthiness and accuracy of the accessed contents and resources (Livingstone and Helsper, 2009), and the real ability in performing various specific tasks with measures of overall self-efficacy (Livingstone and Helsper, 2009; and Helsper, 2012). The measurements are as varied as the subjects and can cover technical, social, creative, and critical skills. Understanding these measurements in a holistic way provides an opportunity to use these as predictors for the use of ICT applications more directly.

While the access issues have been researched thoroughly, the digital skills issue is still in its infancy, especially with the emergence of newer platforms and applications. Park and Kim (2015) researched the skill issues between urban and rural users and found large skill gaps between the two groups. For instance, rural users have the skills to use more online participatory activities related to social and political issues and they use email and e-government services intensively. Literacy issues are also related to the digital skill assessments and they are, as with digital participation, related to the socio-economic status, education levels, age, gender, industry sector, employment opportunities (Park and Kim, 2015), and geographic locations.

In research of educational institutions, Littlejohn *et al.* (2012) found that teachers need to place greater value on digital literacies and better prepare their students and their own

organisational processes to succeed in the digital knowledge world. They recognised that digital literacies impact on individual identity, especially on how individuals embrace knowledge in digital forms and their attitude towards those on the daily basis. They concluded that the digital skills should be developed and embedded in all teaching and learning activities and that the students, the staff of the institutions, and their own operational systems should leverage every single opportunity to hone the digital skills for all of the people involved. The digital technologies, the digital environments, and the digital practices should be present at the maximum (Littlejohn *et al.,* 2012).

The newest form of ICT applications is in social media. The skills to use these newer social media platforms are also important for citizen engagement, especially in the more disadvantaged groups such as young people with disabilities. In their research on digital skills, Raghavenda *et al.* (2015) found that learning to use social media leads to an increase in social participation among the disadvantaged research groups and that in order to benefit fully from social media, parents and care service providers also need to learn the skills and the knowledge to integrate with the group.

Against the backdrop of digital access, participation and skills and the disparities between rural and urban area, there is a need to look at those issues in a more sophisticated and realistic views, especially from a small European city to see how the policy makers, the key stakeholders and the people can harness the benefits of the ICT-based opportunities, uptake, engagement and outcomes. In particular, it is important to move research away from the current predominance of "pundit suppositions, travellers' tales and laboratory studies" (Wellman, 2001, p. 2031) towards a robust survey-based work which hopefully begins to unpack the complexities of the digital divide thus promoting effective digital participation in both geographic areas of rural and urban (DiMaggio and Hargittai, 2001).

As cities develop their digital profile, concepts such as 'digital economy' begin to emerge which move the focus from products to digital services and networked technologies. Industries and governments adopt these lower-cost services and technologies with little regard towards the citizen-user. This creates a situation in which a large number of citizens are not able to access these services or technologies. Subsequently, as citizen engagement moves from an aspect of corporate social responsibility into a monetisation opportunity, availability, affordability, usability and usefulness are aspects moving to the forefront of key drivers for engaging users (Hanson, 2010).

Therefore, it is important to explore the three key conditions of access (i.e. usage, ICT infrastructure, information), participation (i.e. practices, willingness), and skills in using the key digital tools. An attempt to identify the key drivers to digital participation, possible barriers that hinder the progress, and any forms of new rural-urban digital exclusion should be examined. The ultimate goal of this exercise is to enable individuals to fully engage in the digital world while providing governments with evidence and insights for their policy strategies toward stronger social inclusion.

In its pursuit of smart city initiatives, Cork City faced a challenge in how to effectively engage with its residents and involve them in consultation, feedback, decision-making, and implementation processes. The research decision was made to pursue a strategy, inspired by crowdsourcing, in order to best make use of local expertise, collaborating with academics, industry, social organisations and citizens/residents to resolve the challenges.

2.4 Citizen Engagement

Citizen engagement, citizen participation, and public participation are becoming increasingly popular topics among both academic researchers and government related practitioners. The words reflect a focus on a new trend of promoting new forms of democratic practices that compliment and address the political and democratic deficiencies facing many democratic systems today. Before exploring where this new trend may head and what it entails for citizens and those who try to get the citizens involved, it is important to understand why the new trend take the centre stage in many academic and practical areas ranging from political science to public administration, to public policy, to diffusion of science and technologies.

In a rich literature of citizen engagement, participation, and public participation, the term ‘citizen engagement’ is very likely to be used interchangeably with ‘citizen participation’. So what does citizen participation mean? According to the most cited article “A ladder of citizen participation” by Sherry Arnstein (1969), “citizen participation is a categorical term for citizen power. It is the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future.” In her famous eight-rung ladder topology, citizen participation aims at including the have-nots, primarily black people in the US during the 1960s, in determining how information is shared; goals and policies are set; tax resources are allocated;

programmes are operated; and benefits such as contracts and supports are distributed. Despite a fact that the topology was theorised in the late 1960s and the have-nots are not necessarily black people anymore, a lot of the meanings of the categories are still applicable in today's practices of citizen participation. For example, a number of new economic development or planning programmes in the US laws require the participation of potentially impacted citizens and other entities. Authorities use different means of engagement (i.e. public hearings or reviews or comment procedures) to mainly 'educate' citizens and involved parties, which falls into the lowest rungs of 'manipulation' and 'therapy' (Arnstein, 1969). These rungs were categorised as non-participation because they are not really aimed at enabling people to participate. Depending on the terms and conditions regulated by funders (i.e. United Nations, World Bank, federal or central governments) and programmes, authorities are using higher rungs of 'informing', 'consulting', and 'placation' to ensure that the potentially impacted citizens and parties can hear and be heard but they have no ways to know if their concerns are taken into consideration. These rungs fall into the degrees of 'tokenism' because, despite the levels of openness to the citizens to participate, they are not having any power to make or influence the final decisions. Recently, deliberative participation innovations experiment some forms of citizen participation that were categorised at the highest levels of 'partnership', 'delegated power' and 'citizen control' rung in the Arnstein's (1969) ladder. In projects like a participatory budgeting in Porto Alegre city in Brazil (Fung and Wright, 2003), residents of the city were enabled to participate directly in forging the city budget. They were enabled to propose, discuss, and make agreements on using the public monies, which previously routed to be supporting funds, for projects that focus on resolving common goods challenges of the local communities such as street paving and water services. In this example, the citizens exercise different 'degrees of citizen power' (Arnstein, 1969), and they show that together they could overcome personal or group agendas to come up with solutions that serve a larger cause with many more people benefitted from the solutions rather than themselves and the immediate groups that they attach.

Meanwhile, public participation has different meanings to different institutions, organisations, and those who try to get their agendas across and/or supported by the public. For instance, in an Irish government document (DECLC, 2014) public participation means: "Public participation can range from involvement in local neighbourhood and community life (e.g. tidy towns, residents associations, sports clubs) to structured engagement with

public authorities and associated decision-making structures (e.g. area committees, Strategic Policy Committees, community development organisations, participatory budgeting; petition rights; plebiscites; town or area meetings, including meetings of municipal districts) and everything in between, including voting" (DECLC, 2014). Whilst, in a legally required participation in planning in the US, the public participation "requires a systems perspective that supports and builds on the interactions among public sector agencies, nonprofits, business organizations, advocacy groups and foundations which make up the complex evolving reality of contemporary society" (Innes and Booher, 2004). In another context of public policy in science and technology, Powell and Colin (2009) point out that public participation means "lay citizens should have a say in scientific and technological developments that will affect their lives and the broader society in significant ways and lay citizens bring valuable knowledge and perspectives into decisions about scientific developments and decisions that include more diverse perspectives will be more robust." The authors argue that in order for the citizens to participate in a meaningful way, they need knowledge, skills, efficacy, and collective organising skills that enable them to influence science and technology policies over the long term. Therefore, when citizens participate in those engagement activities in the emerging nanotechnologies and nanotechnology developments, they can acquire knowledge and efficacy to understand certain levels of technical, social, political, and other critical aspects of the topics, and gradually, they can come up with collective and political organizing capacities to engage effectively with other citizens, scientists, media, policy makers, and other key actors. While it is true that citizens can learn from the processes, there is another important underlining issue regarding why science and technology policy needs citizen participation. Most of the funds for the science and technology programmes come from public monies. When researchers apply for funding of the research programmes, they have to prove that their research is useful and impactful for citizens. And the best way to do that is to actively engage with citizens to help them to help the scientists. That way, the scientists can ensure the funders that their research is supportive by the citizens and that impacts of the research will be for all participants.

As portrayed by the literature, citizen engagement, citizen participation, and public participation could mean different things in different contexts and at different levels of engagement and participation. However, they definitely include efforts to get two sides of an equation to involve with one another. One side is people (i.e. citizens, residents, individuals), as the key stakeholder and the key component of any other forms of social

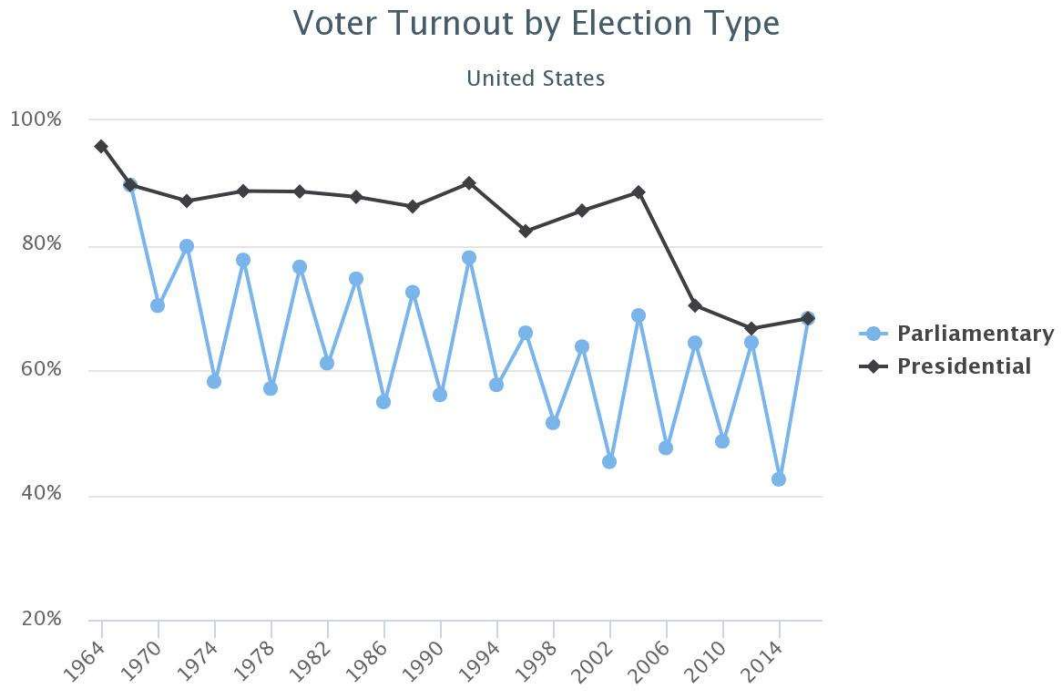
entity (i.e. communities, groups, neighbourhoods). The other side is government entities, most of the time, other levels of authorities, and/or other legal entities. Those involved in the engaging and participating efforts are the participants.

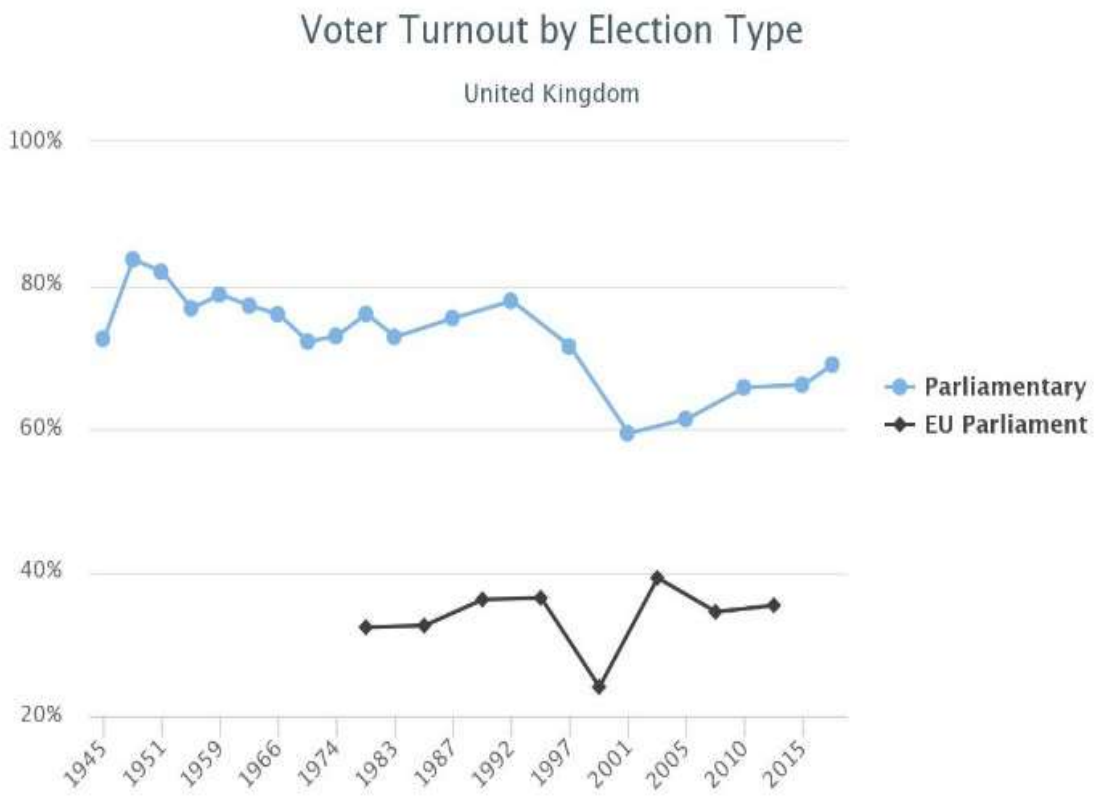
Departing from the meanings of the key terms, let us look at why public participation is becoming increasingly important and explore one of the most relevant questions in this thesis: how do the participants engage/communicate/participate with one another? Apart from that those important questions, other aspects of participation are worth to capture including how the participants come to decision together; and how do their discussions connect to or influence policy outcomes and public actions.

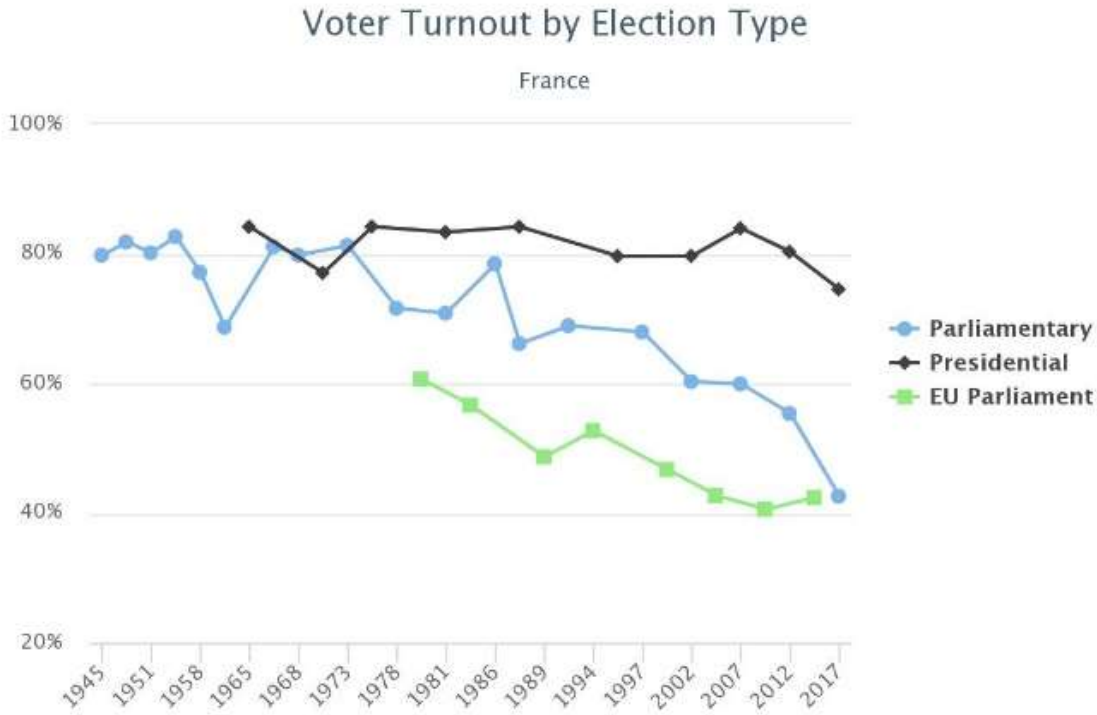
2.4.1 The Why

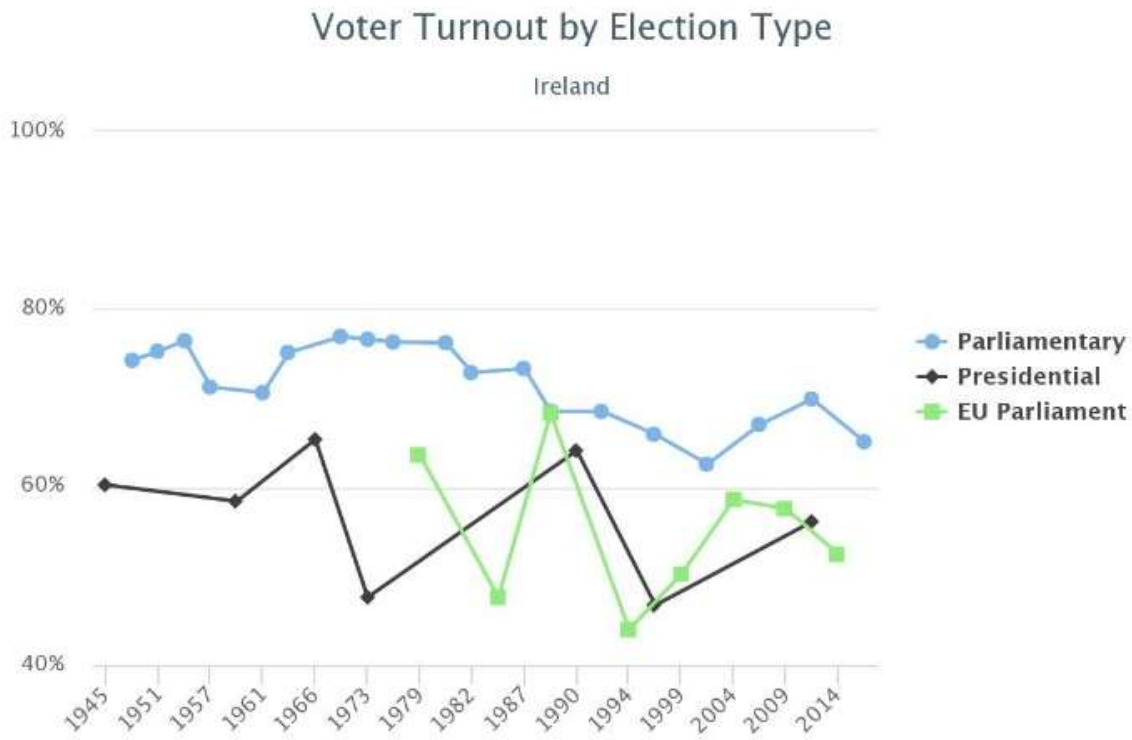
Representative democracy has performed poorly in the past few decades within democratic systems in most part of the world. It is becoming clearer that the traditional representative democratic practices are not sufficient. The most popular practice of the representative democracy, voting, is on a decline. The graphs in Figures 2.7 show the trends in parliamentary, presidential, and European Parliament elections of in the key democratic systems in North America, EU and the home country of this thesis, Ireland.

Figure 2.7. Voter turnout of the US, UK, France and Ireland.




Voter Turnout by Election Type
United Kingdom
100%
80%
60%
40%
20%
1945
1951
1959
1966
1974
1983
1987
1992
1997
2001
2005
2010
2015
Parliamentary
EU Parliament


Voter Turnout by Election Type
France
100%
80%
60%
40%
20%
1945
1951
1958
1965
1968
1973
1978
1981
1986
1989
1994
1997
2002
2007
2012
2017
Parliamentary
Presidential
EU Parliament



Author's self-generated graphs using online tools provided by the International Institute for Democracy and Electoral Assistance (International IDEA) in Sweden.

And according to Fung and Wright (2003) ""Democracy" as a way of organising the state has come to be narrowly identified with territorially based competitive elections of political leadership for legislative and executive offices. Yet, increasingly, this mechanism of political representation seems ineffective in accomplishing the central ideals of democratic politics: facilitating active political involvement of the citizenry, forging political consensus through dialogue, devising and implementing public policies that ground a productive economy and healthy society, and, in more radical egalitarian versions of the democratic ideal, assuring that all citizens benefit from the nation's wealth." They also identified other conditions related to the distrust in government including deregulation, privatisation, reduction of social services, and restrictions on government spending, while the best actions from the government should be greater responsiveness, more creative and effective democratic state intervention. These issues could be apparent anywhere with consequences seen in isolated populations, social anger, increased marginalised groups and poverty, unemployment, increasing inequality, and under-provision of public goods like training and public health.

These notions are very much like what the democracy literature has been demonstrating: the participatory and deliberative democracy complement the representative democracy rather than replacing it. Sweeting and Copus (2013) point out that "the participatory form of democracy is now firmly rooted, perhaps uncomfortably, alongside the representative form."

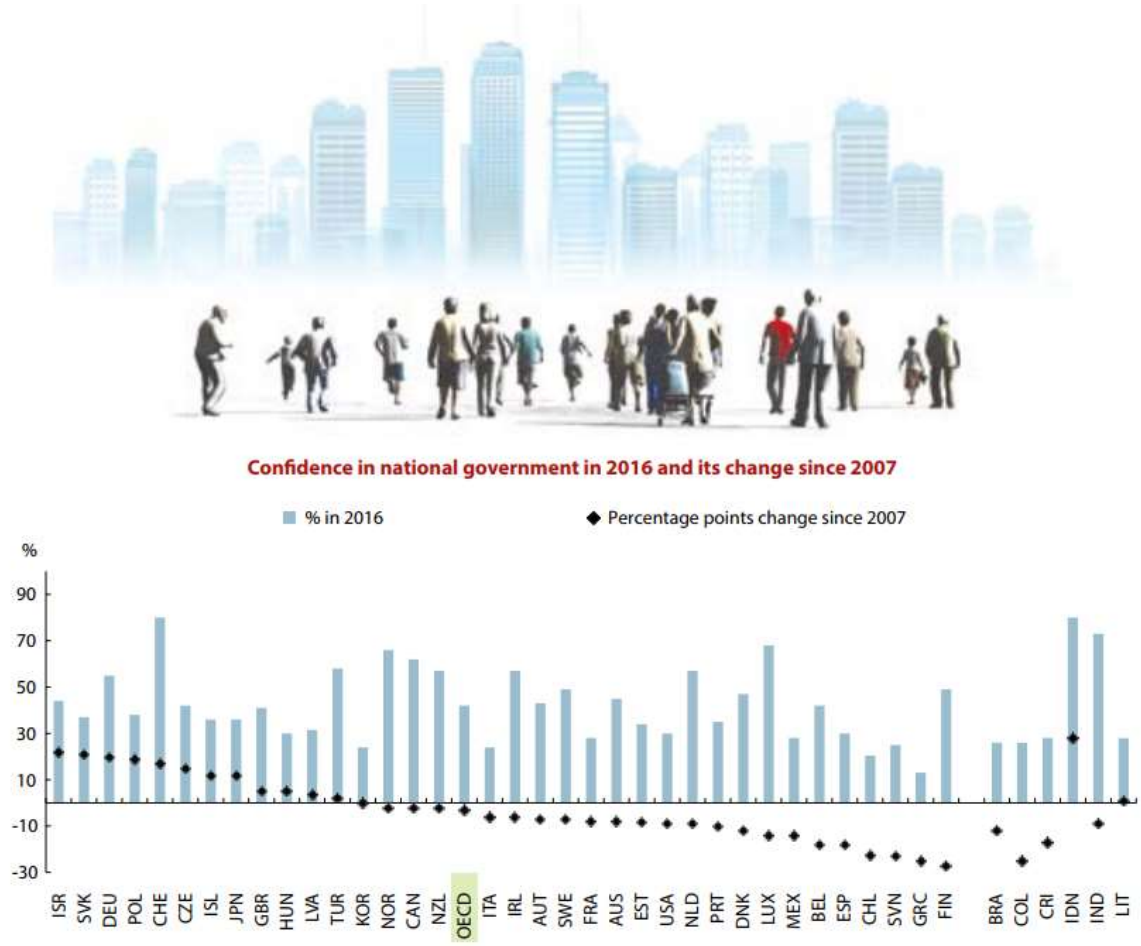
Apart from the decrease of the political practices and limited avenues for participation, the rise of citizen participation also came from the legal requirements set by governments, intergovernmental legal entities (i.e. the EU) and international organisations (i.e. United Nations) for democratic policy making processes and governance practices. In the policy making processes, citizen participation ensures legitimacy, justice, and democratic features of the public policies. Meanwhile, citizen participation in the governance of different levels of governments helps to improve multiple purpose and values in contemporary governance. As Fung (2006) put it "public participation at its best operates in synergy with representation and administration to yield more desirable practices and outcomes of collective decision making and action."

Copious research proves that there are tangible benefits from citizen participation in the governance of various governmental levels. In a public performance measurement research, Holzer and Kloby (2005) found that citizen participation adds value to the overall process of implementing systems of performance measurement at central and local government levels. Weeks (2000) analysed a four-scale trial of deliberative democracy and found that citizen participation and informed public judgement generated opportunities for deliberation and informed decision making for all participants in the process including citizens, managers, and elected officials. The author detected that involved citizens become more informed and eager to dedicate their intellectual energy to contribute to the discussion in order to come up with a solution. In an assessment in the education sector, Robert (1997) found that the citizen participation was helpful in reducing school budget, and in crafting state education policy. Wang (2001) assessed public participation in small US cities and found that collaboration between elected officials, public managers, and citizens was associated with better responding to public demands, building consensus, and improving public trust in government.

Within public administration, there was a trend – New Public Management (NPM) – being adopted in many democratic systems. The NPM was a part of series of governmental reform

programmes to deal with challenges including lack of trust in government; alienation government activities from lay citizens; lack accountability and transparency; lack state capacities to solve problems; and public demand for different kinds of government. The NPM was adapted from the managerial style in business management (Kudo and Granier, 2016) into public administration with intentions to improve efficiency, effectiveness and accountability of the public administration systems. In the business principles, customers and clients are essential to sale processes, offers, promotions and other relevant aspects. These notions of customer-oriented and outcome-oriented were utilised in the NPM, from as early as policy making processes to the implementations, and assessments of outcomes. Kudo and Granier (2016) assessed that under the new notions of customer-oriented, the reform of public service delivery by public sectors was forced to outsource some functions, privatise enterprises, and revise the role of government in accordance with the role of private sector and civil society. With the NPM managerial style, there were shifts toward decentralisation, management by objectives, contracting out, competition within government, and customer-centric. The shifts meant there were many more stakeholders and players involved in the whole process from policy making to organisational structures to the delivery of public services. And just like in the business management, NPM uses ICT to ensure the complexity, efficiency, effectiveness, and accountability of the whole ecosystems. Thus, NPM enhances performance of public administration and promoted e-government (Kudo and Granier, 2016).

Figure 2.8. Confidence in the OECD national governments is on the decline.



Source: Adopted from the Government at a Glance 2017 Report. http://www.oecd.org/gov/government-at-a-glance-2017-highlights-en.pdf.

Like any other matters, citizen participation also faces criticism. A number of scholars argued that citizen participation and engagement can do harm to the public itself, to government officials, and to the processes of public governance (Collingwood and Reedy, 2012; Day, 1997). One of the reasons for the criticism was the associated costs, both tangible and intangible, of the whole engagement or participation processes for all participants. The costs include aggregated time spent, wage loss, transportation costs, childcare costs, and other professional and personal commitments. In addition, Hibbing and Theiss-Morse (2002) argued that the public is disengaged and disinterested in politics in general and that citizen participation and engagement could actually increase public frustration and perceived powerlessness. The frustration and hopelessness would lead the public to even more exclusion, tokenism, inequality, injustice (Arnstein, 1969), and risks of collusion by stronger social or interest groups (Young, 2001). A number of scholars (such as Sunstein, 2000; Shapiro 2002) have argued that citizen participation can generate risky decision

making, group think, and polarisation for the public while reducing officials' ability to facilitate policy negotiations and fulfilling diverse demands of the public (Sunstein 2002). It was agreed among the critics that citizen participation processes were a big challenge for government officials who had been already struggling with insufficient time for the workloads, limited budget, and access to other resources. Nabatchi and Farrar (2011) found that government officials were not very much supportive of the citizen engagement and participation processes because the processes forced them to interact with those who were not well informed, hostile, and disrespectful. Regarding citizens' abilities to participate in public deliberation or policy discussion, a few critics pointed out that they didn't have suitable skills and opportunities to practice those skills, therefore their participation could result in unintended consequences as named previously. While criticising the public participation, the critics agreed that those consequences came from a fact that there weren't enough opportunities for the citizens to learn necessary skills for this type of engagement while the results of the discussions were disconnected from the actual policy making processes.

Departing from analysing citizens' abilities and their opportunities to participate, Aristeidou et al., (2017) focus on the profiles of engagement in online communities of citizen science participation. Using mix methods of validation of an existing framework, analysis of a comparative citizen participation at communities, the researchers wish to contribute to the guidelines for recruitment and sustainability of citizen participation communities.

Aristeidou et al., (2017) conclude that extrinsic engagement factors, such as software and community aspects, attract and activate members; and intrinsic factors, such as interest in the topic, are the main reasons that sustain members in the community for longer periods." Therefore, it is important to take into account a good balance in the design of engagement initiatives between extrinsic and intrinsic factors

Motivations and factors from citizens are important in the public participation, however, public managers' motivations are equally essential as they are on the other side of the feedback loop. Huang and Feeney (2016) focus on the public manager group to understand the ways in which public managers' motivations are related to engaging the public in organizational decision making.

The analyses base on the data from two national surveys of U.S. local government managers conducted in 2010 and 2012 to investigate if and to what extent, the performance-based rewards and public service motivation (PSM) impact on citizen participation in government decision making and examine the ways in which the relationship between PSM and citizen participation is moderated by performance-based rewards and mediated by value similarities. Huang and Feeney (2016) find that the performance-based rewards are negatively related to citizen participation in government decision making whereas PSM is positively related to citizen participation both directly and indirectly through person–organization value equivalence.

Moving away from the local public managers, Sjoberg et al., (2017) show that bureaucratic responsiveness (i.e. response to inquiries input by citizens) is positively associated with future participation in Fix My Street in the United Kingdom, which gathered more than 300,000 acts of participation. The researchers argue that their finding's objective efficacy (i.e., how much an individual can make an actual difference) appears to have a substantial effect on continued participation. Thus, it suggests that the calculus of participation may be an appropriate way of thinking about certain types of participation where the benefits and probability of success are easily observed. The research also discovers that the importance of responsiveness on participation is not corresponding with the continued participation of returning users. The data show that the majority of users who report a second time do so independently of whether a previous report has been addressed.

Sjoberg et al., (2017) note that beside responsiveness as the key predictor of future participation, there are many more factors that future research could consider such as citizens' attributes (e.g., demographics or experience with other civic engagement processes) affect their willingness to participate initially and repeatedly.

Citizen participation, satisfaction, and public performance have been examined in their pair causal comparisons, but there are no underlying paths available among the three important variables that decode the citizen participation in local governments.

Wu and Jung (2016) explore the associations between public performance, citizen participation, and citizen satisfaction by using a structural equation modelling, a method used regularly in quantitative analyses of business and social science. They utilise the annual

citizen survey of San Francisco to test four hypotheses as latent paths derived from public performance, citizen participation, and citizen satisfaction.

The results show that the high level of citizen participation is positively associated with citizen satisfaction, but the relationship between the participation and satisfaction is significantly mediated by perceived public performance. The findings indicate that active citizen participation can hold public administrators accountable for performance, and also the perceived public performance is positively associated with citizen satisfaction. In addition, the positive relationship between citizen participation and satisfaction is mediated by the perceived assessment of respondents on the public performance of municipal services.

Overall, advocates and critics had their arguments for and against citizen participation and public participation; however, they all saw the declines in political, civic, religious, and social participation. They also agreed that the declines were not healthy for societies and for the collective effort in dealing with social, economic, and development challenges or harnessing the opportunities provided by a deeply interrelated and globalised world that we are all in today. They pointed out some of the reasons including the lack of opportunities and skills of participants; though they focused mainly on the citizens it did not mean that the government officials were well trained to participate with the public. So, all pointed to a set of possible solutions for citizen participation to yield its real values and benefits for all while keeping the pitfalls at bay. The solutions can be varied in venues, formats, vehicles, and tools, but they have to ensure an improved experience for all participants throughout the processes. And how exactly has the citizen participation experience been created, developed, and aspired for better?

2.4.2 The How

Non-political participation literature showed that majority of citizen participation activities have been experimented and implemented in various venues following different paths including innovations and practices of participatory democracy or deliberative democracy. Citizens have participated in public policy making process and public governance in both face-to-face formats and Internet-based applications.

The face-to-face citizen participation formats include referenda; town hall meetings; focused groups; deliberative voting; public forum; consensus conference; round tables;

deliberative polls; surveys; citizen/user panels, juries, citizen schools, interviews with stakeholders; open days to talk to staff; public meeting; policy debate or forums; workshops; and other mechanisms. Almost all of the face-to-face formats could be replicated with the Internet-based and online applications; however, a few of the formats are more popular at this point in time such as social media, chat rooms, online public forum, surveys, and deliberative polls.

The citizen participation's topics, subject matters, and their policy levels (i.e. local, central, federal or intergovernmental) influence are also varied with different outcomes and uses of the outcomes. For example, citizens in EU are discussing and contributing their ideas for a number of topics such as equality, sustainable economy, green habitats, holistic health, sustainable food, personal development, and others (CIMULACT, 2016).

Around 1000 citizens (as they are called but they do not necessarily have to be EU citizens to participate) are recruited via Internet-based applications such as online forum, social media, and email systems by lead research organisations in each of the participating countries of the EU. The participating citizens are sent with information about the project after registering online themselves. They gather at the fixed time and date, in an informed venue, where they learned about the objectives of the specific topics and meet other fellow citizens. They work in groups of their own choice among the topics to be discussed on the day.

Usually, five topics are discussed at one-day sessions within frameworks bounded by sets of suggested questions. The processes range from discussions to debates, to on-site polling, and agreements about the top priorities that they, as representatives from a participating country, can input to the project. The overall aim of the project reads “in a highly participatory process, the project will provide a unique contribution to European research and innovation policies and topics, create dialogue and shared understanding among the actors, and build strong capacities in citizen engagement, thereby enhancing responsible research and innovation (RRI) in the EU.” It details objectives of the project below, in its own terms:

- Involve citizens in the actual formulation of the EU research and innovation agendas.

- Provide concrete and unique input to the identification of the future European research agenda by eliciting concerns about, wishes for and visions of desirable sustainable futures from 1000 citizens in 30 countries in Europe.
- Make the European research and innovation agenda relevant and accountable to society by engaging citizens, stakeholders and experts in co-creating research agendas based on real, validated and shared visions, needs and demands.
- Contribute to responsible research and innovation in the EU by promoting the engagement and inclusion of the public in the identification of desirable sustainable futures.
- Set a new standard for public participation through the development, testing, training and assessment of methods for citizen and stakeholder engagement.
- Make the building of the future more accessible. It is no longer only a question discussed by policy makers and experts; it is a wider public conversation for a greater democracy.

From the actual implementation of one engagement session described above, the processes of engagement are effective with information provided prior to the event and the participants are well assisted to frame their discussion, debates, and come to agreement. However, impacts of their inputs seem unclear because the route of the input to become an EU overall policies is uncertain. There were a few follow-up emails with the participants after the assembly session completed, but, the outcomes are still nowhere for the participants to find out if their inputs are actually taken directly into the EU policy making processes or they are just referenced information that helps the actual decision makers in EU to make the final relevant policies.

Such experiment in the EU is not singled out in participatory democracy. While the effort of EU, by providing funding for the CIMULACT and many other similar projects in EU, was well intentioned and reasoned, there are unanswered questions that entangled the participants' experience, the outcomes, the formats, the desired objectives, and many more aspects.

In some prominent research by deliberative democracy theorists Fung and Wright (2003), four projects in different parts of the world (i.e. US, Brazil, and India) were analysed under a framework named Empowered Participatory Governance (EPG). Fung and Wright (2003)

described the EPG as it "presses the values of participation, deliberation, and empowerment to the apparent limits of prudence and feasibility". The scientists argued that the projects they analysed "aspire to deepen the ways in which ordinary people can effectively participate in and influence policies which directly affect their lives… They are participatory because they rely upon the commitment and capacities of ordinary people to make sensible decisions through reasoned deliberation and empowered because they attempt to tie action to discussion."

The four projects were Neighbourhood governance councils in Chicago; Habitat conservation planning; the participatory budget; and Panchayat reforms. The project in Chicago devolved power and restructured bureaucracy over policing and public school, thus bringing hopes and suppressing fears for residents of inner-city areas. The Habitat project empowered stakeholders to develop governance mechanisms that allow the coexistence and thriving conditions for both the development of people and protection of endangered species. The participatory budget in Porto Alegre, a small city in Brazil, facilitated local residents to directly participate, discuss, and agree upon the use of public monies for common goods investments including street paving and water services. The Panchayat project in West Bengal and Kerala, India established direct and representative channels for villages to operate some parts of administrative and fiscal developments by themselves and for themselves.

These projects were analysed based on three central principles: a focus on specific, tangible problems; involvement of ordinary people affected by these problems and officials who are familiar with them; and the deliberative development of solutions to these problems (Fung and Wright, 2003). There were many lessons learned from the analyses in terms of governance structures; bottom-up participation; deliberative solution generation; and the conditions for the experiments to work such as devolution, centralised supervision and coordination, enabling conditions, and institutional challenges. The cases worked and demonstrated a set of evidence that the deliberative participation can empower ordinary people to learn, evolve, and be competent to make decisions that they know would affect them; have their say in crafting the finalised solutions, and involve in the processes of implementing the solutions. Fung and Wright (2003) detected that "effective solutions to certain kinds of novel and fluid public problem may require the variety of experience and knowledge offered more by diverse, relatively more open minded, citizens and field

operatives, than by distant and narrowly trained experts. Second, direct participation of grassroots operators increases accountability and reduces the length of the chain of agency that accompanies political parties and their bureaucratic apparatus."

The analyses also outlined drawbacks that may be considered in next experiments. The limitations included unequal positions of powers among the participants; constrained political engagement; and risks of balkanization of a polity that should be unified.

This examination of Fung and Wright (2003) was an example of a growing literature in deliberative participation and participating democracy. In addition to finding applicable frameworks, other researchers dug deep into many aspects ranging from finding factors and criteria that attract, enable and sustain citizens to participate in public issues; tools, especially newer versions of ICT applications, to the mechanisms to enable and maximise the opportunities for citizen participation.

Regarding the factors and criteria for active participants, socio-demographical variables are important, especially education levels (Putnam, 2000; Fung and Wright, 2003); social and economic statuses; race; gender; and age (Nabatchi and Amsler, 2014). Whilst, contributing psychological factors, such as personal and political self-confidence, a need for recognition, openness toward conflicts, and ideological intensity, are relevant in the participation processes. Proximity to social networks, levels of activism, and volunteerism are also strong social indicators among those participating citizens (Ryfe and Stalsburg, 2012), meanwhile, the benefits for participants or their perceptions about the importance of the issue (Fung, 2003) are also likely to be significant. Along with this line, incentives for citizen participation seem to be a matter whether it is the internal incentives of personal interest in a topic or an investment in a policy outcome or external incentives of money (Kleinman *et al.,* 2011), public recognitions or rewards of other values.

Regarding ICT applications, citizen participation has used or access to e-government (electronic-government), m-government (mobile-government), government social media, online forums, and most recently smart phone apps for citizen engagement such as the Citizens Connect of Boston City.

2.4.3 ICT and Citizen Engagement

Since the late 1990s, the growth of information and communication technologies (ICT) has been an important enabler for local governments to use in fostering citizen engagement (Ferro *et al.,* 2013; and Jennings and Zeitner, 2003). Numerous research has found evidence for the positive roles of the ICT applications in helping local and central governments to cultivate and nurture citizen engagement with the authorities. The roles comprise providing timely and actionable information (Chatfield *et al.,* 2013; and Fuentes-Bautista, 2014), being effective platforms for citizens to involve in public life (Linders, 2012); facilitating formation of social networks (Bonsón *et al.,* 2012); and contributing to participatory and deliberative democracy (e.g., Åström *et al.,* 2012; Hong and Nadler, 2012; Park and Perry, 2008). The first role of providing timely and reliable information for the citizens to be aware of and to make informed decisions has been evolving since the first Web 1.0 applications by local and central governments. Lean *et al.,* (2009) found that cities and towns are using their websites to provide information about their town and city developments while the same websites also function as platforms for collecting and paying fees, thus helping the citizens to effectively use their time and resources (i.e. transport costs). The ICT applications also helped governments to develop their public services toward more personalised and inclusive services for the citizens (Astrom *et al.,* 2012; Hong and Nadler, 2012).

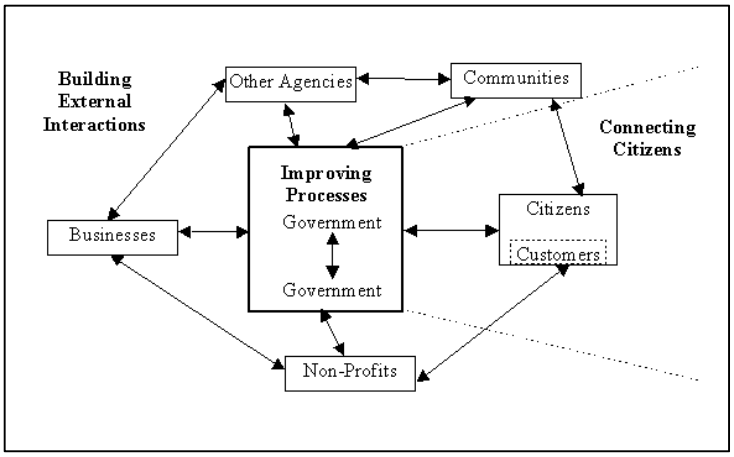
The adoption of ICT tools also enables the two-way public affairs' discussions on the social media. First, the information about policy and local public affairs can be distributed at lower costs compared to other traditional forms of print newspaper and radio advertisements. Secondly, the use of social media can help the governments to sense sentiments and social expectations of people toward new ideas, thus helping the governments to conform with. These adaptations would enable the local governments to focus on the promotion of transparency, to engage the citizens more effectively, and to build trust by taking the citizens' responses and contributions into account of the public issues (Linders, 2012; Ellison and Hardey, 2014; Karkin, 2013). These social media tools can promote a new form of governance "we-government", a development from e-government, which indicates the need of governmental transformation by cooperation and increased citizen e-participation (Linders, 2012). Social media might not always include the voices of the general public due to digital skill, access, and generation gaps, as reviewed in depth in the Local Government literature review section (Page 66), but they do open considerable options to improve the

two-way dialogues between governments to citizens and vice versa in interactions and policy development (Panagiotopoulos *et al.,* 2013). Around the world, citizens use social media tools to force governments to listen to what they care about and to demand respect (Warren *et al.,* 2014).

ICTs offer governments at all levels a series of tools and platforms to adopt new approaches in establishing greater transparency, promoting anti-corruption, reviving stronger accountability, improving public service efficiency, boosting good governance, reducing potentials for inappropriate behaviours, and strengthening reform-oriented initiatives. And these technologies enable the engagement and participation of citizens directly into all processes, as long as the governments are open and truly want to work with their citizens for the common goods, at all levels including the local governments (Axelsson *et al.,* 2010; Prosser and Hughes, 2011). And among all the ICT applications, E-government has been around for the longest and the most widely adopted that it became the universal trend in both developed and developing governments in the past few decades.

E-government was defined as "the use of information and communication technologies (ICTs) to improve the activities of public sector organisations," (Heeks, 2003) and it has been in operation in the public sector for more than 60 years. E-government aims at improving government processes via e-administration; connecting citizens: e-citizens and e-services; and building external interactions: e-society. The e-administration targets cutting process costs (i.e. financial costs and time costs); managing process performance (i.e. planning, monitoring and controlling the performance of process resources including human, financial and other resources); making strategic connections in government (i.e. connecting arms, agencies, levels and data stores of government to strengthen capacity to investigate, develop and implement the strategy and policy that guides government processes); and creating empowerment (i.e. transferring power, authority and resources for processes from their existing locus to new locations). Heeks (2003) argued that domains – developed by Ntiro (2000) in Figure 2.9 – directly tackle the problems facing governments which are too costly, too inefficient and too ineffective; too self-serving and too inconvenient; and too insular.

Figure 2.9. Focal Domains for E-government Initiatives



Source: Adapted from: Ntiro (2000).

The two aims of e-government – improving process and building external interactions – have been analysed by numerous researchers for successes and failures in operation, technical matters, return on investment, rates of adoption, systems' design, and function definition. Whilst the connecting citizen aim was explored mainly in citizen engagement and participation angles because a lot of the e-government adoptions had failed really badly on these topics.

Reddick (2011) found that citizens most likely to use e-participation for management activities (i.e. public administration services including tax, registration, applying for codes and licences) while according to Meer *et al.* (2014) empirical studies suggested that citizens mainly utilise e-Government options in terms of one-way communication. They also found that the dialogue options offered by e-Government were applied in a limited fashion and non-digital communication was still preferred. Meer *et al.* (2014) concluded in their research analysing the government-citizen dialogue "governments predominantly utilise the Web to disseminate information. They seem to lack responsiveness, openness, and interactivity, indicating one-way communication or simple interaction despite the Web-based opportunities to facilitate active two-way communication. Since dialogue is characterised as two-way communication beyond simple interaction, one may conclude that governments do not utilise e-Government to its fullest potential in terms of facilitating and utilising all dialogue possibilities." Such conclusion wasn't rare in other studies and there was a new wave of calling for reforms of e-government where dialogues, two-way interactions, interactive communications with citizens are at the centre (Pederson, 2016; Meer *et al.,*

2014; Tummers and Rocco, 2015; and Nica and Potcovaru, 2015). These topics are actually connected with the development of smart cities and the reforms of e-government could facilitate the citizen engagement, thus gradually get them to participate more with the government, especially at local levels because that's where most of their daily demands for interactions with government happen.

2.4.4 Citizen engagement in smart city

The challenges of citizen engagement in the smart city have been important topics to smart city initiatives and the institutions that provide funding. The Europe for Citizens and the European Youth Event 2016 programmes are just two examples of how innovative funding initiatives can encourage active and sustained citizen (and youth) engagement.

Reviewing the literature, the concepts of citizen engagement have a variety of definitions and interpretations of both academic research and from practitioners. Sheedy (2008) defines citizen engagement as, 'acts of sharing of information, power, and mutual respect between governments and their citizens'. Emerging from ideas of public participation, citizen engagement requires the government to share agenda setting and to ensure that policy-making decisions involve public input (MacKinnon *et al.,* 2003). Citizen engagement is also characterised by a commitment from 'government to work with its citizens' in a reliable and continuous manner. Lukensmeyer and Hasselblad (2006) argued that through the real citizen engagement, governments can gain an understanding of the issues in their communities, learn potential solutions, and provide opportunities for citizens to use their knowledge to help shape policies and plans that affect them. Reasons for governments to engage with their citizens include a reduction of the "democratic deficit" (MacMillan, 2010) and good governance (Bang, 2009). Strong engagement and participation help the governments to mobilise citizens' resources to capitalise on their meaningful inputs into policy making and in their participation in the democratic processes.

Within the citizen engagement literature, there are complex topics related to the democratic systems and the development of democracy. The liberal democracy promotes the role of the representatives who become professionals in the political arena to deal with issues on behalf of the people (Held, 2013). However, the decline of traditional democratic engagement such as voting has created the opportunities for an increase and the need for newer forms of civic and citizens' engagement (Kennedy, 2016). The backdrop of the decreasing number of

voters showing up at the voting stations became a prevalent trend in the democratic countries. The consistent decline in polling results showed that there is also a decline in people trust of politicians and governments. The accountability of the government also becomes an issue. We see trends emerging for alternatives to traditional engagement from both the government and the people (Bingham *et al.,* 2005; Fung, 2003; 2006; Nabatchi, 2010). These trends include the use of ICTs, to provide better services for the people, thus regaining their trust and increasing the accountability of the governments and authorities. Whereas the people came up with deliberate local budgeting (Fung, 2003; 2006), protests, and social movements to have their voices heard or at least be on the agenda for discussion with the government.

Bang (2009) argues the new forms of participation are creating groups of 'expert citizens' who are working within community organisations, therefore they understand and operate well "inside" the system of governance. The expert citizens are believed to have a deep understanding of the practice of good governance because they know their networks and know the necessary negotiation within them (Bang 2005, 2009; Bang and Sørensen 1999). Marsh and Li (2008) also argue that the expert citizens are a 'resource or political capital for democracy' because they experience dealing with problems of exclusion based on ethnicity, gender, class/poverty on daily basis.

Citizen engagement and participation are having two-way impacts: on the governments and on the citizens themselves. The citizens learn to interact with the local governance and grow their interest in and demand for transparency (Bang, 2005, 2009; Marsh, D & Li, Y 2008, Bang and Sørensen, 1999; Piotrowski and Ryzin, 2007). Through the interactions and participation in local governance, the people demand a variety of transparency, including fiscal, safety, and government concerns, and principled openness. Sheedy (2008) believed that early citizen engagement, such as at the beginning of policy or program development, 'can increase citizens' sense of responsibility, lead decision-makers to make better decisions by enabling them to understand social implications of their decisions, and increase the legitimacy of public decisions'. However, there are numerous institutional and practical challenges in the citizen engagement practices and processes. The challenges include the formats, the financial resources, the structures of decision making processes, the viable methods for citizen engagements, the complete inclusion of citizen, the institutional justification for taking on the inputs from the citizens, timing, the sharing of power with

representatives, and many more (Boyd and Lukensmeyer, 2004; MacMillan, 2010). Another practical challenge is the assessment of outcomes and results of the citizen engagement programmes since their effects do not present in the short term (Speer, 2012; Voorberg *et al.,* 2014).

Based on the outlined contextual challenges, proven benefits, and the necessaries of the citizen engagement, it is also understood that citizen engagement does not aim to remove the authority of government and leadership and that it actually acknowledges that many public policy issues are bigger than the abilities to deal with solely by the governments (Lenihan, 2009). In fact, the roles of the governments lie in exercising their authority to establish effective means of citizen engagement (Lukensmeyer and Hasselblad, 2006; Lenihan, 2009) and that 'public policy issues require the attention not only of government but also of an actively engaged citizenry. As such, understanding the importance of all-inclusive democratic participation must act as a guiding principle for citizen engagement.

Addressing on the topic of 'citizen-centric' in the smart city, Cardullo and Kitchin (2017) prove of what entails, why it is important and how does it work for the citizen participation in the planning, implementation and development of smart cities. The scholars use and extend Arnstein (1969) seminal work on participation in planning and renewal programmes to create the 'Scaffold of Smart Citizen Participation' – a conceptual tool to unpack the diverse ways in which the smart city frames citizens. They apply the scaffold concept to measure smart citizen inclusion, participation, and empowerment in smart city initiatives in Dublin, Ireland.

What they find was the most 'citizen-centric' smart city initiatives are rooted in stewardship, civic paternalism, and a neoliberal conception of citizenship that prioritizes consumption choice and individual autonomy within a framework of state and corporate defined constraints that prioritize market-led solutions to urban issues. They did not find strong evidence for grounded in civil, social and political rights and the common good as a strong participation motivation.

Cardullo and Kitchin (2017) conclude that "significant normative work is required to rethink 'smart citizens' and 'smart citizenship' and to remake smart cities if they are to truly become 'citizen-centric'."

Also making the case for citizen-centric, Degbelo et al., (2016) put the citizens in the centre of GIScience, which offers solutions to address six citizen-related challenges that they attribute to the delay in realizing smart city vision despite a recent surge of research and smart cities initiatives in practice. The citizen-related challenges are the engagement of citizens, the improvement of citizens' data literacy, the pairing of quantitative and qualitative data, the need for open standards, the development of personal services, and the development of persuasive interfaces.

The researchers use methods and techniques from GIScience to tackle these challenges, and presents the concept of an Open City Toolkit as a way of transferring insights and solutions from GIScience to smart cities. The tools aim to generate insights into the user's perspectives so that system designers can generate appropriate governance mechanisms to close the gaps between the promises of open data and what is actually realized for the benefits of the users and systems owners. The authors also indicate that closing the gaps in open data may increase the digital divide and social inequality. Therefore, a sustainable basis for delivering public benefit from public data is to motivate and enable communities themselves to innovate local service provision, social enterprise and job creation.

GIScience has two core pillars of spatial representation and visualization, and spatial analysis, smart city can use those features to generate visualised happenings in smart cities. The data generated by the citizens and embedded systems of cities can be visualised on the GIS maps with series of layers that provide and validate useful information for citizens and city policy makers. The visualisation of city's happenings can become more accurate because GIS systems can collect data from other sources (i.e. citizens' smart phones, sensors, actuators…) for triangulation, thus improving the accuracy of the provided information.

In order for the GIS systems work, Degbelo et al., (2016) emphasize the understanding of targeting citizens other than skilled developers. The more vulnerable groups such as children, disabled or elderly (technologically illiterate) people, should be particularly considered because the GIS-enabled smart cities requires the enablement of all of them to become first-class smart citizens that are aware of their city environment and the city services provided to them, and are able to interact with them. The levels of digital competency are varied among users, it is necessary to understand that each citizen perceives, interacts with, and senses the city in distinct ways. Therefore, there is a need for

identification and characterization of how different groups of citizens perceive and understand cities.

All of the considerations are important, according to Degbelo et al., (2016) because "without engaged and educated citizens on the access, creation, and interpretation of data and knowledge, a city may only be halfway smart and open."

Echoing the importance of citizen participation in the new era of technology progresses, Theocharis and Deth (2016) show that a large variety of creative, expressive, individualized, and digitally enabled forms of participation can be classified as parts of the repertoire of political participation.

Analyses from innovative survey with a representative sample of the German population, the authors demonstrate that old and new forms are systematically integrated into a multi-dimensional taxonomy covering voting, digitally networked participation, institutionalized participation, protest, civic participation, and consumerist participation. Additionally, the backgrounds of consumerist, civic, and digitally networked participation are very similar to those of older modes of participation such as protest and institutionalised participation. Theocharis and Deth (2016) also find that whereas creative, expressive, and individualized modes appear to be expansions of protest activities, digitally networked forms clearly establish a new and distinct mode of political participation that fits in the general repertoire of political participation.

Key variables for the effectiveness of new modes of participation include higher education, gender – for instance, men have a significantly higher probability of engaging in the institutionalized and protest acts, but not in consumerist acts in which women have a higher probability to be engaged –, and age. Age appears to be relevant for voting, consumerism, and volunteering.

The new modes of participation are particularly relevant for young people, who have been shown to be disconnected from traditional politics and to be highly critical of politicians and the party-political system. Meanwhile, digital media, as a tool and a mode of participation for young people, continue to develop at the unprecedented velocity and with unpredictable consequences not only for engaged citizenship. Theocharis and Deth (2016) show that the concepts and tools for measuring new forms of participation can be updated based on the growing research that attempts to identify, document, conceptualise and taxonomize these

new forms of participation and democratic innovations more systematically. They cite a number of studies that highlight a lack of understanding about what citizen participation means among academics, policy makers, and for citizens themselves.

Given the availability of the new modes, a crucial question is how to integrate both new and old forms of participation systematically into a general repertoire of political participation in ways that are conceptually meaningful and can allow for a consistent measurement of the phenomenon.

Learning from the literature and own analyses, Theocharis and Deth (2016) conclude "digitally networked forms of participation do not establish an expansion of one of the available modes of participation. They create a new and distinct mode of participation well fitted within a general taxonomy of political participation."

Departing from the detailed citizen participation analyses, Effing and Groot (2016) seek to address the lack of knowledge regarding effective smart city participation strategies. In recent studies, some of them examine effective strategies for the participatory governance of cities, including smarter ways to use the potential of citizens and companies. The researchers focus on the main question of "by using what digital strategies can cities effectively involve citizens and companies in the policy and development process of the city in order to become a smarter city?"

They set the starting assumption that the best cities of the world to live in are not the ones with the most advanced technological layers but cities that create an atmosphere where citizens, companies and government build a vital and sustainable city in close collaboration.

As many other cited scholars, electronic participation becomes one of emerging mechanism for such participation and collaboration to take place. Effing and Groot (2016) also use the ladder's theoretical models to define and categorize various levels of citizen participation but in this case, they use electronic means. There are 11 rungs divided into three stages (levels) of e-enabling, e-engaging, and e-empowering. The first stage encompasses providing access to existing data and information for citizens and companies. The second stage enables people to interact with the organization and start a dialogue via provided platforms and tools. Citizens can provide consultation for certain projects, decisions or activities for instance with forums and polls. The last stage allows citizens to participate, contribute, follow and assess on all the discussion that they are interested.

The Social Smart City framework, as Effing and Groot (2016) introduce, provides the audience with a refined way to look at digital strategies for participatory governance in cities that aim to become smart cities. The framework offers an overview, which can be further developed and refined, of various digital strategies for participatory governance in smart cities. In addition to providing various examples of digital strategies within smart cities, it also provides a broader perspective on participatory governance than a two-way relationship between citizen and government.

As captured in the previous reviews, smart city provides new context and tools for collaboration. Among the public populations, there is a particular group, the youngsters who may best harness and utilise the opportunities provided by the smart cities because they were born with the peak adoption of ICT applications and devices. They are familiar with the technologies around the house, schools, and public areas. They grow organically with the technologies. However, they are also the least involved group who participate and/or involved in public issues. They might be the driving force for the development of smart city when they are engaged, involved, and empowered. The following literature review focuses on this particular group to comprehend natures of the youth's participation, blockages or possible dynamics that can release their full potentials for themselves, for the governments, for the communities they belong, and for the innovations that benefit all.

Generally, there is a great deal of literature related to youth participation, outcomes, impacts, strategies, and newer platforms that attract, enable, engage, and involve young people in various programmes including parliament initiatives, participatory action research, art and creative activities. This reflects the necessity to understand -- width and depth -- of this important group of young people, in most research covering those from 15 to 24 years old.

2.4.5 Youth engagement and participation

In many studies, it is conventional to accept the broad conception of participation which includes all civic cultures and activities but still honouring the importance of voting as a democratic practice. This is due to the fact that within the context of teenagers, most of them have no voting right yet, but they can play an influential role in the decision-making process before a referendum or initiative is held (Kunz *et al.,* 2013). For the relevance and proximity of in the later analyses in this thesis, the particular selected definition youth anticipation is also echoed in the *Irish National Strategy on Children and Young People's Participation in*

Decision Making 2015-2020 by the Irish Department of Children and Youth Affairs (2015): "The process by which children and young people have active involvement and real influence in decision-making on matters affecting their lives, both directly and indirectly" (DCYA, 2015).

Despite growing numbers, teenagers are largely excluded from participation in local and national decision-making, digressing them from active participation and involvement socially and politically (Ben-Attar and Campbell, 2014). In some cases, teenagers who live in informal settlements faced even tougher barriers in finding opportunities for engagement and participation with local communities and governments. The youth often faced prevalence of disconnect and distrust from the systems that they live (Iwasaki *et al.,* 2014).

Meanwhile, research found that youth participation is positively beneficial for the young people themselves and the society they live in. For positive teenagers and youth development, both the youth and the society should promote a variety of developmental competencies that help them to become productive, contributing members of society. The competencies should be at individual, social and systems levels (Alicea *et al.,* 2012; Delgado, 2011; Ersing, 2009; Lind, 2008).

Regarding the civic engagement, research found that those who are involved and participated in civic activities are strongly correlated in improving their personal core competencies. Those young people have higher self-esteem and tend to be more physically active and actively committed to their friends, families, and communities (Bernard, 2016).

In research on teenagers 15-18 in the Netherlands and Switzerland, Kunz *et al.* (2013) found that direct democratic processes offer many spontaneous issue-specific opportunities to influence policy decision. Those adolescents in a direct democracy system like Switzerland were involved in political issues more than those in representative systems such as the Netherlands (Kunz *et al.,* 2013). Youth participation in home care for elderly was found increasingly beneficial in contemporary society, highlighting the education of the social, psychological, cognitive, and biological aspects of ageing (Santana *et al.,* 2015). Youth-oriented and collaborative research generated useful insights on implications for supporting high-risk youth and their families in order to enhance the quality of life in a meaningful and sustainable way (Iwasaki *et al.,* 2014).

In a more active form of engagement and participation, the teenagers found sports meaningful and fun because they developed learning skills; they found competition challenging; and they enjoy the social engagement with others (Jakobsson, 2014). The more social connections that people have, the more likely it is that their social capital will grow (Portes, 2000). Some forms of youth civic engagement are related to social class and race (Flanagan and Levine, 2010; Kahne and Middaugh, 2012).

2.4.6 Youth, engagement, and participation with technologies

However, there are differences in the approaches that youth engage and participate in civic activities. Research by Kahne and Middaugh (2012) show that youth civic participation and activism were changed with the presence of social media to become peer created and directed. Social media became the target platform for proliferations of their activities. The new platform enabled participatory politics through peer-based interactions that were not guided by traditional institutions like political parties or newspaper editors.

In addition, teenagers continue to be the group that endure the greatest impact by the development of ICT, especially mobile and smart phones (Ben-Attar and Campbell, 2014). Pew Research (2014) found that young people are often three times more likely to be online than the general population. In fact, no other age-group participates online more frequently than the young (Gibson *et al.,* 2005).

The role of technology in engagement with consumer choice politics is the most obvious example of the young people's shift in their connection to politics. They are actually more active than older people when they engage on their own terms (Coleman and Rowe, 2005). Through the internet interactions and social networking activities, the youth is seen as tolerant, compassionate, concerned about social issues at home and abroad, and prepared to take action to make the world a better place (Huckle, 2015).

Carnegie Research on E-participation shows that political institutions and social organisations have been slow to recognise that young people see social and political participation predominantly through the use of social networks, online media, and more direct and creative forms of activity (Coleman and Rowe, 2005). Therefore, it is a fair argument that bottom up, grassroots initiatives have engaged young people more directly.

Regarding their skills in the ever evolving technology-enabled society, the youth would like to know more about the wider world and to have the skills to be effectively engaged and ensure that their voices can be heard (Bourn, 2015).

Today any young person can interact with government offices, see rapid results of appeals and even communicate directly with the president of a country and get a response. The new forms of communication via mobile phones can improve the quality and quantity of user-generated information in a way that transforms understanding of the status and needs of the young people by public officials and local government authorities. Social media and mobile devices allow for effective scaling up of participation by young people (Ben-Attar and Campbell, 2014).

This is where youth engagement and participation overlap with the adoption of Smart city for development. The future of a Smart city is inherent in active involvement of its youth. One of the fundamental principles for the success of a Smart city is a paradigm shift on how young people and youth are considered in the general population. As 'citizens of today' (Department of Children and Youth Affairs, 2015) with a right to be respected and heard during their teenage years and in their transition to adulthood, teens have the attention of policy makers who are becoming increasingly aware of the impact of youth on the city and its systems.

2.4.7 Where to next

Citizen participation is becoming more relevant and apparent success factors in the development and implementation of governmental policies and socioeconomic improvement programmes. In an ideal scenario, citizens are empowered to participate starting from their own neighbourhood. They have choices in using different tools (i.e. face to face, mobile apps, online access, calls) to have their voices and opinions heard. Then they are informed of how their inputs are processed and what the outcomes are of such processes. They are aware of what's happening in their own areas, cities, and regions and they have the opportunities to discuss with their fellow citizens, authorities and other stakeholders come up with agreeable resolutions for issues that impact their neighbourhood, their cities, and regions. Citizens can use reliable information, evidence and available data to analyse their options before coming up with the resolutions. They are also empowered to join forces or contribute resources to resolve challenges facing their neighbourhoods, cities, and

regions. Through those processes, they could progress toward more collaborative and co-productive approaches in resolving challenges. They can even come up with businesses, both for profit and/or social entrepreneurship, to help their fellow citizens while easing pressures on government systems. That way, citizens can work with government and other stakeholders in partnerships with certain levels of control. These mean they can really practice the highest degrees of citizen power (Arnstein, 1969).

While there was a rich literature about the outcomes of direct public engagement, the research was generally thin and unsystematic and was often disconnected from attempts to improve practice (Nabachi and Amsler, 2014). It was evident that much of the reported research used quantitative methods and did not engage in the deeper qualitative study of how context and design affect the practice of engagement, and in turn how practice affects the public's experience of engagement. Among the reviewed studies by Nabachi and Amsler (2014), very few made clear the different contexts and designs for the processes under examination, therefore, it was possible to draw only a few broad conclusions such as: "empirical studies show both benefits and drawbacks of direct public engagement for individual participants, communities, and government and governance; in-person deliberative public engagement processes seem to generate better outcomes than both traditional public engagement and online public engagement processes; and context and design choices affect who attends, how prepared they are, how much they know and learn, with whom they interact, how they participate, and likely what they experience." Also, there was little research exploring how these dynamics affect the practice of direct public engagement and the experiences of officials, professionals, and members of the public.

By and large, these are the identified gaps by the scholars of the subjects. In order to foster better citizen participation, there are a number of studies needed to provide systematic approaches to practitioners while newer theories of citizen participation should be hypothesised and tested. Citizens are using various vehicles, tools, and venues that they can access to voice up their concerns, demands, and possible solutions for the common challenges. Whilst, governments at different levels are also investing in the efforts to harness better results from citizen participation. Academic studies are necessary to contribute to the progress.

In the past decade, research agendas have been focused on new governance processes, public participation, stakeholder processes, deliberative democracy, and deliberative public

engagement. The agendas are important but they should be broadened toward finding frameworks, models, factors, and contexts that impact strongly on citizen participation at different levels of government, especially the direct public engagement at local levels.

Especially, ICT is becoming an important set of tools for both governments and citizens in their participation efforts. Then, how to promote the stronger use of ICT in different formats for citizen participation? What would be the roles of the known dynamics of the participation processes? Those include political will, end-user design, marketing and publicising, technology readiness, wireless network availability, access issues, skills issues, digital participation, and improving education, hard-to-reach and marginalised groups (i.e. the youth, seniors, the travellers) in society and much more.

Returning to the theories and practices of the social capital enrichment for all, it would be hard to avoid Putnam's (2003) questions regarding the role of ICT technologies, which he referred to as the Internet. In his view, the most important question is not what the ICT will do to us, but what we will do with it. How can we use the enormous potential of the communications tools to make out investments in social capital more productive? How can we harness the promising technologies for thickening community ties, how can we develop the technologies to enhance social presence, social feedback, and social sues? How can we use the prospect of fast, cheap communication to enhance the now fraying fabric of our real communities instead of being seduced by the mirage of some otherworldly "virtual community"? How can we make the ICT applications and tools a part of the solution? The technologies will not automatically offset the decline in more conventional forms of social capital, but it has that potential, so how can we mitigate such risks?

In a larger perspective, participation in democratic systems included as both procedural voting with representative approach – a method to elect and change elites that rule us at a given time interval (LSE, 2013) and direct civic cultures and the expansion of democracy and democratic decision making into the everyday. The political participation repertoire takes many forms ranging from voluntarism to public protest, highly structured and tightly run organisations have given ways to voluntary associations and ad-hoc advocacy groups (Blumler *et al.,* 2015; Dalton, 1984). Democracy becomes a way of life with participatory models practice by citizens (Verba and Almond, 1963; Pateman, 1970; Habermas, 1994; Held, 2006). And smart cities have highlighted all conditions, features, and tools that cater for such way of life – participatory practices – to flourish, starting at local levels.

2.5 Chapter summary

The chapter describes smart city as new contexts where the application of ICT tools, technologies and collaborative principles of doing things are the distinguished characteristics. The first wave of smart city was the experiment of new technologies on silo physical infrastructures and systems of cities. The first wave proved that smart city solutions can improve efficiency and effectiveness of the systems by improved management with data analyses enabled by the new technologies. However, the first wave also exposed the lack of citizen engagement and participation that limit the potential large scale adoptions and benefits of the new smart city solutions for the real proprietors of the cities: citizens and residents. Therefore, citizen engagement and participation become the centre of many arguments and research in the development of smart city.

At large, citizen participation is highly stimulated in operational and strategic interconnections between governments, other public agencies and citizens/residents. Meanwhile, local governments are leveraging resources and actively seeking innovations to improve their engagement with citizens/residents. In the meantime, citizen engagement and participation has their own characteristics, progresses and complexity. The happenings – demands, advantages, willingness, legal provisions and positive possibilities of citizen engagement – create a new opportunity for a new wave that could revive grassroots democracy by effectively engaging and collaborating with citizens/residents. The new wave, if it reaches a critical mass, could strengthen democracy by engaging and exciting people again for common goods and higher causes. The people could become less alienated and being more respected about what they think, concern, and care. Additionally, the new wave of getting citizen involvement into local affairs and public issues can also facilitate the top-down approach from the governments, in this thesis's frame, it is the city governments, with the bottom up approach where citizens/residents are empowered and facilitated to engage and participate. In order for the new wave to shape, huge reforms, innovations, and resources from all related parties would be needed. And the hot trend of smart city can enable and expedite those prerequisites with ICT tools and the collaborative approaches in gathering collective public intelligence, knowledge, and resources.

Overall, the literature shows that there are gaps in getting a better understanding of how cities can effectively engage with their citizens/residents within the smart city contexts. The "How" question includes many aspects for systematic investigation, such as the roles of

local governments, councillors, officials, ICT technologies, conditions, motivations, and key demographical factors for engagements. Gaps exist in how governments, citizens – especially the hard-to-get groups, such as the youth – use different mechanisms, instruments, solutions, and ICT tools to effectively engage with each other in public issues, innovations, and local developments. There are open questions in the levels and roles of digital access, participation, and skills that facilitate and foster the two-way engagements effectively. In addition, cities are of difference sizes (i.e. large, medium and small), having different resource accesses and abilities to generate revenues, etc. And many of those cities are pursuing smart city journeys.

In particular, there are a very limited number of studies about smart city development in small and medium-sized cities – cities with population range from 100,000 to 500,000. Especially, very little research focuses on an overarching question of how the small and medium-sized cities can foster a two-way engagement between local governments and their citizens/residents in the new contexts of smart city so that they can successful utilise collective resources and knowledge for local development.

As an effort to bridge one of the gaps, this thesis undertakes the following overarching research question:

How can Cork as a medium sized city in Europe effectively engage, empower, and involve its local citizens/residents using smart city initiatives?

To answer the overarching research question, there are interrelated specific questions that need to be understood based on the interrelated literature presented above. This research seeks to resolve the following specific questions:

- RQ1. What are the perceptions, current practices, and skills of Cork citizens/residents in engaging and participating in local public issues, and how do they use public infrastructure?
- RQ2. How do rural and urban citizens'/residents' responses differ in relation to RQ1?
- RQ3. What are the responses of the measured topics in RQ1 among the youth?
- RQ4. What are the perceptions, challenges, and solutions of the key leaders of the Smart Gateway Initiative for the measured topics and their ways to lead?
- RQ5. Does crowdsourcing instrument work in the data collection process for Cork?

Chapter 3

METHODOLOGY

3.1 Introduction

The Methodology chapter lays out justifications for the employed methodologies in this thesis. The case study method is used together with a mixture of qualitative and quantitative methods. The evaluation method is also employed while practical considerations reinforce the choices of methodologies.

A detail method usage for each of the specific research questions – outlined in the concluding remarks of the Chapter 2 (Page 95) – being examined in the Cork case study is presented in the Chapter 4 Cork: Case Study Setting.

3.2 Employed methodologies

3.2.1 Case study for CSG

The main proposition of this study focuses on the "How" question. This type of questions is preferred to be resolved by case study method (Yin, 2009; Bryman and Bell, 2007; Gerring, 2007). Analysing how Cork Smart Gateway, in its smart city initiative, engages with its citizens/residents is a holistic investigation of a contemporary phenomenon within its real-life context and case study method enables the researcher to do it.

Cork is typical because like many other cities of its size it faces urban challenges in delivering services to its citizens/residents under reduced funding from central government. It has to compete with the capital city or another tier one cities in its country for investments and resources. It has similar motivations and driving forces like many others cities of its size in economic growth and sustainable development. Not much different from other cities of its size in Europe, it does have to compete for talents to achieve economic growth while facing an ageing population. Like other cities of its sizes, Cork has ageing infrastructure systems while it has to keep up with service demands of local citizens/residents.

Cork also faces global challenges, such as sustainable development, and some specific challenges for similar cities in Europe, including ageing population and infrastructure systems. Therefore, it positions Cork as a good single case study. Lessons learned from Cork can be useful for other similar cities.

In January 2014, Cork City Council (CCC) and Cork County Council (CCoC) decided to pursue a smart city approach for Cork Region in a Smart Gateway Initiative. After a year of

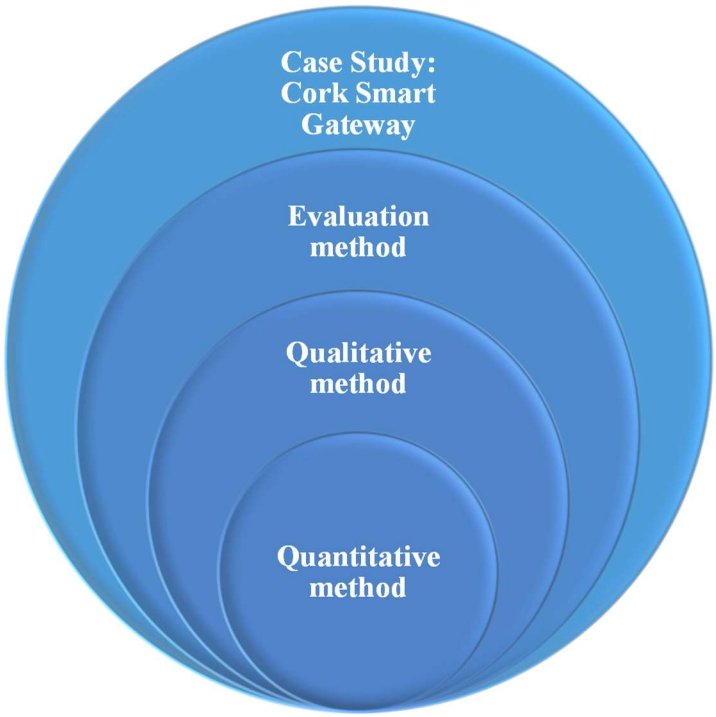
exploring the smart city agenda, it planned a two-year pilot programme in 2015-16, before actually starting its smart city journey in which technologies, such as ICT, play a core role in citizens/residents engagement and wider economic growth.

This research focuses on a neglected aspect in the smart city research spectrum: the two-way engagement between the city and its citizens/residents in smart city initiatives. Cork is addressing this aspect early in its pilot programme and it is a perfect case for this aspect to be analysed systematically.

The case study method is selected for this study for three reasons: the type of research question, the control the investigator has over actual events and the focus on contemporary as opposed to historical phenomena (Yin, 2009). This study's all-encompassing research question requires a holistic and meaningful analysis, which the case study method can offer (Yin, 2009; Gerring, 2007).

Figure 3.1 below describes other methods embedded within the case study of this research. The embedded methods complement each other to provide a rounded exploration of the contemporary happening in a real life context: The Cork Smart Gateway.

Figure 3.1 Methods to be used within the case study (Author's self-illustration).



3.2.2 Case study method: advantages and disadvantages

As a positivist epistemology researcher and the position of a typical case, the Cork Smart Gateway case study needs to be done rigorously. All processes, including research design, data collection, analysis, and interpretation and reporting, need to be carefully planned and deployed.

The context of the Cork Smart Gateway distinguishes itself amid the new urban development trend of utilising smart technologies in physical systems and operations for efficiency and evidence-based decision-making processes. It provides an opportunity to dig in the richness of the new phenomenon and the extensiveness of the real life context. It requires and enables many variables of interest and data points. The case study method points the researcher to essential tactics such as using multiple sources of evidence with data to converge in a triangulating fashion (Yin, 2009). The case study of Cork allows the researcher to add at least two more sources of evidence: direct observation of the happenings and interviews with the people involved in the happenings. The Cork case study provides the researcher with unique strength in its ability to deal with a full variety of evidence – documents, artefacts, interviews, and observations.

Like other research methods, case study also faces critiques even when it is a distinctive form of empirical inquiry. One of the criticisms is the lack of rigour of case study research. The case study researchers are blamed for being too messy and not following systematic procedures. They are criticised for allowing vague evidence or biased views to influence the direction of findings or conclusion (Yin, 2009; Gerring 2007). Such disapproval is less likely the case when researchers use other methods, which might have been developed for a long time and guidance for specific research procedures are available for researchers to follow. Another source of the criticisms comes from a fact that people have confused case study teaching with case study research. Case study research requires researchers to account for all evidence to be reported fairly, in a systematic manner. While in teaching, case study materials might be altered to demonstrate arguments more effectively (Gavin, 2003).

One of the most often disapproval of case study method is it is usually blamed for its validity in generalisation. The case studies, like experiments, are generalizable to theoretical propositions, and not to populations or universe (Yin, 2009). Within this pathway, the main goal of doing a case study is to expand and generalise theories with analytic generalisation,

not enumerate frequencies. Reporting the case study is also being criticised as a lengthy document with massive and unreadable records. All of the disapprovals somehow result from a fact that the skills for doing a good case study have not been defined (Yin, 2009).

Flyvbjerg (2006) named the five misunderstandings or oversimplifications about the nature of case study research:

1. General, theoretical (context-independent) knowledge is more valuable than concrete, practical (context-dependent) knowledge.
2. One cannot generalise on the basis of individual case; therefore, the case study method cannot contribute to scientific development.
3. The case study is most useful for generating hypotheses; that is, in the first stage of total research processes, whereas other methods are more suitable for testing hypotheses and building theories.
4. The case study method contains a bias toward verification, that is, a tendency to confirm the researcher's preconceived notions.
5. It is often difficult to summarise and develop general propositions and theories on the basis of a specific case study.

Flyvbjerg (2006) corrected them, defending the case study method as a necessary and sufficient method for certain important tasks in Social Science. And good social science is problem driven and not methodology driven in the sense that it employs those methods for a given problematic, to best help answer the research questions at hand. Flyvbjerg (2006) also noted that a combination of qualitative and quantitative methods would best resolve the task.

A single case study, like the Cork Smart Gateway, is a single-shot affair – a single example of a larger phenomenon (Gerring, 2007). Questions of validity are often distinguished according to those that are internal to the sample under study and those that are external (applying to a broader – unstudied – population). The corresponding virtue of case study research is its internal validity. Often, though not invariably it is easier to establish the veracity of a causal relationship pertaining to a single case than for a larger set of cases. Case study researchers share the bias of experimentalists in this respect: they tend to be more disturbed by threats to within-sample validity than by threats to out-of-sample validity.

It seems appropriate to regard the trade-off between external and internal validity, like other trade-offs, as intrinsic to the cross-case/single-case choice of research design.

When studying decisional behaviour research, which one of the objectives of the Cork Smart Gateway case study may offer insight into the intentions, the reasoning capabilities, and the information processing procedures of the actors involved in a given setting.

Taking into account the informed disadvantages, the Cork Smart Gateway case study is to be done with other embedded qualitative, quantitative and evaluation methods. The strategy ensures the overall case study has multiple sources of evidence and that data is converged in a triangulation. These tactics are following a widely accepted case study method (Gerring, 2007; Yin, 2009).

3.2.3 Evaluation research method

Weiss (1998) defines evaluation research method as "the systematic assessment of the operation and/or outcomes of a programme or policy, compared to a set of explicit or implicit standards, as a means of contributing to the improvement of the programme or policy."

There are five key elements in that definition: systematic assessment (conducted with formality and rigour); the investigation of the operation and outcomes of the programme; standards for comparison; contribution to the improvement of the programme.

The Cork Smart Gateway allows some spaces for evaluation, which is intended for use because smart city is a journey toward new ways of doing things rather than a destination. The evaluation, which starts out with use in mind, will contribute to a longer run of the city's deployment plans. Findings in the evaluation can be useful for other cities that are seeking to follow the same path as Cork. Although the evaluation method focuses only on the early stage of the two-way engagement using smart initiatives in Cork, the planning and pilot stages are usually key stages in making or breaking a successful programme.

The reasons for why the evaluation method is used in this research are: it requires skills to make research simultaneously rigorous and useful when it is coping with complexities of real people and real programme run by real organisations; and it encompasses the formative and process, which comes in the early stages, and seem to be dedicated to improving the programme. Many evaluations focus on impacts. People, organisational, and social issues

are central to understanding those impacts, and hence, to evaluation. These evaluations tend to be robust and very comprehensive, producing greater insights. The Cork Smart Gateway provides such opportunities for valuable understandings. It might be first of its kind in the context of early stages prior to a smart city journey.

3.2.4 Qualitative method: in-depth

As generally defined, qualitative research can be constructed as a research strategy that usually emphasises words rather than quantification in the collection and analysis of data and that (Bryman and Bell, 2007): The qualitative method has following characteristics:

- Predominantly emphasises an inductive approach to the relationship between theory and research, in which the emphasis is placed on the generation of theories;
- Has rejected the practices and norms of the natural scientific models and of positivism in particular in preference for an emphasis on the ways in which individuals interpret their social world.

In the Cork Smart Gateway, a series of interviews and ethnographical analysis shed light on the understanding of subjective meanings help by selected actors in the smart initiatives. This approach provides in-depth understanding about what has been working regarding the existing engagement practices and motivations of these forms. The interviews with selected authorities and community leaders bring to life what can be done and improved in smart initiatives for better and more effective two-way engagements.

3.2.5 Quantitative method: theories tests

Bryman and Bell (2007) defines quantitative research as a research strategy that emphasises qualification of the collection and analysis of numerical and statistical data that:

- Entails a deductive approach to the relationship between theory and research, in which the accent is placed on the testing of theories;
- Has incorporated the practices and norms of the natural scientific model and positivism in particular; and
- Embodies a view of social reality as an external, objective reality

Within the CSG case, it poses a great opportunity to test established theories in citizen engagement to understand if those theories work in a newer context of people using more

and more technologies in their daily life interaction including engagement with local authorities and public issues. Quantitative data are relevant in this case study for two reasons. First, the collected data cover the behaviour and attitude that this overall case study is trying to explain. Second, the data relates to the embedded components of the analysis within the broader case study. It complements the qualitative data that is critical in explaining and testing the case study key propositions in a new context.

The scale of the data collection project is huge and it required resource sharing and strong support from the local authorities, volunteer communities and other related groups in Cork. This is where practical considerations come in to demonstrate that it is not easy for a case study research to just emerge anywhere and at any time for researchers to do a meaningful, applied study but also contribute to academic knowledge.

Regarding practical considerations for this research, in guidance books for research methodologies and doing research, most of the authors stress the importance of practical considerations in doing research (Bryman and Bell, 2007; Yin, 2009; Gerring, 2007; Marsh and Stoke, 2002). The feasibilities may influence researchers' choices in research strategy; design; method; resources and costs. They also may be determined by the nature of the topic; people being investigated; political acceptability.

In the CSG case study, the accessibility of the researcher to the case at a very early stage, in a role of a member of the CSG's steering group, was important. Indicated by the literature review and given the infancy of the topic, the case provides a good opportunity for testing matured theories in citizen engagement while generating new theories in this gamut using new contexts and new technological means. The researcher has built an international skill set that is useful for the city in such a new journey of going smart in its engagement with citizens and residents. The active role of the researcher in practices and the timeliness of the Cork going smart coincided and gave the researcher an ideal opportunity to do the applied research work.

In addition, because the scope of the project is quite large, it requires sizable financial and non-financial resources. Leaders of the CSG agreed to contribute funding for the researcher to carry out the surveys set across targeted groups described in the above-mentioned quantitative method section. Additionally, the political background is ideal in the sense that a new management and mandate for transformation at city levels are encouraged globally

and Cork has joined such movements including smart city, learning city, Covenant of Mayors, healthy city, with full confidence and support.

Given all of the practical considerations outlined above and the rigour of applying mixed research methods, Cork is a good case study and its findings and conclusions will contribute new learnings to both academic and practical spheres.

3.3 The Research Question

The literature review reveals gaps for a better understanding about how cities can effectively engage with its citizens/residents in smart city contexts. Cork presents a good opportunity to explore one of the open questions. Being a medium-sized city, lessons from the Cork case study can be relevant to similar size cities which have similar aspirations for the development of smart city. Again, the research question is:

How can Cork as a medium sized city in Europe effectively engage, empower, and involve its local citizens/residents using smart city initiatives?

The overarching research question is being dealt with by the exploration of five interrelated specific questions:

- RQ1. What are the perceptions, current practices, and skills of Cork citizens/residents in engaging and participating in local public issues, and how do they use public infrastructure?
- RQ2. How do rural and urban citizens'/residents' responses differ in relation to RQ1?
- RQ3. What are the responses of the measured topics in RQ1 among the youth?
- RQ4. What are the perceptions, challenges, and solutions of the key leaders of the Smart Gateway Initiative for the measured topics and their ways to lead?
- RQ5. Does crowdsourcing instrument work in the data collection process for Cork?

The findings and implications of the five interrelated specific research questions aim to provide a holistic evidence for Cork to position itself on a trajectory to shape a successfully engaged, empowered and involved local citizens/residents using the smart city initiatives.

Using CSG as a case study, the interrelated specific questions were explored to form key puzzles for the effective citizens/residents engagement. The quantitative data analyses use the data collected from the CorkCitiEngage project which the researcher gauged the

literature, planned, developed, and implemented for Cork. The CorkCitiEngage project focused on three major categories of public participation in public issues, digital skills, and key public infrastructure access and usage. The categories were selected for measurement as they were associated with Smart city key characteristics (Alawadhi *et al.,* 2012; Giffinger *et al.,* 2007) and to align with the specific objectives of the Cork Smart Gateway Initiative. The qualitative analyses use the data from series of semi-structure interview and the documentations of the whole processes of the collaborative works involved in the collection of the quantitative data.

The surveys were the first step to define where Cork's citizens/residents with their perceptions, practices and willingness are in public participation. By setting up a baseline with the collected data, Cork Smart Gateway could identify the key factors and evidence, which this research helped to capture quantitatively. Next, this research analysed the views of the CSG leaders to verify their perceptions and understandings about Cork's baseline and challenges and to evaluate the leaders' solutions to overcome the challenges in leading the CSG forwards. Overall, by outlining the key components and understandings from both quantitative and qualitative analyses, the research enabled Cork to be clearer on its route to a successful engaged, empowered and involved local citizens/residents in the smart city initiatives.

3.4 CorkCitiEngage Samplings

Five sets of surveys were designed with an aim to maximise the chance for all groups of population in CASP to participate.

The target samples are:

- Government officials working in CCC, CCoC, and their affiliates (Official)
- Representative General Public (Rep)
- Non-Representative general public (Non-Rep)
- Senior Citizens/Residents (Senior)
- Youth (15-18 years old) (Youth)

The survey sets were also designed depending on the applicable survey methods used and associated costs. While four out of the five target samples were planned to be non-representative samples based on the survey methods utilised, the Representative General

Public sample was the most valuable and challenging one. The Official survey was carried out by sending the invitation to respond to the survey and the survey link in an email from CCC and CCoC's ICT system administrators and a few unit leaders of the two councils. The Non-Rep was a public invitation including the survey link published on the two councils, UCC, and CIT official websites. The invitation was also sent to internal email systems of the two universities. Social media accounts of all those institutions and their subordinates pushed information and the survey link on weekly and then daily basis on key platforms including LinkedIN, Twitter, Facebook, Instagram and Snapchat for a few weeks. Although the Senior survey used face to face interviews by student volunteers, this survey only reached respondents in their own settings of day care centres and community centres. The Youth survey used the online method with an email of invitation to participate, personal consent to respond, and the link to the survey. All of the consent schools received the email and used their computer classes to ask for their students' participation. The Youth survey only has 25 questions rather than the regular 30 questions in the other groups because the adolescents have not involved in using public services.

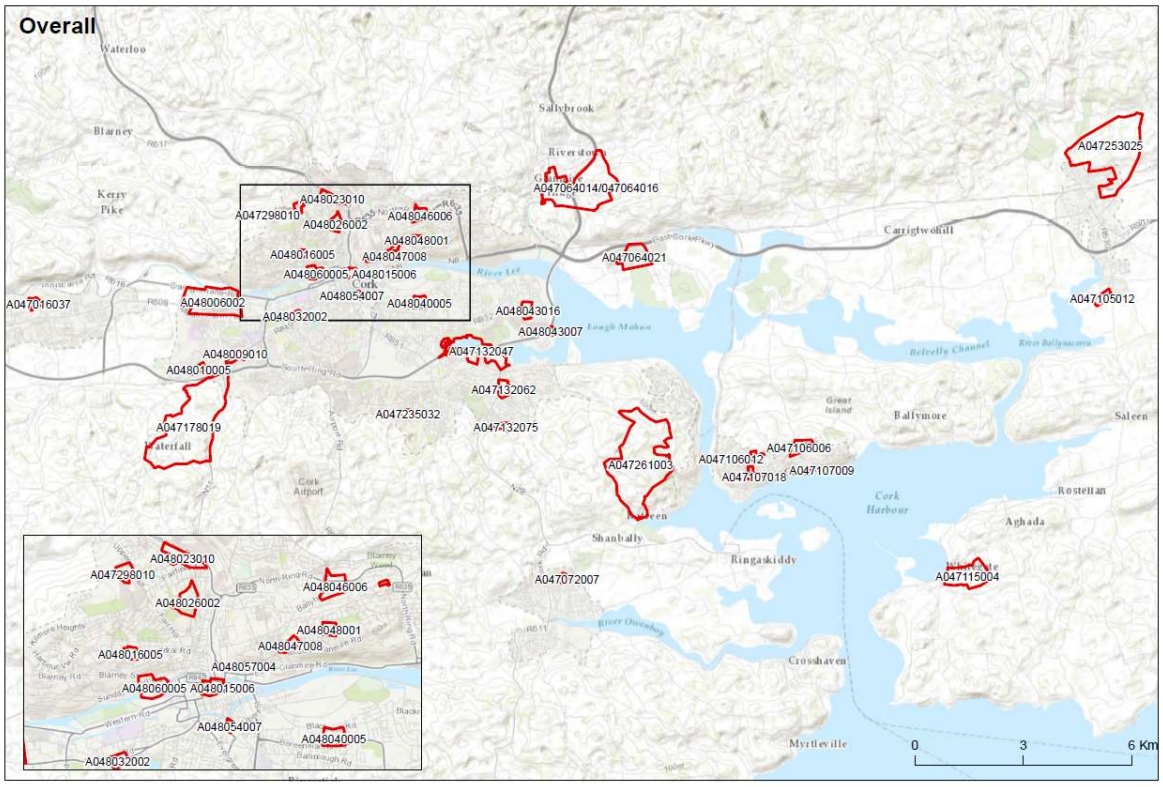
The Rep survey sample was crafted systematically by calculating relevant variables using the Irish Central Statistics Office's (CSO) demographical data in Small Area (SA) sampling frame of the CASP areas. The SAs are the smallest geographical levels defined by CSO for the National Census in Ireland. SAs are smaller than the Electoral Divisions, which is another geographical that are usually used in large scale surveys. An SA usually encompasses a geographical area comprising around 100 households, depending on the sizes of the households in the areas, there may be SAs with more households than other.

For the selection of the most representative SAs in CAPS, the acquired data were calculated using Excel tool based on key variables available on the CSO data set. The selected variables include gender, age groups, ethnicity, occupation, industries, education levels, and personal computer and Internet access. The variables were normalised from absolute values to percentage values for statistics purposes. Then the variables were set on its percentage depending on the level of their importance to the overall survey. For instance, the literature shows that age groups, education levels and gender are important variables in the public participation. They were given higher weights than other less impactful variables such as industries. The calculations resulted in a value that was considered the most representative for all calculated SAs. That absolute value was then being used as the benchmark against

all calculated values of all the used SAs. Only those SAs which were least deviated from the benchmark value were selected as the survey SAs. Those SAs were then identified in SA maps that were used by fieldwork researchers.

There were 20 SAs were selected to satisfy the 1000 sample quota of the survey with a response rate of 50%. The Figure 3.2 shows the actual SAs that the general public representative survey was carried out.

Figure 3.2. The map shows the selected SAs after the complex sampling calculations were done.



Carrying out the representative sample survey was the most challenging operation. The researcher proposed to experiment a crowdsourcing method that is usually used in making software under the computer science industry. The CSG steering committee agreed and funded the operation. The experiment included the recruitment of volunteer field researchers, planning and train their relevant skills, survey field operation, and health and safety issues while doing field works.

3.5 Questionnaire Design and Survey Implementation

The questionnaire contents and designs were based on literature review, particularly in the citizen engagement (Page 73), local government' public services (Page 46), challenges and usage of ICT tools to engage with citizens/residents, the objectives of the Cork Smart Gateway (Page 116) and the immediate aims of the CorkCitiEngage project (Page 119). The questionnaire focuses on three key topics:

- **Public participation:** measuring current and preferred practices, willingness to engage and participate in public issues and understanding about existing smart projects in the city.
- **Digital skills:** measuring current and preferred usage of traditional and digital tools available.
- **Public infrastructure:** measuring current and preferred access and usage of public transport, internet, and open data.

As the justification put forward in the CorkCitiEngage section (Page 119) of the Chapter 4, the categories were selected for measurement as they were associated with smart city key characteristics (Alawadhi *et al.,* 2012; Giffinger *et al.,* 2007) and to align with the specific objectives of the CSG. They also overlapped with key features of Learning City set by the UNESCO in 2013. The surveys were set to detect citizens' understanding of smart city projects in Cork; current practices and willingness to engage/participate in public issues; digital skills; preferred means of communications; and access to and use of hardware, broadband internet and public transport (i.e. buses). The five sets of surveys were designed with a mixture of multiple choices, open-ended questions and Likert-type scale (Maurer and Pierce, 1998). A few questions in the surveys were adopted from existing European (EAVI, 2013; EC, 2013; EC, 2014; EU, 2013) and international surveys in citizens' engagement, digital skills and volunteerism. The majority of the questions were designed based on specific objectives of the CSG and the key features of Learning Cities. A questionnaire was constructed with strong support from subject matter experts in UCC in questionnaire creation and survey deployment. After the design stage, the questionnaire went through a testing stage. A small number of targeted participants received paper forms and web links to the piloting surveys to complete and researcher(s) identified flaws and made improvements. The questionnaires had gone through the required review processes by both

respondents and involved people from CSG. They were officially agreed to use the reach the targeted respondents.

The public participation category was measured in all five sets of surveys. The measurement of current practice in volunteering and their willingness to involve in future smart city projects was itemised to identify trends and suggestions. Research showed this measurement to be important (Smith, 1994) since those who volunteer have the higher enthusiasm to engage/participate in general public issues. The digital skills category measured current usage of traditional and digital communication tools available to the five targeted survey groups. The groups' preferred communication means indicated not only their preferred but also their reference of those means that they want to use more. The usage of social media was also designed in the questionnaires to detect how it could be leveraged for stronger citizens' engagement strategy. The category also featured as an important aspect of the Learning City to show that people can learn anywhere, anytime, and through any digital device.

The public infrastructure access and usage category were essential for both smart city and Learning City. The surveys measured current usage and potential usage of public transport, the Internet, and open data. The measurements reflected the current status of the key characters: mobility and Internet usage. The updated demographical data category was important in the sense that it could give statistical validations against what was already known in the 2011 Census and other CSO surveys. It provided relevant contexts to map where and how the proposed surveys account for the proportions of Cork's citizens and residents. There were three popular methods for rolling out the questionnaires: post, online, and telephone interviews. Each of the methods would result in different response rates. Literature and current practices show that the online method is the cheapest for both survey participants and researchers, especially in data input, processing, and analysing (Umbach, 2004). Telephone interviews and post methods can be used as additional measures when the online method does not generate the desirable response rates.

Figure 3.3. The survey methods used in their corresponding target participating groups of the CorkCitiEngage project

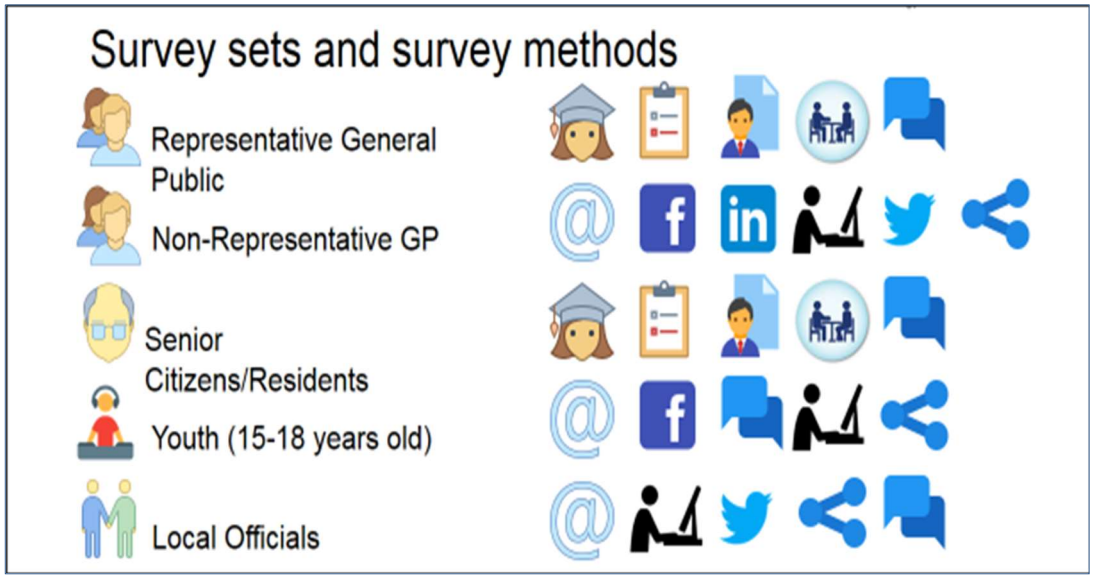


Figure 3.4. The number of respondents in each survey and their totals. Mallow was then collapsed into the Non-Representative group due to the nature of the data and their surveyed method, which was the face-to face with a group of population that has a particular interest when they visited the Mallow Science and Math Festival.

Representative	950	Senior	141
Non-Representative	1301	Youth (15-18)	768
Mallow	87	Official	352
3599 respondents			

In this specific project, each set of the surveys was conducted with the most appropriate and cost effective methods (Figure 3.3). All research ethics concerns were addressed in each of the surveys, following codes of ethic regulated by the UCC Social Research Ethics Committee. The surveys used an innovative and original 'smart' approach which combined traditional door-to-door survey methods with crowd-sourced information-gathering, using student volunteers going door-to-door and an additional online survey. The crowd-sourced

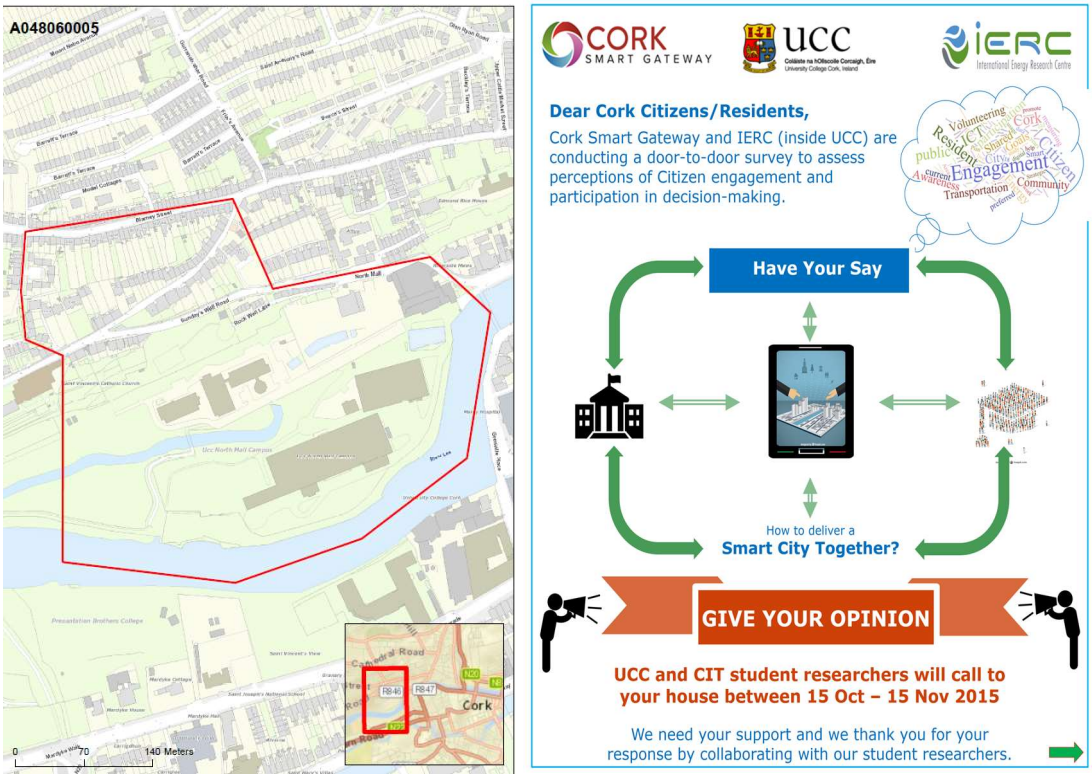
methodology was an experiment that shed light on the possibility of sharing risks, resources, and expertise when carrying out this type of research. The online public survey was open for three months, and CorkCitiEngage student volunteers spent nearly three months visiting Cork neighbourhoods to ask people what they think about their involvement with public policy matters. The sets of surveys were deployed for three months and yielded good results with details below outlined for each of the surveys.

Figure 3.4 summarises the total respondents from each of the deployed surveys that accumulated a total of 3600 respondents, making it the largest available data sets at the city level in either Smart city or Learning City context globally.

Have Your Say – Representative General Public sample – gathered 950 respondents through face-to-face and door-to-door interviews by student volunteers in 20 selected small areas in Cork. Figure 3.5 shows a sample map of the selected small areas used for guidance by volunteer students and the information card delivered to each households in the selected areas for this Representative (Rep) survey set.

Have Your Say – Non-Representative General Public (Non-Rep) or tech-savvy general public/adults yielded largest respondents of 1301. This group of respondents accessed the survey web link through internet applications (i.e. social media, email, web link on websites…). Despite the fact of the non-probability sample, this group's skills, perceptions, practices, and understandings could be considered as an ideal group for smart city interactions. This was because of their high proficiency of digital skills for the context of highly ICT-enabled solutions that are usually adopted in SC projects.

Figure 3.5. the left picture is an example of a selected small area that volunteer field researchers went to do their door to door survey. The right picture is the front of the information postcards that informed the citizens/residents in the selected SAs for their collaboration and response to the survey.



Have Your Say – Seniors - student volunteers collected 141 respondents using face-to-face interviews. Due to the small sample size, the sample may not be representative of the general population of this group, and it is important to keep this in mind while reviewing the results of the study.

Speak up Youth – the teenager group – attracted 768 respondents from 26 schools and youth reach centres. While it was not a large selection of the general population of this group, it sufficiently significant to show consistent views, practices, and skills across relevant activities, policies, and programmes benefiting or targeting this age group.

Work with Citizens – the local authorities/officials – harvested 352 respondents from Cork City Council, Cork County Council and their affiliates. The responding rate was at more than 10% of the total employees at the two halls and this was the common responding rate in organisation-wide surveys.

3.6 Method for each of the RQs

3.6.1 Cork at baseline

As described in the data gathering processes, after the data were collected, analysed for the RQs were screened, cleaned, and conducted according to the specific RQs. Cork at baseline utilised the descriptive data analysis using Excel and SPSS software. The results were presented in coloured stacked up bars for all survey groups. The number of respondents of the survey groups was different therefore, statistical tactics were used to naturalise the analyses. All of the comparisons use percentages rather than the absolute values.

3.6.2 Rural versus Urban

The RQ2 used the aggregated data from the surveys. As described at the survey design there were differences in the number of questions in each of the surveys. For instance, the Speak up Youth had only 25 questions while the general public survey Have Your Say had 30 questions. Therefore, only the overlapping questions were used in the analyses of differences between the rural versus urban. The total number of analysed data for this exercise was 2237 respondents. Excel and SPSS softwares were used to analyse the data for this RQ. The data were screened and cleaned before being divided into rural and urban categories. The analysed questions based on the presented topics were normalised by using percentages rather than the exact values. The differences in the percentages based on the commonly used statistical test of the t-test. Only those statistical tests with P values at or smaller than 0.05 at a confidence level of 95% were recorded.

3.6.3 Youth

The RQ3 was analysed as descriptive exploration. The exercise provides evidence and insight to understand how to approach, engage, and involve the hard-to-reach group in public issues. Excel and SPSS software were used to generate visualised graphs to demonstrate the detail responses of the youth based on 25 questions of the on-line survey. The descriptive analyses profile key measurements of what this special group interest, perceive, practice, and want in related topics for their public participation. Whilst, the in-depth analyses of the correlations between genders and digital skills, public participation, volunteering, and impacts were determined by statistical Pearson Chi-Square tests. Only those tests with p value ≤ 0.5 were recorded to confirm the correlations of the measured

variables. All the statistics analyses were run by using the Statistical Package for the Social Sciences (SPSS) software.

3.6.4 Movers and shakers

The RQ4 qualitative analyses used data from the 13 semi-structured interviews. The questions were composed based on the initial findings of the survey. Each of the interviews lasted in more or less an hour. The interviewees had the questions before hand. All of the interviews were recorded on two voice recorders. The voice clips were coded to exclude the identity of the interviewees and then transcribed using the speech-to-text softwares branded as Dragon Naturally Speaking Software and Trint. The transcriptions were manually validated by the researcher and cross-checked again by a fresh eye quality controller. The transcriptions were cleaned to take out repetitions and off topic conversations. The data were then put into key categories for analyses. The exercise followed theories of qualitative analyses which highlight the "why" and the "how" (Kara, 2015) aspects of the citizens/residents engagement from the key drivers of the CSG initiatives. The data showed their awareness, understanding of the related issues, their anticipated solutions, and known challenges.

3.6.5 Crowdsourcing

The RQ5 was analysed using the evaluation method reviewed in the methodology theories. The evaluation method highlighted the whole process of the data gathering for the CorkCitiEngage project using crowdsourcing method, a methodology used mainly in computer science and software development. In the CorkCitiEngage, the utilised crowdsourcing refers to a method of gathering and/or analysing data that is led by non-experts. It is used in situations where the amount of data that must be dealt with is so large that it is not feasible or economical to employ experts, but which the task also cannot feasibly be automated. It has been used successfully in many different areas, for example, a gathering of data on habitats of insects and animals (Silvertown *et al.,* 2015), classifying high fidelity photos of deep space (Tinati *et al.,* 2015), and DNA analysis (Khatib *et al.,* 2011). Researchers that have successfully used crowdsourcing to gather useful and valid data emphasise the importance of designing and managing the process through which data is gathered. People will engage willingly and usefully in crowdsourcing if the task assigned

to them is simple and clear, and they can see how their work is contributing to science (Tinati *et al.,* 2015).

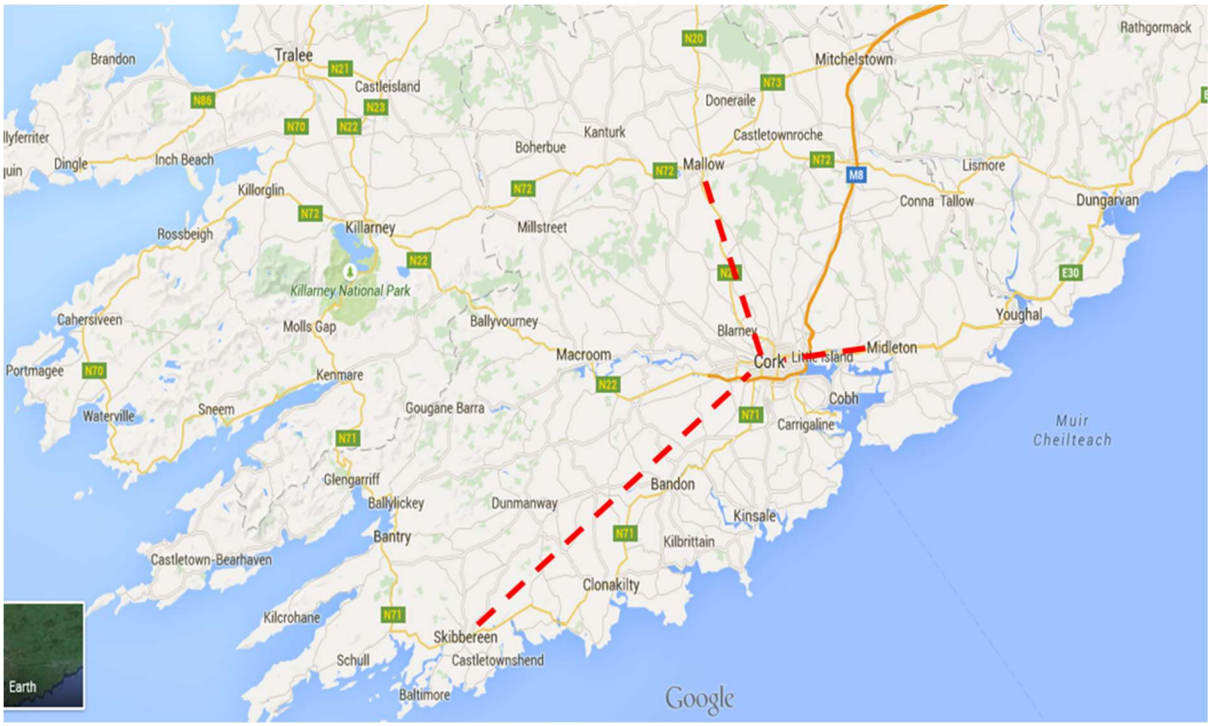
The evaluation method systematically analysed the steps taken in the whole processes from the beginning of the crowdsourcing being selected to experiment in the project to the outcomes with impacts to the participants. It was a high-risk experiment when crowdsourcing was used in two layers: overall design and implementation of the CorkCitiEngage project and in the data gathering of the Have Your Say survey for the Representative General Public Group. The evaluation method revealed the strengths and weaknesses of the whole processes while providing some insights for improvements in next experiments of the crowdsourcing method in other projects that aim at doing common good and require a large number of participants.

The data profile for RQ5 includes notes, emails, and interaction records from the beginning of the process to the completion of the whole CorkCitiEngage. While the crowdsourcing method was the subject of the experiment, the researcher employed practical and innovative tactics to apply the theories of crowdsourcing into practice. For instance, the network development in the crowdsourcing theories focuses mainly on stakeholders who are very often online rather than physically within proximity like the case of CorkCitiEngage. The rich resource of student volunteers from UCC and CIT was leveraged at its best and became a deciding factor in the successful experiment of the method for the CorkCitiEngage. The findings and discussion chapter shows the learnings in details.

Chapter 4

CORK: CASE STUDY SETTING

4.1 Cork Profile



4.1.1 Overview

Cork is a nearly half million population county, including 125,622 residents of Cork City, locating in the southern-most region of the Republic of Ireland. The settlement of Cork city and suburbs had a population of 208,669 in April 2016, an increase of 5.1% compared to the figure in 2011 (National Census, 2016).

Being the second largest county in Ireland, Cork has been a destination for investment by the world's leading companies, generating jobs and demands for higher education and skills training provided mainly by the two world-class educational institutions: University College Cork and Cork Institute of Technology. While economic growth is making Cork a good place for investment, job opportunities, educational and training activities along with other urban amenities, these place enormous pressure on city and regional infrastructure systems.

As described in the literature review, cities have three key environments of physical, economics, and social. Cork's profile is presented to highlight the current challenges facing the city and region.

Regarding the physical environment, Cork has been built around the River Lee at lower levels of elevation and has been flooded from time to time, resulting in serious aftermath

consequences. In the most recent floods happened in 2009 and 2014, for instance, damages and relevant repair works, business disruptions cost the city and its residents around €3.1 million (Kelly and Hayes, 2014) and €50 million, respectively. Water supply was taken from local councils to make up the Irish Water operation, leaving the local councils with limited resources to ensure good quality of the water supply to citizens/residents. Like any other economic entities, transport infrastructure is crucial for Cork.

The city and region can be accessed by air, via one international airport, by sea, via a passenger and cargo port, by roads, via networks of local, regional and national roads (nearly 500km), and by rail via train services connecting to Dublin, other cities, and towns across Ireland. Cork has public transport systems serving the inner city, and outer connecting towns, rural areas, and other regional cities. While those physical infrastructures are important for Cork, the local councils have little authority to the operation, management, and planning of their direct support to the city and region's growth. For instance, public transport has been managed by state own companies and what Cork can do is proposing for additional or reduced services based on its projected development plans. The actual decisions regarding the quality and quantity of those services are decided by the companies. Meanwhile, Cork City plays the key role of both economic hub and employment centre to nearly 30,000 of commuters living outside the city boundary including those from other counties such as Kerry and Waterford. Despite such travel demand, only nearly 10% of the commuters use public transport, meanwhile, 34% of those who live within the city boundary go to work, study or do other business by cycling and on foot.

Another important infrastructure is internet connectivity and access to personal computer (PC). While Cork has high a speed broadband connection available but in some areas, internet access in some neighbourhood inside the city was as low as 43% in 2011 (CSO, 2011). The situation improved nationally with 85% of households have access to the internet (CSO, 2015), however, given the speed of improvement in Cork, there may still areas suffering from low access percentage. The situation was similar with access to a PC which showed that nearly 60% of households without a PC in a few areas in Cork City. While the access to PC is now mediated with smart phones, there are public services that require access to a PC for appropriate usage. There are other infrastructures in the city such as hospitals, schools, health care services, public lighting, parks, and parking and they are all under pressure for increasing demands for services and for renewal, maintenance, and replacement

due to ageing conditions. Like many other cities in Ireland, Cork is facing housing pressure for its citizens/residents. The pressure come from the limited number of available houses and the decreased quality of the existing houses. Over 40% of the total houses in Cork were built from 1946 to 1980. The numbers of people on the waiting list for social housing is on the rise every month in Cork. Meanwhile, the local authorities (city and county councils) faced severe cuts from the central government funding for social housing. The City Council got only 10% (€5M) in 2011 from the allocated funding it got in 2009 (€54M). Cork County received around 22% (€16.6M) for the social housing fund that it was allocated in 2009 (€74.3M).

About the economic environment, Cork was no exception when it comes to suffering from the consequences of the global economic recession. The unemployment rate doubled from 2006-2011 while a few industries cut their hiring by a half and other went bankrupt totally. The situation has been improved since Ireland was back on track for economic recovery since 2014.

Like many other cities, Cork provides great opportunities in public and private sectors for its citizens/residents and those who live nearby. Among the largest employers in Cork in 2011 were Cork University Hospital, Apple, UCC, Boston Scientific, Cork Institute of Technology and others. Among Cork population in 2011, only 42.3% people age 15 and over categorised themselves as working. With the presence of UCC and CIT in the city, students made up a particular economic group with nearly 15% of the total population in 2011. The retired population was also high, at 15%. The proportions of the two groups were higher than State's average and they represented different demands of services. In 2011, majority of people in Cork worked in professional services, accounting for 26% of the total jobs available. The professional services are jobs associated with the workers' trained qualifications or experienced professions. The second largest jobs were in commerce and trade, at 23,5% in 2011. Working people in Cork also work for manufacturing, building and construction, transport and communications, public administration, and in other occupational groupings such as cleaners and labourers, sale and customer services, managers, directors, and senior officials. Cork also had a high level of unemployment rate, at 12% in 2011, a little higher than the national rate. The latest analysis from 2016 National Census is not yet available, however, the local councils are focusing on key drivers of economic development and job creation in their local growth strategies.

Regarding the social environment, Cork enjoys a nice addition to people coming from other countries including those from the European Union (EU) to the 87% of the Irish citizens/residents in the city in 2011. A more recent figure about this is not ready yet but it was projected as a rising trend for Cork to be home for increasing numbers of people from outside Ireland. The mixture, other investment, and effort of relevant agencies and authorities resulted in positive reputation for Cork. In 2016, Cork was selected as the first European city to host the third UNESCO Global Network of Learning Cities Conference in September 2017. In July 2017, Cork was ranked the number one city in Europe for cultural venues and facilities by the EU Cultural and Creative Cities Monitor. Cork is seen as the top of the league out of 64 small and medium-sized cities across Europe. Cork has many arts and sports facilities and is a popular venue for festivals such as Cork International Choral Festival, Cork Learning Festival, Cork Film Festival, Guinness Cork Jazz Festival, and many smaller ones. There is a dozen of Gaelic Athletic Association (GAA) clubs in operation in Cork. The GAA clubs played more than 14000 games in 2016 (GAA Annual Report, 2016). A part of being players in a variety of games and sports under the GAA clubs, people can volunteer at those games, making them as a good way for many to engage locally.

Cork is also home to two internationally reputable education institutions: University College Cork and Cork Institute of Technology. The two institutions enrolled a combined population of more than 35000 students locally, nationally and internationally. Apart from these higher education institutions, the city also has around 51 national schools and dozens of secondary, vocational, community and comprehensive schools. These schools are not only for educational and professional training purposes but their activities and the interactions inside the schools provide a rich fabric for social interactions among the students and their parents, both inside and outside the schools' walls.

Cork city has a 24.3% of the total population completing third level education, a much lower than the figure in the county, which is at 31,4% in 2011. The second most popular level of education for Cork city was upper secondary at 19%. The recent educational trends showed that people tend to attend and stay on in higher education more than they did in the last decade. The presence of more educated population is meaningful for the social capital of the city but also for other associated aspects such as health issues, civic engagement, social cooperation and relationship (Fukuyama, 1992). Systems of libraries and community centres are also contributing to the educational and learning demands of the local

citizens/residents. There are seven local libraries in addition to one central library in operation in Cork. There are nearly 40 community centres under management of local authorities, and private and social organisations.

However, within the social environment of Cork, there are remaining and interrelated issues facing the city such as ageing population, deprivation, and gaps in skills, education levels, incomes, living conditions, and mobility among the neighbourhoods. For instance, Cork has a significantly higher proportion of people age 65 and older, at 15% of the total population, compared to the 11% at national figure (CSO, 2011). Despite that fact, the percentage of residential and nursing care beds in Cork in 2011 was lower than average at the national level. Also, the ageing population is also facing risks of poverty, deprivation, and consistent poverty. The older people are also being limited in their mobility, thus putting themselves at risk of health and mental issues including isolation and loneliness. ICT has been proven providing useful tools for this group of population to cope with the risks, however, the skills to use those ICT tools and access issues are open for research. Deprivation occurred in a number of areas in the city in 2011 and it was correlated with the higher unemployment rate, lower educational levels and skills, lower incomes and living conditions. A few serious deprivation areas have been supported by the Revitalising Areas through Planning, Investment and Development (RAPID), which aims at increasing investment made by central and local authorities; improving the delivery of public services through integration and coordination; and enhancing the opportunities for communities to participate in strategic improvements of their areas. Also, like many other urban areas, Cork also has other issues such as homelessness, discriminations, crimes, assaults, alcohol abuses, and drugs. These present as ongoing challenges to the local governments and authorities, who have been facing serious decreases in human resources, available funding, and access to programmes since 2008.

4.1.2 Policy Context

Against the mix backdrop in Cork, it is logical to review the policy context that local governments and authorities are constituted to operate, especially in the aspect of citizens/residents engagement that leads to “public participation” which was stated in many policy documents.

4.1.3 The organisation of local authorities

According to the administrative division, Cork City and County belong to the primary levels of local government in Ireland. As stated in the 2014 Local Government Reform Act (LGRA), the State levels include local government areas to be known as (a) counties, (b) cities, and (c) cities and counties. There are 26 counties (Cork County), 3 cities (Cork City) and 2 cities and county. Representing an important part of the local governments, local authorities are Cork County Council and Cork City Council and they have jurisdictions throughout their administrative area (2014 LGRA). The Article 28A of the Irish Constitution utters that the local governments are responsible for "providing democratic representation of local communities" and to "guarantee local elections at least every five years". Local governments function in both aspects of a representative role and an operational role through "performing a number of important functions" and by being "responsible for a range of services". As local governments, Cork City and County operate "through a network of directly elected local authorities" (The Irish regions office, 2015), in cooperation with public servants and professionals employed at the local councils. The local governments are responsible for delivering a wide range of services in housing, planning, recreation facilities and amenities, environmental protection, and others (The Citizens Information Board website, 2015).

The number of councillors per local authorities is decided by the law. Cork County Council has 55 members and Cork City Council 31. Councillors are directly elected by members of the local communities in local elections for a five-year term. Local authorities are managed by Chief Executives (CEs) who are appointed by the local authority councils for a seven years term that can be extended by an additional three years. The CEs are in charge of supervising, coordinating, managing and paying the employees, and officers of the council. They sign third party or outsourcing contracts on behalf of the councils. The CEs are also responsible for ensuring local authorities operate smoothly and for enforcing policy decisions of the elected councils (2014 LGRA).

4.1.4 The 2014 LGRA: potential for public participation

The 2014 LGRA regulated establishments of Local Community Development Committees (LCDCs). The Cork County and City LCDCs have been under establishment and development since 2015, in each local authority with respect to its administrative area. The

establishment of the LCDCs aims at developing, coordinating, and implementing a coherent and integrated approach to local and community development. The LCDCs include members of the local authorities, representatives of public authorities, local community interests, publicly funded or supported local development bodies. Each LCDC works with its concerning local authority and in accordance with the principles of sustainable development, to make and implement a six-year Local Economic and Community Plan (LECP) in order to promote economic development of locals and communities in its functional area. The LECPs are expected to have a core strategy with specific objectives that need to align with development plans of the concerned local authorities and with any regional spatial and economic strategy. It is mandated that the preparation processes of the LECP have to include consultations with local communities in order to promote effective participation by the local communities in local governments (2014 LGRA).

Apart from the participation of the LCDCs in the local governments, public participation has been strongly encouraged by the central government. The views were clear in a report commissioned by the central government to evaluate the citizen engagement with local governments and recommend for further inclusion of the citizens into a local decision-making process, such as in the processes of making an LECP.

In the Working Group Report on Citizen Engagement with Local Government led by Minister of the Environment, Community and Local Government Phil Hogan (2013), the public, according to the Aarhus Convention, can be defined as "one or more natural or legal persons, and, in accordance with national legislation or practice, their associations, organisations or groups". Participation can be considered as "an integral part of the process of assisting the local authority lead overall community efforts to move towards an economic, environmental and socially sustainable future that delivers an improved well-being for this and future generations" (Phil Hogan, 2013). And, there are different degrees of public participation "from involvement in local neighbourhood and community life to structured engagement with public authorities and associated decision-making structures."

While the report did not specifically describe the actual current situation in Cork, however, it is important to understand the bigger picture of the citizen engagement at national level to position Cork in a fair context. The report stated that there was "a democratic deficit at local level" due to the "absence of meaningful opportunities for civic participation", "concerns about the ability of communities to influence decisions" and "mechanisms to

channel civic energy" whereas citizens' engagement requires that people "people believe that they can influence decision-making and that their views are taken into account". Existing structures to support citizen "are not reaching all sectors within communities" (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013).

"The participation of citizens in public life and their right to influence the decisions that affect their lives and communities are at the centre of democracy". For ensuring a genuine public participation in decision-making process, local authorities "must go beyond the range of communication, consultation and citizen participation mechanisms used in the past". However, "public participation processes" must "be complementary to the statutory consultation processes" and "cannot be allowed to substitute" (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013).

The report reinstated that local governments are "key democratic institution" that should work "for the people with the people" (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013). It projected that if people are involved in the decision-making process about their own environment, "outcomes of those decisions are more likely to provide for the well-being of this community and future generations of the communities concerned". The report highlighted the possibilities of people contributing local knowledge that help to make "solutions developed are relevant to the local area, rather than being imposed by external experts" (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013).

At a larger effect, the report stated that citizen engagement can contribute to reinforcing democracy because it "builds trust and confidence" between citizens and local authorities, strength their "identification with political institutions" and show that they can bring changes. Thus, it can strength citizens' feeling of belonging to a local community and so their involvement in it and improve relationships among people of a community (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013).

One of the core objectives of a local government "is to promote the well-being and quality of life of the public and communities". Moreover, local authorities deliver a wide range of services that are important for citizens' daily life. It directly concerns citizens and so this is why local authorities "must talk with and listen to people and communities as well as

implement the necessary actions" in order to ensure "efficient and good value services" (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013).

A "more open, more honest and more accountable" decision-making process helps to increase the successful implementation of the decisions. A stronger and earlier involvement of citizens "helps to build consensus" and can ensure a better understanding of why a decision was made because people know "the whole range of factors which may influence a decision" (Working Group Report on Citizen Engagement with Local Government, to Phil Hogan, 2013).

Yet, a stronger citizen engagement does not come without challenges, some of them are already in existence while others are new. For ensuring an effective public participation, the report recommended to set up an "open and participatory systems (...) developed through an open and participatory engagement with interested parties". It would require "capacity building" and "buy-in" across all relevant sectors (local government, communities, citizens/service users, local development and other stakeholders...). The report pointed out some cautions while implementing citizen engagement strategies and activities. The cautions included below in the report's own terms:

- Wider citizen/resident participation should not compete but rather complete the local representative democracy. Thus, local authorities and elected members have a key role to play in promoting citizen engagement,
- A supportive political culture, and effective and economical means of engagement, including the use of the latest media and technology,
- It requires adjustments from the Local Authorities as well as from the public. Local Authorities will have to ensure that the public is aware of their right and responsibilities in these areas. They will also have to ensure that engagement with the public really is participative,
- It is a complex process requiring time, new mechanisms and so to develop skills among elected members, officials and people,
- Public participation must be balanced between different groups in society,

- Maintaining confidence among citizens on how information generated from engagement is used, and establishing openness and accountability in the subsequent decision-making process,
- Increased incidence of "consultation fatigue".

The report also mentioned about the usage of ICT tools to boost citizen engagement in public policy making. Whilst, in a report published by the Organisation for Economic Co-operation and Development (OECD), ICT had been recognised as powerful sets of tools that could improve the citizen engagement experience (2004). The OECD report highlighted the learnings of using ICT tools to improve public participation as: as an enabler, not a solution; online provision of information is an essential precondition; and barriers to a greater online citizen engagement in policy-making are cultural, organisational, and constitutional not technological.

The report outlined potential contributions of ICT tools to improve citizen engagement including greater access to quality information and quantity of information; interactive participation for online consultation; vast opportunities for numerous formats of online public participation. ICT applications offer powerful tools for searching, selecting, and integrating vast amounts of information held by public administration and presenting the results in forms that can be easily understood and reuse by individuals. ICT also enables governments to build and use their own platforms for analysis of public inputs and to provide feedbacks to citizens on how their comments and suggestions have been used in reaching decisions.

For effective uses of ICT tools, the OECD warned the local governments to pay attention to scale, capacity, consistency, evaluation, and commitments. The capacity refers to the development of virtual public spaces that enable individuals' voices to develop into a community voice, and for local governments, it is the question of how they listen and respond appropriately to each individual contribution. The capacity includes actions to raise awareness and capacity among government officials about ICTs potentials and limits on public participation. The capacity also includes the ability develop tools for online engagement that provide citizens with an opportunity for both to participate in, and to understand, collective decision-making and to develop the skills for active citizenship. Coherence or consistency means that governments need to take a holistic view of the policy-

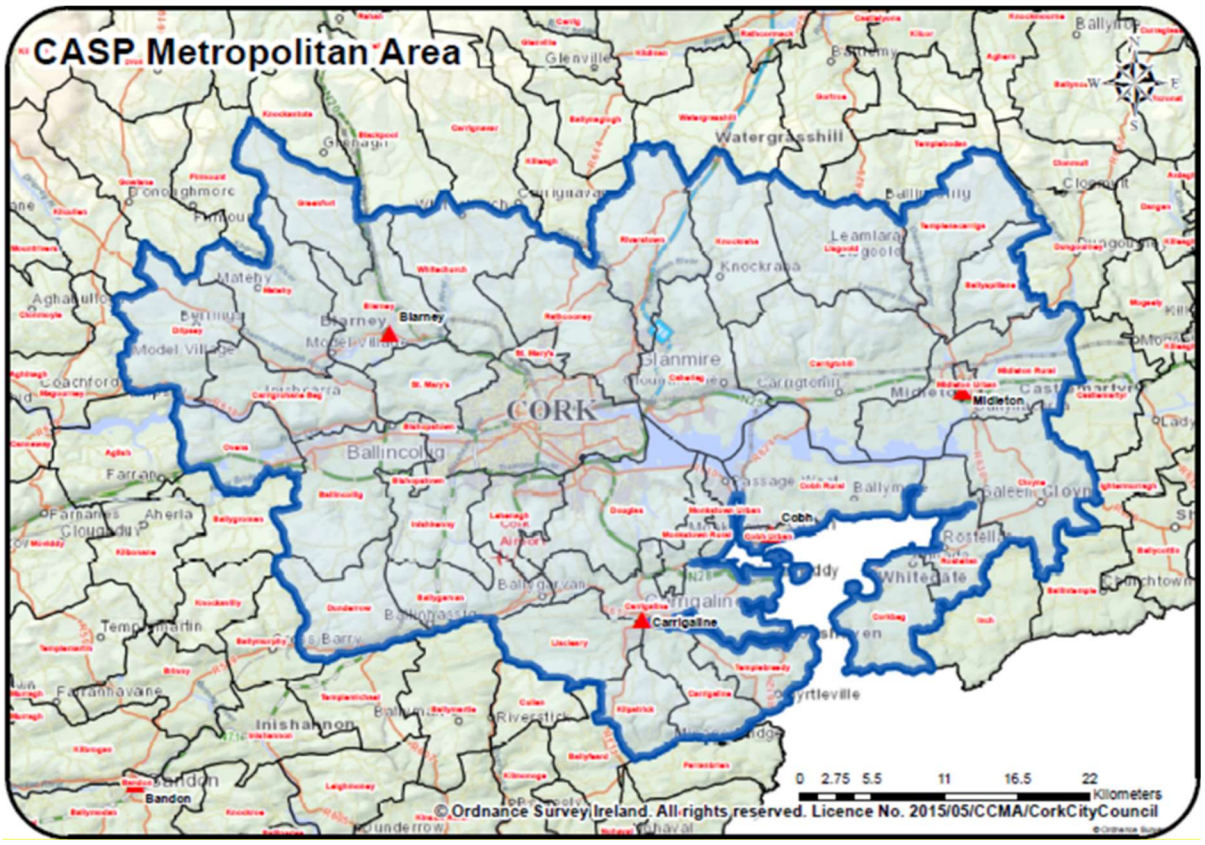
making cycle and design appropriate processes and technologies for such systems. The evaluation is important to be done publically on a regular basis because it gives insights into the experience of the online engagement from both citizens' and governments' perspectives. The commitment indicates the efforts of governments to adapt their structures and processes to ensure that the results of online consultations are used, analysed, and disseminated.

In summary, it is regulated for local authorities to engage with local citizens and residents in making planning, services delivering plans, economic and social development and other activities. And ICT tools are becoming more available and better in analytic abilities that allow local governments to harness relevant insights from citizens/residents to bring into consideration of the local policy making processes. In Cork, although it is mandated to engage with its citizens and residents, Cork also recognised the opportunities to turn the engagement into participation for harnessing the collective advantages and resources of the local people for socio-economic growth. And Cork Smart Gateway is one of the initiatives to implement such strategy.

4.2 Cork Smart Gateway

Cork County and Cork City decided to act upon the recognised challenges in the existing regional infrastructure and are working together in planning the sustainable development of the region the Cork Area Strategic Plan (CASP). While CASP is designed to provide a framework for the integration of land use, transportation, social, economic and environmental elements for the Cork area, to 2020, it also requires a growth of 40,000 new jobs and serving the daily demand of a current population of approximately 350,000 people. The CSG was initiated in the spring of 2014 as one of the solutions to meet the sustainable growth demands of the CASP area (Figure 3.1). Geographically, CSG covers the CASP region or the Cork municipal area which includes the Cork City and a vicinity nesting other major urban centres such as Mallow, Ballincollig, Clonakilty, and Middleton in Cork County. CSG is led by four key steering members: Cork City Council, Cork County Council, Tyndall National Institute from University College Cork, and NIMBUS Centre from Cork Institute of Technology.

Figure 4.1. The boundary of the Cork Area Strategic Plan (CASP)



The rationales for CSG came from a combination of global trends including rapid development and capacity to deal with complex systems of technology and communication (ICT); rapid urbanisation; increased demand for public services; social and environmental considerations; and competition at international sphere (CSG Project Justification, 2014). The leaders of the CSG understand the context that Cork is operating: a strong competition for trade, investment, and human talent national and international levels; severe impacts of the economic crisis that led to a prolonged recession; European policy demands for ensuring competitiveness and achieving social, economic, and environmental sustainability for EU regions. And CSG inherits substantial experience, assets, and capability in research, development, innovation, and technologies from the founding members and other stakeholders in the region. The two councils have a long history of collaboration with each other and interaction with citizens/residents, and of providing services in response to the needs of the region and its population. CSG was set up with a strong consideration of established structures and programmes, and a framework for cooperation and cross-working between agencies and sectors. CSG is seen as an overarching strategy to maximise the existing advantages in a consistent manner that promotes smart agenda for the region and

that projects are developed on an integrated basis. CSG is also set to harness the best value derived from involving data opportunities that provide insights and evidence for greater benefits of informed decision making by stakeholders.

CSG utilises a new urban management practice using technologies to boost cities' competitiveness, promote sustainable development, and enhance the quality of life of citizens. The overall aim of the Cork Smart Gateway is to improve the region's economy, environment and quality of life for its citizens (CSG Project Justification, 2014).

Among many definitions of the smart concept, CSG chooses the concept: "Use of ICT to boost economic activity, enhance quality of life, and promotes the protection of environment and natural resources. Involves the active engagement of the four societal pillars – government, the private sector, academia, and the citizen – in consultation, feedback, decision making, and implementing projects, to maximise the overall benefits."

As one of the first steps, CSG focused on the fundamental question of how to effectively engage with Cork citizens and involve them in consultation, feedback, decision-making, and implementation processes. The CSG recognises that infrastructure growth has significant impacts on community-based projects. Carroll (2013) showed that a multi-disciplinary approach is necessary for sustained impact and engagement. The key question of effective engagement with citizens was also a lesson learned throughout Cork's visits to early Smart city adopters such as Cologne, Barcelona and Dublin. CSG worked with the researchers to identify the best practices of citizen engagement (Pham, 2014) in smart city initiatives. CSG would need both a technology platform for citizens' engagement and an effective citizens' engagement strategy (Pham, 2014).

The effective citizen engagement requirement was also apparent in the Cork Learning City initiative, which was promoted by UNESCO and Cork was one of the first four adopters. The UN organisation also developed a list of key features of Learning Cities with measurements, including some overlapping indicators with those usually required in the development of Smart city or Smart Gateway in Cork. Another synergy in the two initiatives was the vital participation of major sectors in society, especially public bodies and citizens, in the implementation processes.

Addressing the key challenge in engaging with citizens/residents, the Cork Citizens Engagement (CorkCitiEngage) was launched to set up a baseline which informs the CSG

leaders with evidence and recommendations for intervention. CorkCitiEngage researched key characteristics and indicators of the two initiatives (Smart Gateway and Learning City) pursued by Cork to come up with the idea of establishing baseline citizens' engagement data, thus identifying channels, platforms and practices for the meaningful engagement and involvement between the local authorities and their citizens.

4.3 CorkCitiEngage

Being one of the first members of the CSG founding committee, the researcher proposed to set up baseline of current and preferred ways of engagement with Cork citizens/residents. The CorkCitiEngage was introduced to the public as a data collection project to assess baseline engagement measured by key factors. The factors were determined by the key characteristics of a smart city in conjunction with the key measurements of a learning city.

CorkCitiEngage set the context for Cork as it wanted to become a smart city through the CSG, which is also positioned to enhance Cork's reputation as an attractive region to live, work and invest. CSG also aimed to become a part of the European smart city project, a new urban management practice using technologies to boost a city's competitiveness, promote sustainable development and enhance the quality of life of its residents.

The project highlighted a strong education heritage, Cork was also set to become one of the world's first UNESCO Learning Cities, established under the Beijing Declaration. The achievement would enable Cork to create and reinforce individual empowerment and social cohesion, economic and cultural prosperity, and sustainable development.

An important synergy identified in the two initiatives was the vital participation of major sectors in society, especially public bodies, and citizens/residents. Thus, one of the fundamental success factors was how to effectively engage with citizens/residents and involve them in consultation, feedback, decision-making and implementation. Leaders of CSG positioned the active engagement of residents as Cork's major differentiator in competition for EU funding and successful implementation of the initiative. Both initiatives require quantifiable indicators to measure progress and success while ensuring meaningful engagement and involvement of major sectors of society. There are some overlapping metrics between those required in the development of a smart city and those defined by UNESCO to measure Learning City development so it is efficient to look at both together.

For instance, both initiatives place the importance of ICT infrastructure and digital skills of the local people.

The overall aim of the CorkCitiEngage was to collect data from citizens/residents and produce a baseline and analysis for relevant authorities and stakeholders to map out areas of impact for investment planning, policy implications and deployment programmes. The data will be collected through a series of surveys covering:

- Public participation: measuring current and preferred practices, willingness to engage and participate in public issues and understanding about existing smart projects.
- Digital skills: measuring current and preferred usage of traditional and digital tools.
- Public infrastructure: measuring current and preferred access and usage of public transport, internet, and open data.

The surveys were designed with a mixture of multiple-choice, open-ended and Likert-scale questions. Some questions will be adopted from existing European and international surveys on citizen engagement, digital skills and volunteerism, such as the European Social Survey. However, the majority questions were designed based on the specific objectives of the Cork Smart Gateway and UNESCO Learning City initiatives. The major research groups to be surveyed were: officials in Cork city and county councils; general public – both representative and non-representative samples, youth (15 to under 18-year-olds) and seniors (65 years old and over).

4.4 Chapter Summary

The chapter presents Cork profile, policy context, recent changes in the organisational structures, and legal requirements that prompt Cork to come up with new initiatives to mitigate and lead the city and regional growth. One of the initiatives is the CSG, which was set up to steer Cork forward by adopting smart city model. CorkCitiEngage is one of the first effort to establish the current context of Cork's population for the citizen engagement and participation. The processes of setting up the baseline for Cork create a good opportunity to for a research to explore how Cork, as a medium sized city in Europe, can effectively engage, empower, and involve its local citizens/residents using smart city initiatives.

Chapter 5

RESEARCH FINDINGS

5.1 Chapter Introduction and Outlines

Emerging from the interrelated literature review of smart city, local government, and citizen engagement in the contexts of smart city, which emphasizes the collaborative principles and the usage of ICT tools and solutions, this research aims at:

1. Tackling the challenges of citizen engagement in smart cities by identifying key factors and conditions that enable and empower citizens to involve in these programmes early.
2. Providing evidence and practical lessons for cities, especially those small and medium size cities in Europe, to innovatively apply in the processes of building smart cities.
3. Contributing to the current academic discourse of how citizen engagement has shifted in a new context of more open collaboration and ICT-enabled platforms and tools. In other words, this research is an effort to enrich the limited empirical evidence into the nature and characteristics of citizen engagement and participation in smart cities. Particularly, the research attempts to provide a better understanding of aspects regarding digital collaboration with citizens, how to facilitate the collaboration, how to optimise citizen participation. These are essential aspects to develop smart cities (Schuurman *et al.,* 2012).

The deployment of the five sets of surveys in Cork yields large data sets for analyses. Chapter 5 presents research findings of the five related specific research questions:

- RQ1. What are the perceptions, current practices, and skills of Cork citizens/residents in engaging and participating in local public issues, and how do they use public infrastructure?
- RQ2. How do rural and urban citizens'/residents' responses differ in relation to RQ1?
- RQ3. What are the responses of the measured topics in RQ1 among the youth?
- RQ4. What are the perceptions, challenges, and solutions of the key leaders of the Smart Gateway Initiative for the measured topics and their ways to lead?
- RQ5. Does crowdsourcing instrument work in the data collection process for Cork?

The Chapter starts with the quantitative research questions 1, 2, and 3. These research questions present relevant and interconnected analyses from the comprehensive and robust

quantitative data collected in the CorkCitiEngage project. The CorkCitiEngage aimed at collecting the relevant citizens/residents data in participation in public issues, digital skills, and key public infrastructure access, and producing a baseline and analysis for both Cork Smart Gateway and Cork Learning City. From September 2015 to January 2016, the sets of surveys were carried out and collected the largest sample of 3599 respondents at a city level. The CorkCitiEngage project was the first of its kind to be conducted at city-wide level. It was also the first smart city-related project that conducts a city-wide and 360-degree view from the general public, senior citizens, youth, and local authorities.

The RQ1, under the title Cork at Baseline, presents the overall descriptive quantitative analysis of the CorkCitiEngage with details in the three key topics measured: participation in public issues, digital skills, and access and usage of key infrastructure. The results provide information and evidence for relevant authorities and stakeholders to map out areas of impact for investment planning, policy implications, and deployment programme using the smart city context.

The RQ2, under the title Rural versus Urban, describes the key descriptive and verified quantitative results regarding the digital divide aspect of the Cork Smart Gateway, which also includes commuter towns and rural areas. The findings provide evidence and insights for interventions and investments in areas that will not only ensure the participation and usage of the urban people but also address the legitimate demands and settings of the people living in rural areas.

The, RQ3, under the title Youth, presents descriptive analyses of the special group of children from 15 to 18 years old. By the time they responded to the survey, many of them were ready to join local workforce while others were on track for their third level education. This group's involvement in local public issues and the CSG in particular became extremely important for Cork and Ireland, especially after Brexit, which was a referendum organised in the United Kingdom to vote for the UK to leave the EU in June 2016. The youth became the forefront labour force that could attract huge investment from financial services companies and multinational corporations to relocate their operation outside the UK. Ireland, especially Cork, became one of the front contenders for new destinations of those companies, which would create jobs, generate ecosystem services, and consumption demands for their own operations and their employees. Therefore, the in-depth

understandings of this group became crucial for Cork to enable, empower, and connect them to the overall development of the city.

The RQ4, under the title The Leaders' View, verifies the perceptions of the leaders of CSG initiative. It records their understandings and potential solutions to the current and future challenges in leading the initiative. The qualitative text analysis is carried out using transcriptions of the twelve individual semi-structured interviews with the key leaders who initiate or have a good understanding about the initiative. The analysis provides a key piece of the puzzles to form a holistic solution for Cork to successfully engage, empower, and involve its local residents/citizens using smart city context.

The RQ5 presents the report of the crowdsourcing instrument that was experimented in the process of forming up the CorkCitiEngage project and the implementation of the data collection. The process descriptions provide insights on how crowdsourcing can be unitised in organising and implementing labour intensive projects. This RQ5 informs an appropriate and cheap method for Cork and other cities to employ in smart city projects, which highlight and require strong collaboration and co-creation throughout different stages of the projects.

The chapter ends with a summary of the key research findings of the five specific and interrelated research questions to deal with the overarching research questions of how Cork can successful engage, empower, and involve its local citizens/residents in the collective development of the city using smart city initiatives.

5.2 Cork at Baseline

The CorkCitiEngage project focused on three major categories of public participation in public issues, digital skills, and key public infrastructure access and usage. The aim of this exercise is to establish a baseline data set for Cork with the measured categories from the target groups discussed in the previous sections.

The results provide a comparative analysis of the aggregated data from all five sets of surveys in the CorkCitiEngage. The comparative analysis was the comparison of the corresponding percentages among the five surveyed groups. The aggregated data set was the merged data according to the surveyed questions, regardless of their question numbering in each of the surveys. The aggregated data comprised all 3599 respondents.

5.2.1 High Level Results Summary

- Cork citizens highly value a shared and collaborative vision of their participation in public issues;
- Cork citizens strongly believe that they have big/moderate impact in making Cork a better place to live;
- However, Cork citizens indicated that they have too few opportunities to participate in local decision-making;
- Top concerns on Cork citizens' minds are sustainable jobs, health and wellbeing;
- Two thirds of Cork citizens volunteered in various arrangements based on both personal interest and helping people as their top motivations;
- Cork citizens identify Cork as an excellent place for life-long learning and education opportunities;
- Cork citizens are skilful in the use of digital tools such as email and texting;
- Email and mobile phone are the most common communication methods Cork citizens use and want the public to communicate with them using these;
- Facebook is the dominant social network used by Cork citizens;
- Cork citizens enjoy good internet connection at home and have a strong demand for hardware and Wi-Fi access at public offices and libraries;
- Two-thirds of the people surveyed would use a smartphone app designed especially for Cork.
- Below are the results on specific topics measured in the research surveys.

5.2.2 Public Participation

The descriptive data analysis yielded positive results of all groups toward public participation, which was measured by direct questions regarding their practice and their willingness to be involved in public issues, future SC projects, and their preferred engagement methods. The main story line is that the people highly appreciate a shared and collaborative vision of their participation in public issues (Figure 5.1). They believed that their participation would have a positive impact on making Cork a better place to live (Figure 5.2). However, there are few opportunities for the people to participate in local decision-making (Figure 5.3).

The seniors, in the meantime, believed in the importance of their participation in local issues, yet, they face more challenges in mobility and activities that could involve them, therefore, they responded low on both their participation practice (i.e. volunteering) and their willingness to participate in the future smart city projects

Figure 5.1. Comparative analyses of the five sets of the surveys regarding participation in public issues and impact of the people on making Cork a better place.

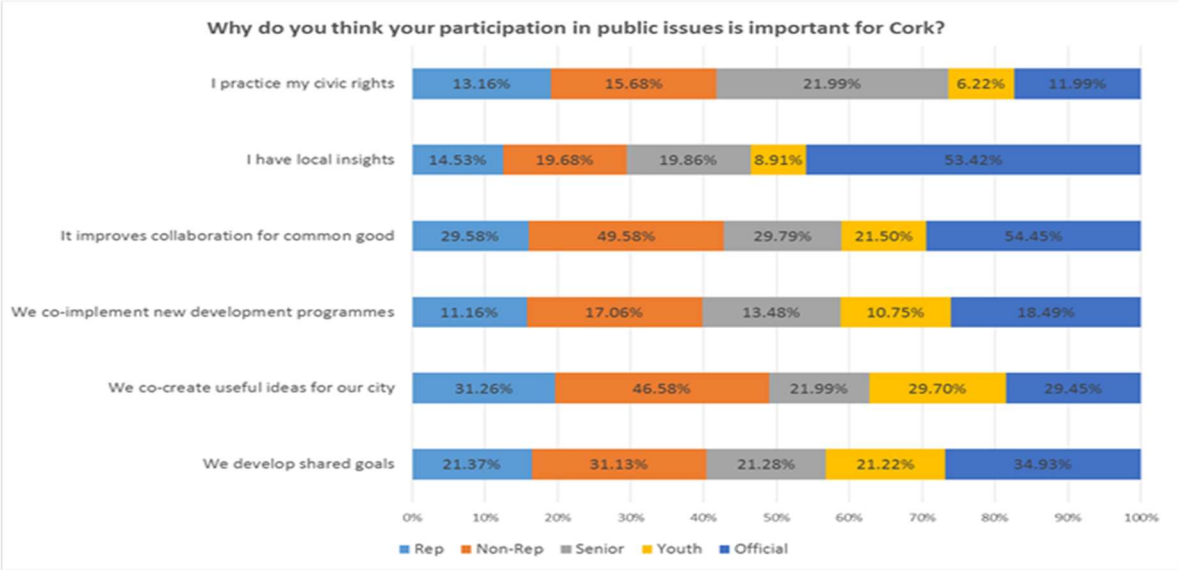


Figure 5.2. Comparative analyses of the five sets of the surveys regarding participation in public issues and impact of the people on making Cork a better place.

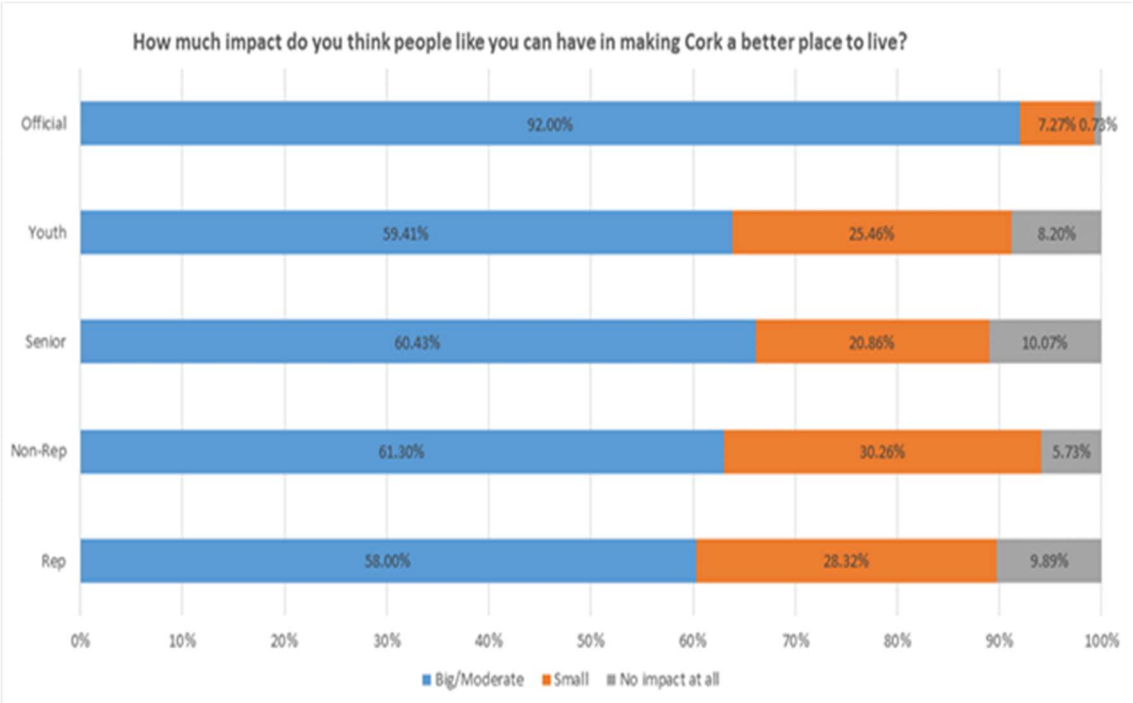


Figure 5.3. Comparative analyses of the surveys in the opportunities for the people to participate in local decision making and their volunteerism in the past year as a measurement of a person's participation practice.

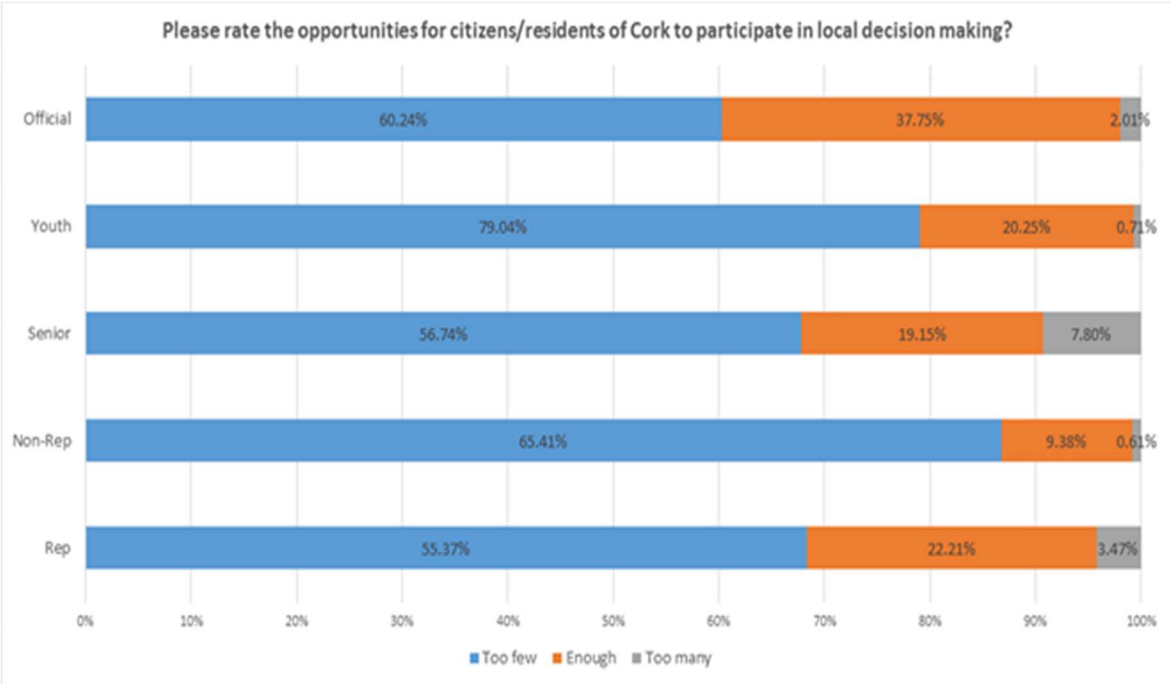
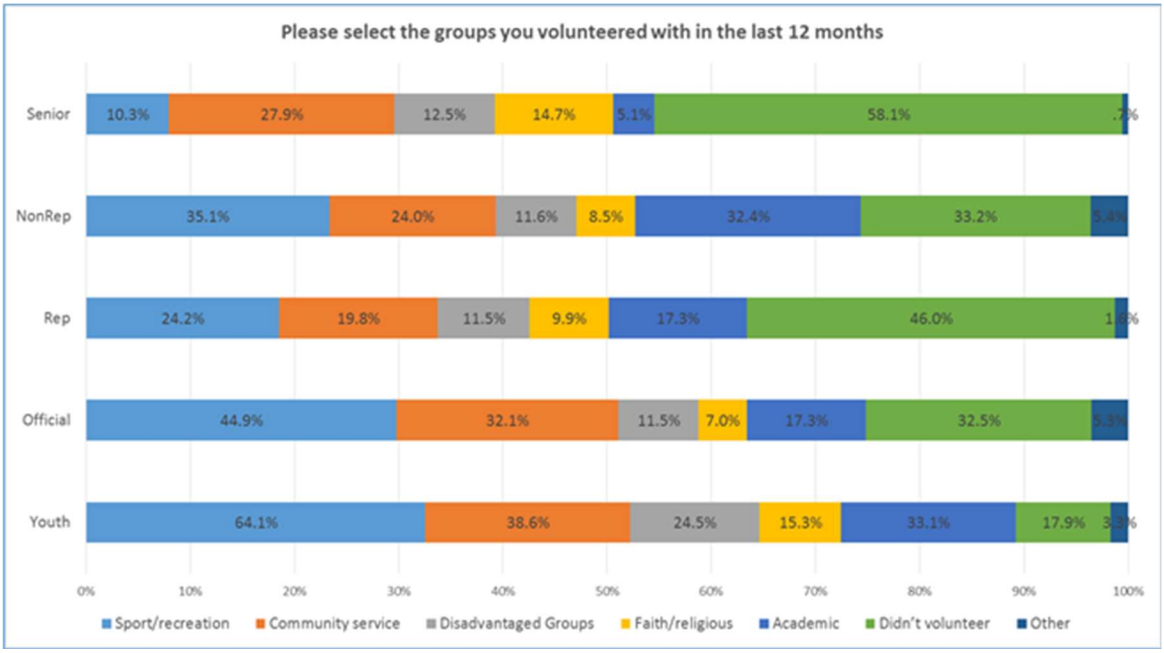


Figure 5.4. Comparative analyses of the surveys in the opportunities for the people to participate in local decision making and their volunteerism in the past year as a measurement of a person's participation practice.



The detailed analysis yielded positive results regarding Cork citizens' teenagers' digital skills, participation in public issues, and volunteering. Detailed findings of this group are

presented in the section Youth on Page 138. The overall findings showed that the adolescents rated themselves as skilled in using key digital tools including social networks, text, online service and mobile apps. Use of email, mobile apps, and social networks correlated with participation, volunteer, and self-perceived positive impact at the local level. Regarding gender differences, female teenagers' ability to use digital tool proficiently strongly correlated with volunteer activities. Similarly, male adolescents' skilful use of email, text, and mobile apps correlated with public participation. Within the context of how to engage effectively with this special group, data showed that teenagers are willing to engage in public issues; digital tools are a big deal for them; and volunteerism is a big part of their lives. They have a strong motivation for participation but they rated opportunities for participation in local decision making as limited. They have a strong desire to volunteer and they want to engage more because they believe they have big impact in making Cork a better place to live.

Putting those findings in the context of the newest release of the National Strategy on Children and Young People's Participation in Decision-Making 2015-2020, results showed that youths have opinions about and want to be involved in the decision-making process for city development projects. They are willing to volunteer their time and are eager to learn. The survey findings of this group provided a partial profile on one group of teenagers that local government could target, what they offer – participation practice and willingness to involve – and how to target, where – relevant activities – to target, and how – utilising their digital skills and volunteering spirit – to target them. Survey results provide insights for local governments to shape action plans in which, children and young adults play a key role in planning the community elements of Local Economic and Community Plans and many others.

5.2.3 Digital Skills

The digital skills of most Cork respondents are average overall when it comes to using key digital tools including email and mobile phone. The two tools are also their desired communication methods when public offices reach out to them. Except for senior respondents, most people would like to use a smartphone app designed specifically for Cork. When it comes to social media, YouTube was quite strong among the Youth and the Non-Rep groups meanwhile, social media did not mean much to the senior group. Figure 5.5

provides a more comprehensive view of the usage of social media among all of the participation groups.

Figure 5.5. Respondents' use of social media platforms

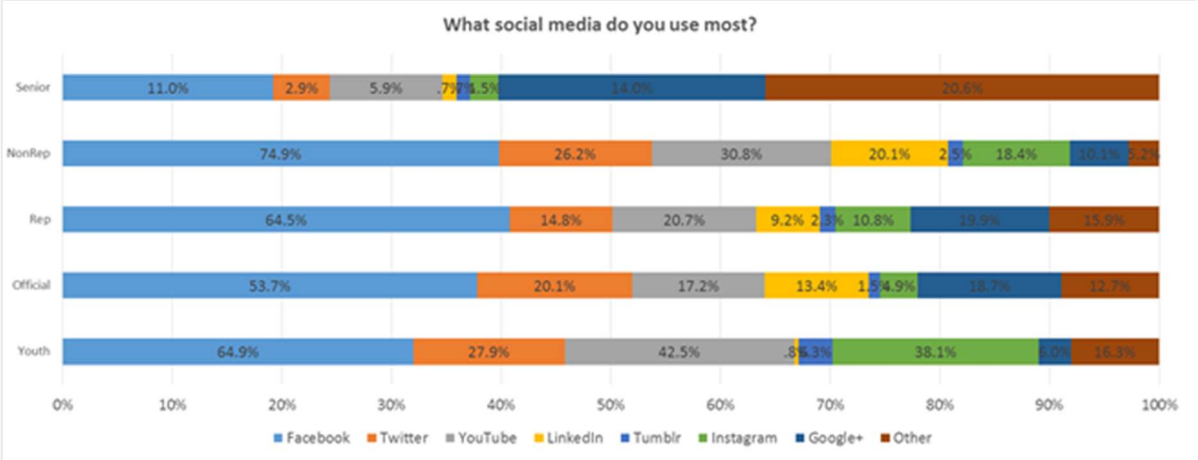


Figure 5.6. Respondents' communications methods and preference for communicating with public offices.

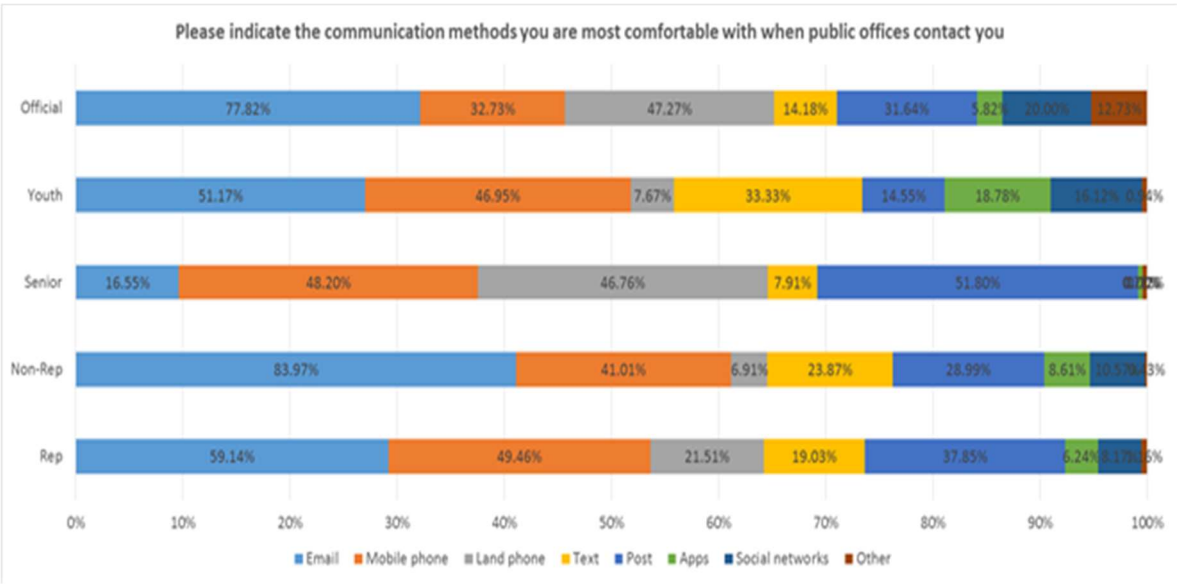
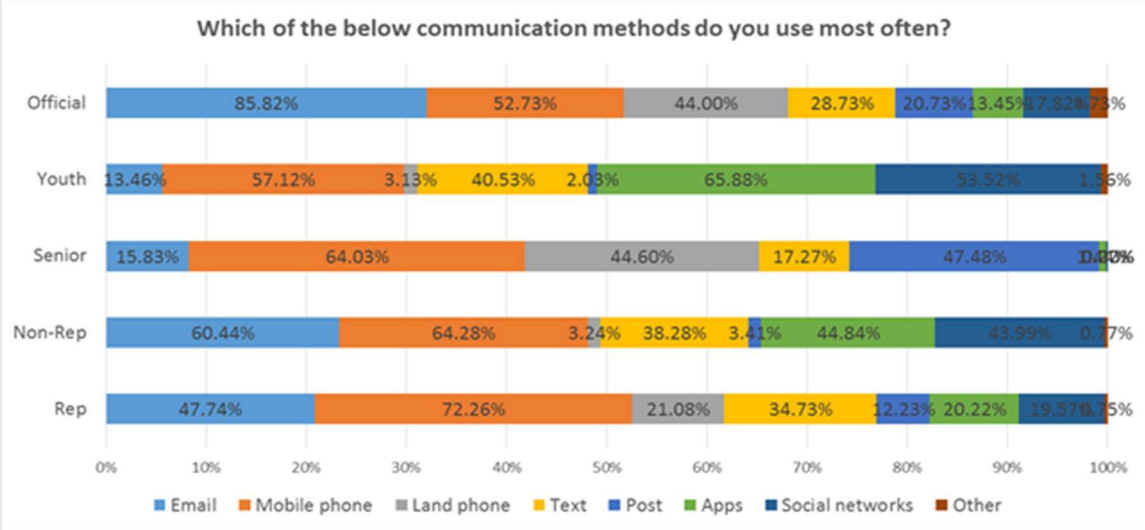


Figure 5.7. Respondents' communications methods



In particular, Figure 5.6 shows that mobile phone was by far the most common communication method across all of the surveyed groups, led by the Official, the Non-Rep, and the Rep groups. Nearly a half of the Senior and Official groups used land phone quite often while apps were the emerging method for the Youth and the Non-Rep groups. On another note, social media and online news sources were common sources of daily information for teenagers, tech-savvy general public groups, and local authorities. The Rep, or representative general public, and the senior got their news from more traditional sources of TV and radio. More than a half of the people rated themselves from good to excellent skills in using the key digital tool including email, text, and mobile phone. The tech-savvy general public (Non-Rep), the teenagers, and the local officials were proficient in using the most recent digital tools of mobile apps, online services, and social networks. Only the senior group responded at the highest percentage for computer skills assistance. The teenagers rated themselves high in social networking, but they rated themselves average for email and online services. Among the surveyed groups, the tech-savvy and the local authorities were the most skilful in using those digital tools.

5.2.4 Access and Usage of Public Infrastructure

Largely, Cork was viewed as an excellent/good place for lifelong learning. This perception was consistent in all of the surveyed groups, with percentages ranging from 60% to 85% giving the area top ratings. This was especially relevant to the teenagers who responded that education opportunities were the second-most important matter for them and for Cork's

future. Figure 5.8 indicates the rating among the surveyed groups. The Official group gave the highest ranking for Cork on opportunity for lifelong learning, following by a narrow margin of all the rest of the respondents. Regarding the opportunities for jobs in Cork, Figure 5.9 indicates that a half of the Official and the Non-Rep groups considered positive (excellent/good), while other groups rate from more than 30% to 45% positive. The vote "Only fair" is consistent across all groups with very small differences. In terms of an immigration friendly environment in Cork, most of the groups rated "Excellent/Good" at around 60%, except for the Official group, which rated at 46%.

Figure 5.8. Analyses of Cork's key characteristics – lifelong learning

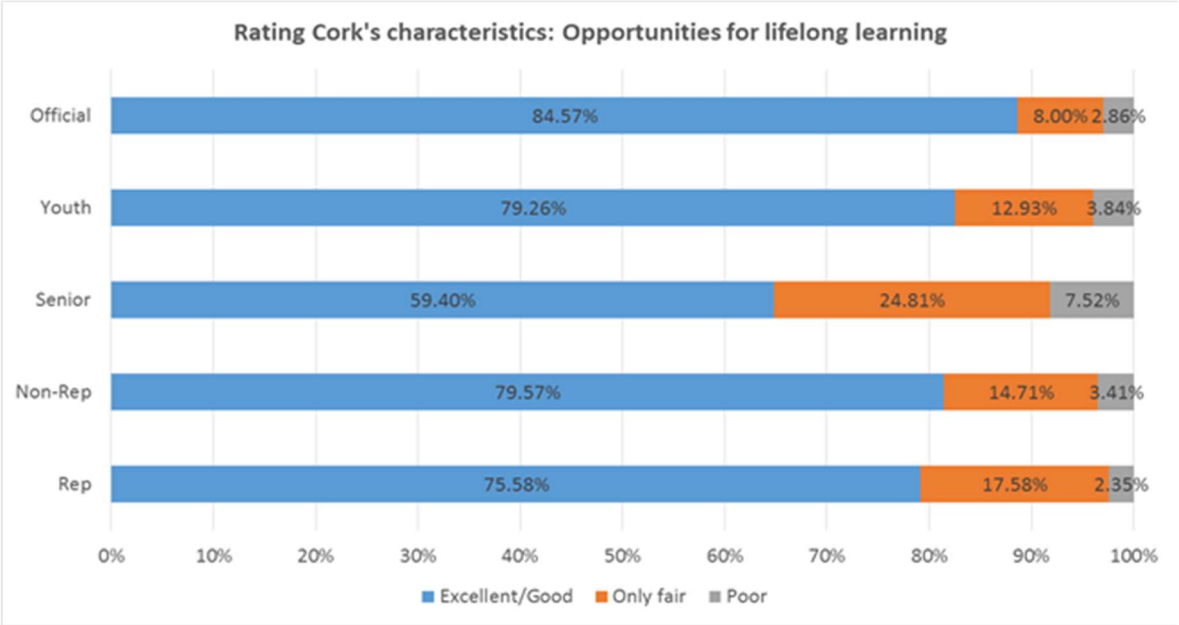
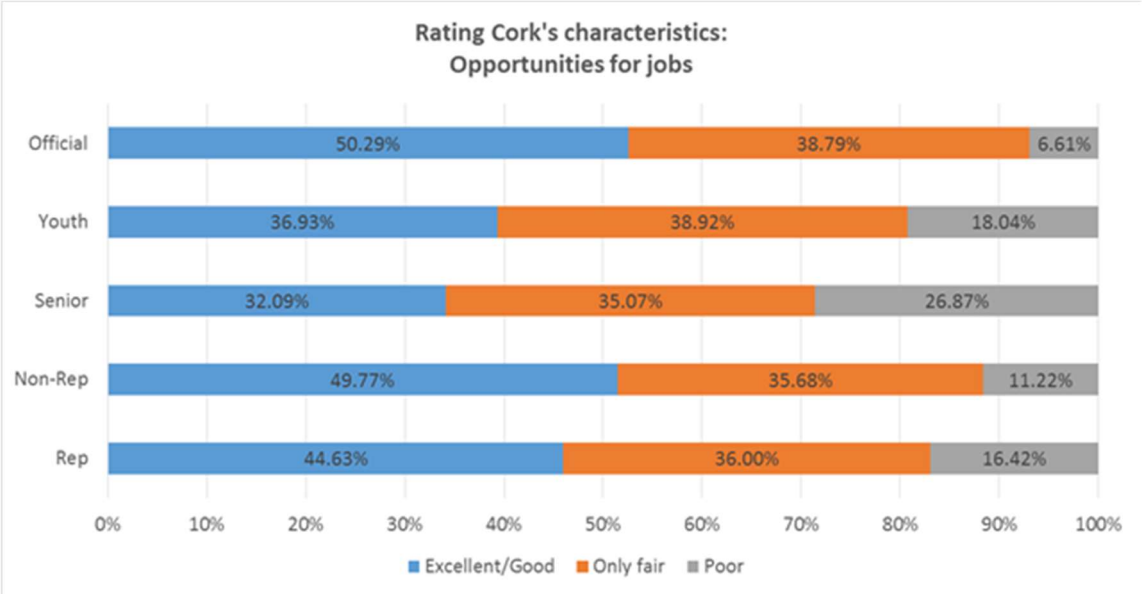


Figure 5.9 Analyses of Cork's key characteristics – opportunities for jobs



While the seniors and the teenagers did not have to deal with many public services, more than a half of the general public – Rep group – and the tech-savvy general public – Non-Rep – used online services including online payment, downloading forms, and getting the desired information. This rate was average compared to other EU countries (Cruz-Jesus *et al.,* 2015) when it comes to online services offered by public offices.

People in the surveys access Wi-Fi mainly at their homes, which demonstrates good connectivity. However, a growing number of people would prefer free Wi-Fi in public places. While usage of mobile phones and smartphones is the mainstream for social media and internet access, the demand for hardware facilities that allow people to better use public services over the Internet is still high. A third of the respondents responded with a need to access computers or tablets at public libraries and at public offices while nearly one-fifth of the respondents wanted to access computer and tablets at community centres. Cork offers a number of smart city projects, however, awareness, access, and use was limited to less than a half of the respondents. Projects include broadband networks, electric vehicles, LED public lighting, CCTV in public spaces and bicycle hire. As demonstrated in Figure 5.10, the bicycle hire was the most recent addition to the public transport in Cork, therefore the awareness of this project was widespread, at over 80% claiming to know about it. Broadband networks give people the necessary connectivity however, only a half of the respondents reported knowing about it. The LED public lighting was the least known of the projects across all of the surveyed groups. Public transport in Cork (bus, train, bicycle hire) was rated at 40% excellent/good and 30% at only fair. Seniors and teenagers rated the quality of public transport much higher, at 60% excellent/good and 22+% fair. These groups depended largely on public transport for their daily mobility.

While future smart city projects were designed in the survey as a participation willingness measurement, they also reflected on people's willingness to use them, such as the use of city open data or the usage of shared payment car rides. From 40 to 60% of the respondents would leverage the five SC project ideas of report public issues, use of city's open data, efficient use of energy, efficient use of water, and use of shared payment car rides. Among these, the teenagers responded highest involvement and willingness to use of these ideas, followed by the tech-savvy general public and the general public groups.

Figure 5.10 Comparative analyses of the people's awareness of the SC projects

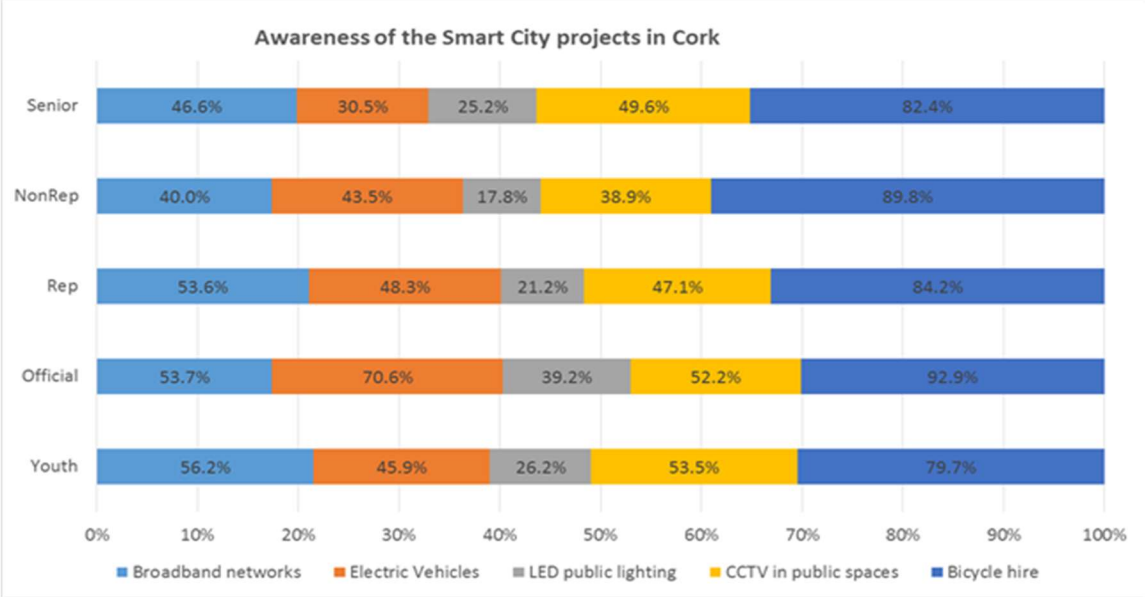
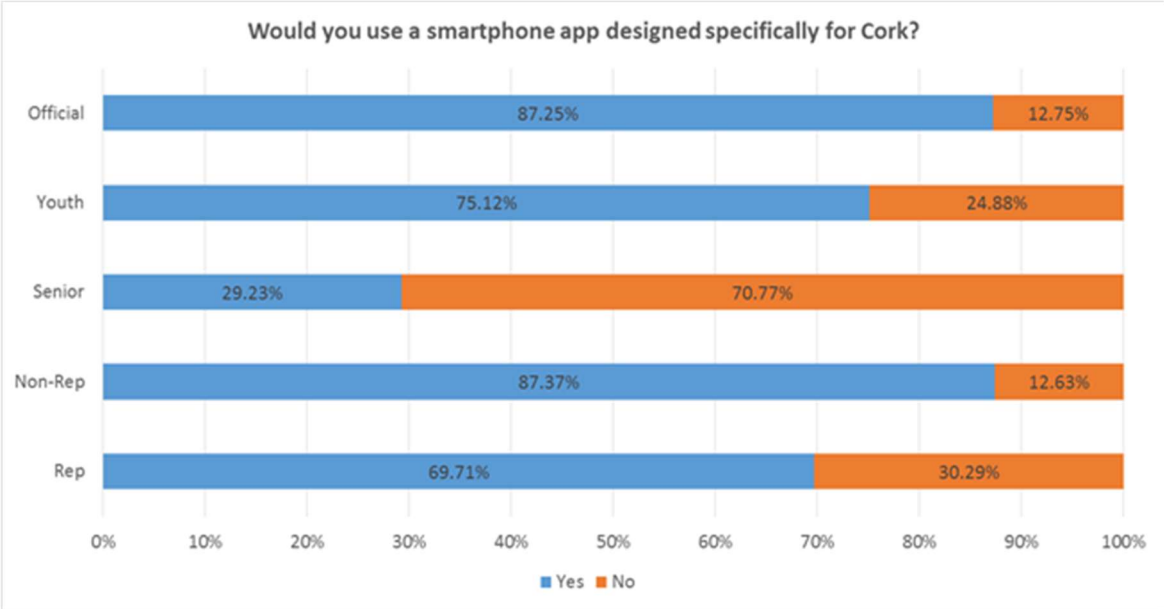


Figure 5.11 Comparative analyses of the people's awareness of the SC projects and their preference in using a city app.



Regarding the use of a smartphone app designed specifically for Cork, four out of the five surveyed groups responded "Yes" at a very high percentage, ranging from 70% to 87%. The senior group was not confident with the idea, thus only 29% of them supported it. Figure 5.11 specified the percentages of each group in the participating respondents.

5.3 Rural versus Urban

This RQ2 explores the three key conditions of access (i.e. usage, ICT infrastructure, information), participation (i.e. practices, willingness); and skills in using the key digital tools. It demonstrated an attempt to identify the key drivers to digital participation, possible barriers that hinder the progress, and any forms of new rural-urban digital exclusion in Cork. The ultimate goal of this exercise was enabling individuals in Cork to fully engage in the digital world while providing governments with evidence and insights for their policy strategies toward stronger social inclusion. The results of this analysis were presented at the *Social Living Labs for Digital Participation: Designing with Regional and Rural Communities workshop* on 4-8 June 2016 in Brisbane, Australia. The paper is published as a chapter in a book titled *Digital Participation through Social Living Labs: Valuing Local Knowledge, Enhancing Engagement* in September 2017.

The descriptive analyses provide insights of the current situation, willingness and the possibilities in the digital access, participation and skills in the context of rural and urban settings. The findings validate, support, and provide new evidence for the arguments and putting them into comparative percentage of rural versus urban; and the statistic significant tests for the differences of rural versus urban settings. The results focus on portraying the following:

- Key drivers and potential barriers that can enable or hinder stronger digital participation by citizens/residents
- Insights toward the key drivers of digital citizen participation
- Digital competence differences in the urban areas versus the rural areas and their current usages of online public services.
- Current and perspective volunteering practices, skills needs, and access challenges, especially in rural areas and among the senior citizen group.
- Community-based avenues in narrowing the gap in digital skills and accesses thus allowing cities and regions - especially those who are considering adopting the Smart city approach

The measurement of the involvement willingness was derived from five potential SC project ideas that Cork City may be able to include in its initiative. The projects were: report public issues, use of city's open data, efficient use of energy, efficient use of water, and use of

shared-payment car rides. Table 5.1 shows that there was little difference between the urban and rural respondents in their willingness to involve in the future SC projects. Over 70% of the respondents in both rural and urban areas indicated their strong or some levels involvement in the future SC projects. The only difference was the percentage of the rural respondents in the 'some involvement' category which was significantly higher (test of statistical significance) than the urban respondents in the same category.

*Table 5.1. Mean values of involvement willingness in the future smart city projects in Cork compared between rural and urban groups (*p<0.05).*

Involvement willingness in future smart city projects	**Urban (n=1582)**	**Rural (n=665)**
Strong Involvement	46.5%	45.1%
Some Involvement	22.7%	28.7%*
No Involvement	30.8%	26.1%

The volunteer was one of the measurements for the people's participation practice. The analysis in the Table 5.2 shows that overall the rural areas' respondents volunteered more (nearly than those in the urban areas. Especially, the percentages of the respondents in the rural areas volunteered in activities including sport/recreation, faith/religious, and academic activities were significantly higher (statistics test) than those in the urban areas. The percentage of the urban respondents was only significantly higher in the 'Didn't volunteer' category. Overall, around 60% of the respondents in urban areas participated in volunteering activities while the respondents in the rural areas volunteered more, at 70%, and the popular activities for both groups were sport/recreation, community service, and academic activities.

*Table 5.2. Mean values of volunteerism compared between rural and urban groups, (*p<0.05; **p>0.1)*

Volunteer activities in the last 12 month	**Urban (n=1582)**	**Rural (n=655)**
Sport/recreation	26.1%	32.5%*
Community service	21.3%	24.4%**

Disadvantaged people	10.9%	12.2%**
Faith/religious	8.2%	12.1%*
Academic	22.9%	28.1%*
Didn't volunteer	41.2%	31.3%*
Other	6.0%	6.6%**

When it comes to the primary sources of information that people use on the daily basis, social media (Table 5.3) is the most popular source and there is no difference in using this from the respondents in the urban and rural areas. Online newspapers and news sources were also a very popular source of information and the percentage of the respondents from rural areas was significantly higher (statistics test) than their peers in the urban areas.

Radio and television were still high, at 45% on the average. The percentage of the respondents in the urban areas used television as their primary source of information was significantly higher than those in the rural areas.

Print newspaper and magazines suffered the global decline trends of the readership in both rural and urban areas. However, the percentage of the respondents in the urban areas was significantly higher than those in the rural areas.

All the data showed that there is a shift in how people access information and use the information to make their decision on a daily basis. Social media provide close to real time information and it tends to provide useful travel, weather, and locally what's on news.

*Table 5.3. Mean values of the primary sources of information compared between rural and urban groups, (*p<0.05; **p>0.1)*

Primary sources of information used on daily basis	**Urban (n=1582)**	**Rural (n=655)**
Television	47.20%	40.90%*
Radio	45.4%	47.0%**
Online newspapers/news sources	47.2%	53.0%*

Social media	50.3%	53.3%**
Print newspapers/magazines	26.1%	16.6%*

About the communication methods, email and mobile phone were the most used means by the respondents in both urban (at 52.10% for email and 67.40% for mobile) and rural (at 55.60% for email and 70.50% for mobile) areas. There were small percentages difference between the two groups but they weren't statistically significant. The text, apps, and social networks were being used regularly by more than 30% of the respondents in both urban and rural areas. And the respondents in rural areas were actually responded in significantly higher percentages in text and social networks. Table 5.4 showed the differences in the actual differences, which also recorded land phone and post were significantly higher in usage of the respondents in urban areas.

The analysis in the Table 5.4 highlights the positive usage of the digital means of communications by the respondents in the rural areas, while their peers in urban areas were supposed to have better connections and access did not use those means as much.

*Table 5.4. Mean values of the most used communication methods compared between rural and urban groups (*p<0.05; **p>0.1)*

Communication methods used most often	**Urban (n=1582)**	**Rural (n=655)**
Email	52.10%	55.60%**
Mobile phone	67.40%	70.50%**
Land phone	15.30%	8.10%*
Text	33.30%	40.60%*
Post	11.60%	7.20%*
Apps	30.30%	33.30%**
Social networks	28.60%	33.90%*
Other	0.60%	0.60%**

When it comes to preferences for being contacted by public offices, email, mobile, and post were the most preferred means, in which the email remained the highest demand by nearly 70% of the respondents, and the percentage of the respondents in the rural areas, (at 74%) was significantly higher than their peers in urban areas (at 67%) areas (Table 5.5).

Text and land phone followed as the preferred means of communications by the public office to the respondents in the urban areas. The percentage of the respondents in the urban areas was significantly higher than their peers in the rural areas in the demand for being contacted by land phone.

In summary, email and mobile were the most popular means of communications for people to use and to be contacted by the public office. The percentage of the respondents used and preferred email as their primary means of communication was actually a little lower than at the national level, which was at 85% (CSO, 2015).

*Table 5.5. Mean values of the communication methods people preferred to be contacted by the public offices compared between rural and urban groups (*p<0.05; **p>0.1)*

Communication methods preferred in interactions with public offices	**Urban (n=1582)**	**Rural (n=655)**
Email	67.10%	74.00%*
Mobile phone	45.40%	44.10%**
Landline phone	16.90%	12.20%*
Text	20.70%	19.40%**
Post	34.50%	33.30%**
Apps	6.80%	7.30%**
Social networks	8.70%	8.40%**

Regarding social media platforms, Facebook was the most popular one and once again the percentage of the respondents in rural areas was significantly higher than their peers in using the tool (Table 5.6). Video platform YouTube was the second most popular social media tool used by respondents in both the urban and the rural areas. Other tools including Twitter

and LinkedIn were used by less than 20% by the respondents while the image sharing tool Instagram was used by 14% of the respondents, and most of them are in their fairly young age of fewer than 25 years old.

*Table 5.6. Mean values of most used social media compared between rural and urban groups, (*p<0.05; **p>0.1)*

Social media used most	**Urban (n=1582)**	**Rural (n=655)**
Facebook	62.8%	69.2%*
Twitter	19.0%	22.3%**
YouTube	23.9%	27.0%**
LinkedIn	14.0%	15.6%**
Tumblr	2.4%	1.5%**
Instagram	13.8%	14.4%**
Google+	15.1%	12.5%**

The demand for using a local smartphone app (Table 5.7) was high at 77% of the respondents, which included a significantly higher percentage of the respondents in rural areas. The percentage of those who didn't want to use the app was at 23% and most of the 'no' respondents were at their fairly senior ages, over 60.

*Table 5.7. Mean values of the willingness to use special local app compared between rural and urban groups, (*p<0.05; **p>0.1)*

Willingness to use special local smart phone app	**Urban (n=1582)**	**Rural (n=655)**
Yes	74.8%	82.3%*
No	25.2%	17.7%**

Regarding the access to the internet, the home was the most popular place for the respondents in both urban and rural areas. In fact, the percentage (Table 5.8) of the

respondents in the rural areas was significantly higher (at 83%) than their peers in the urban areas. The access rate of the rural areas was closer to the national figure which estimated 85% of households had access to the internet at home in 2015.

Nearly 43% of the people responded that they accessed the internet from 'anywhere with free Wi-Fi', meanwhile, the internet access at workplace was at 37%.

*Table 5.8. Mean values of Internet access locations compared between rural and urban groups, (*p<0.05; **p>0.1)*

Access the Internet	**Urban (n=1582)**	**Rural (n=655)**
Anywhere with free Wi-Fi	41.70%	45.60%**
Work	37.2%	36.9%**
Home	75.5%	82.9%*
Public offices	3.7%	2.7%**
Other	12.0%	9.5%**

Regarding the skills in using the key digital tools, respondents self-assessed themselves pretty high on the scale for text and email. Their skills were also fairly good in online services, mobile apps and social networks. There was a consistently higher percentage of the respondents in the rural areas rated themselves significantly higher than their peers in their skills using all of the five measured digital tools.

As Table 5.9 shows details, it was the urban respondents who need to catch up with their skills using the key digital tools while the respondents in the rural areas had been sharpening their digital skills.

*Table 5.9. Mean values of the skills in using the key digital tools compared between rural and urban groups, (*p<0.05.)*

Skills in using key digital tools	**Urban (n=1582)**	**Rural (n=655)**
Email	72.20%	80.60%*

Text	78.30%	84.40%*
Mobile apps	62.80%	69.60%*
Online services	65.30%	71.30%*
Social networks	60.80%	64.40%*

The respondents in the rural areas responded at significantly higher percentages in all of the online services provided by the local governments in Cork. In details, the online payments were highly used by the respondents in the rural areas at over 66%. The respondents in the rural areas were also frequent users in obtaining the information and downloading forms.

Table 5.10 shows all the details of the two groups in percentages which also included 25% of the respondents in the urban areas who didn't have to interact with public authorities or public services over the internet. The analyses demonstrated the differences in the current practices of the respondents with some insights for service designs by the local governments to their peoples in various geographical areas.

*Table 5.10. Mean values of the interactions with public services/authorities over the Internet in the past 12 months compared between rural and urban groups, (*p<0.05)*

Interactions with public services/authorities via the Internet	**Urban (n=1582)**	**Rural (n=655)**
Obtain information	51.00%	57.60%*
Download forms	45.50%	55.70%*
Submit completed forms	32.60%	37.30%*
Make online payments (i.e. property tax, motor tax etc.)	48.60%	66.10%*
Didn't have to	25.00%	12.20%*

The respondents responded fairly reasonable rates, ranging from 22% to 35%, to conditions that would help them to better use public services over the Internet (Table 5.11). The respondents in both urban and rural areas were comparable in their wish to access to

computer/tablet in public libraries. The percentage of the respondents in the rural areas was significantly higher than their peers in the urban areas regarding their demand to access to computer/tablet at public offices. The percentage of the respondents in the urban areas was significantly higher than their peers in the rural areas in the demand for computer skills assistance.

Nearly 27% of the respondents also suggested in their own writings what they believed would help to promote better use public services over the Internet. The suggestions included: 'better website layout and design; phone contact with offices is still very important; more safe, reliable and available free Wi-Fi; discount on computer/tablet; more public service providers on the internet/social media; offer incentives for using public services on the internet; and better websites and more services offers'.

*Table 5.11. Mean values of conditions for better use of public services over the Internet compared between rural and urban groups, (*p<0.05; **p>0.1)*

Conditions for better use of public services over the Internet	**Urban (n=1582)**	**Rural (n=655)**
Access to computer/tablet at public libraries	35.30%	33.30%**
Computer skills assistance	18.8%	15.4%*
Access to computer/ tablet at public offices	26.3%	31.5%*
Access to computer/tablet at community centres	22.6%	20.6%**
Other	25.5%	29.8%*

5.4 Youth

The survey received 768 respondents from 26 participating schools and youth support centres. The generated data were from the target age groups within the geographical boundary of the Cork metropolitan area. The data set is defined as the sample in this paper for statistical purpose, and correlation results are reported where the p-value is <0.05.

5.4.1 Data profile

The collected sample of respondents from the Cork metropolitan area provided a representation of the gender distribution in the population of the targeted age group (15-18 years old). The sample included 46.33% female and 53.67% male respondents as compared to known census data that shows a 48% female and 52% male populations in this age group.

As a result of the researchers' ethical research requirement, all respondents participated through schools or youth outreach centres. These organisations determined the participation of their students and members. Therefore, the majority of the respondents were transition year students who were born in either 1999 (58%) or 2000 (27%). The Leaving Certificate, 6th-year students, accounted for 15.5% of respondents (10% born in 1998 and 5.5% born in 1997). Respondents outside the secondary school system made up 2.6% of the total respondents.

The respondents were mainly White Irish (82.4%), and Ireland was the home country for most of the respondents (83.2%). Other White accounted for 9% while other races made up 9%. Adolescents coming from other European Union countries accounted for 10% of the total respondents.

The majority of the respondents, 86%, have been living in Cork either all of their life or more than 10 years. The remaining 14% of the respondents, including 4.6% who have been in Cork for less than a year, have been living in Cork less than 10 years.

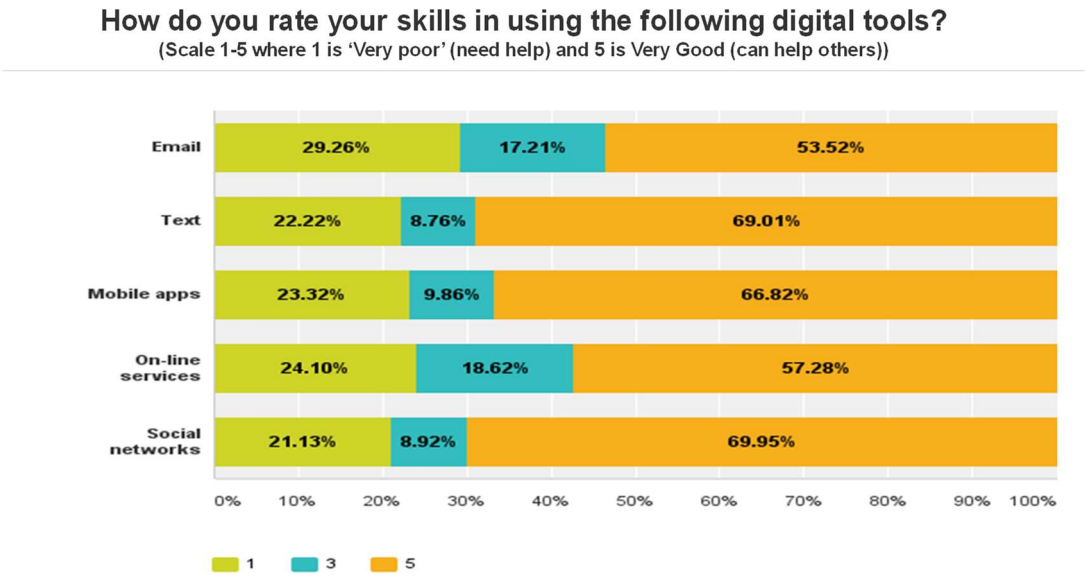
The respondents live mainly in suburbs, 44%, followed by rural areas, 33%, commuter towns, 13%, city centre, 6%, and the rest live outside of the survey areas (non-Cork counties).

While other questions in the survey could help to detect the adolescents' wider attitude, practice, and perception toward key smart city aspects, this paper embraces both descriptive and explanatory analysis and crosstab analysis of the key variables: gender, digital skills, involvement/participation and volunteering. The results were designed to provide insights into areas of how to best engage, empower, and channel positive contributions of the teenagers into smart city projects and enhance their role as *Smart city* citizens.

5.4.2 Descriptive analysis

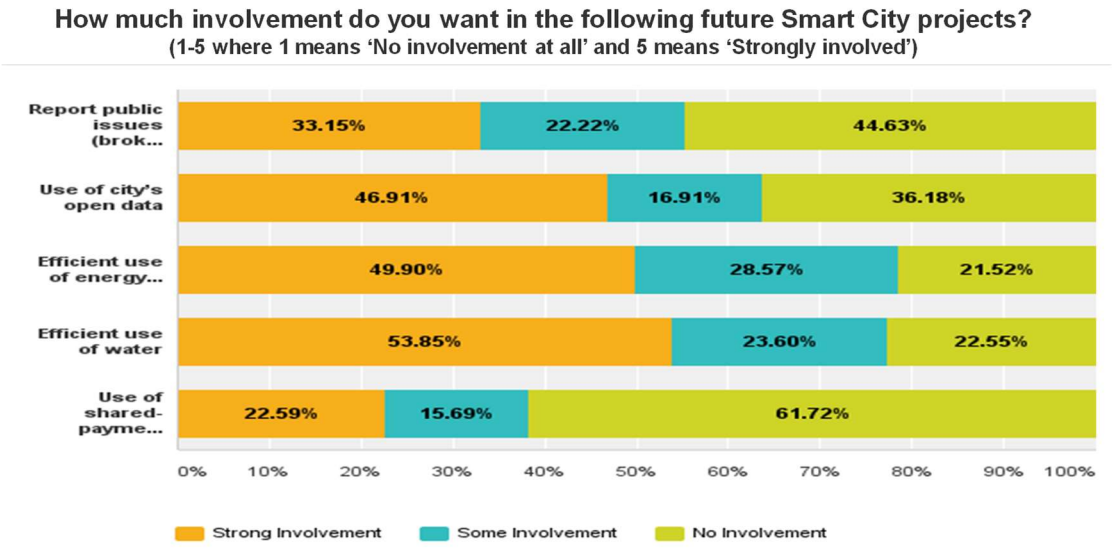
Regarding digital skills, the majority of the teenagers claimed a level of "very good", which means they have the ability to help others use email, text, mobile apps, online services, and social networks. 70% of the respondents rated themselves at the top level for using social networks, with Facebook, YouTube, and Instagram as most used. 69% of the adolescents placed themselves at the top level in texting skills, followed by mobile apps, 67% at the top level, online services, 57% at the top level, and Email, 53.5% of top proficiency. One-third of the respondents rated themselves as weak or needing help with email skills. All of the descriptive analyses have the total respondents of 768.

Figure 5.12. Youth Level of digital proficiency in using key digital tools



Regarding teenage involvement and participation in public issues, the adolescents were strongest (50% strong, and 29% some involvement) in projects concerning the 'efficient use of energy', such as electricity, gas or fuel. The 'efficient use of water' also recorded high levels of involvement from the respondents (54% strong and 23.6% some involvement). The lowest area of involvement in smart city projects was the 'use of shared-payment car ride' with 62% saying no involvement at all. Figure 5.13 summarises levels of involvement in the prompting smart city projects.

Figure 5.13. Youth Levels of involvement in Smart city projects



Regarding the impact of the teenagers in making their city a better place, 60% of the respondents thought that they would have either big or moderate impact, 25% though they would have 'small' impact while only 8% said 'no impact at all' and 6% 'did not know' if they would have the impact. This question was used as a control variable in the correlation analysis.

Regarding volunteering, a majority (more than 82%) of the teenagers volunteered. They volunteered in various activities including sport/recreation, community services, helping disadvantaged people, faith and religious groups, academics, and others. Sport and recreation activities attracted most, 63%, of the adolescents' volunteer interest, while community services and academic were the second and third most popular options among the respondents.

Personal interest, at 56%, and helping people, 43%, were the most popular motivations for the teenagers to volunteer. Meeting new people, at 25%, and community attachment, 17% were recorded as the motivations for the respondents volunteering.

The dataset is collected from adolescent respondents in the participating secondary schools and youth reach centres in Cork. This survey targeted children from 15 to under 18 years old.

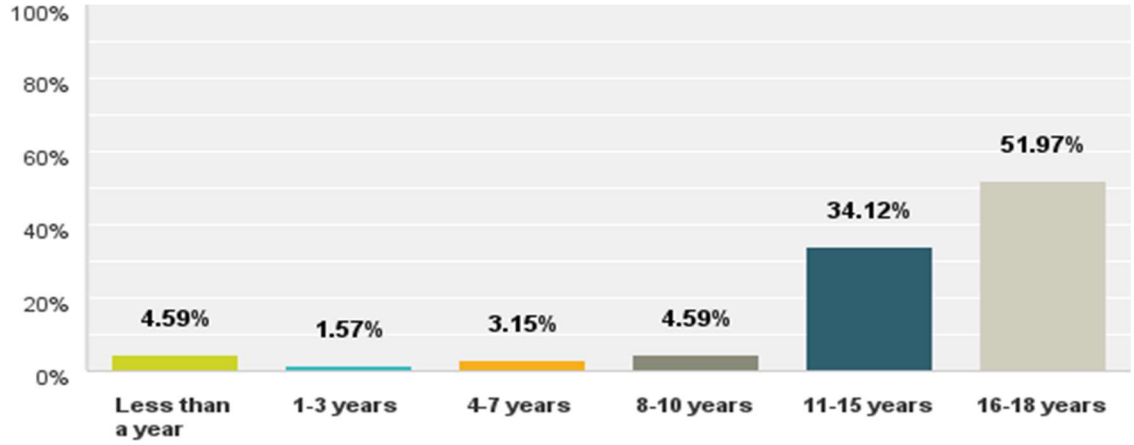
5.4.3 Demographical characteristics

The sample from Youth group in Cork consists of 46.33% female and 53.67% male respondents. The results (Figure 5.14) correspond, but not exactly the same, with the data available from 2011 census data for this particular age group.

Figure 5.14. What is your gender? This question allows only one choice, therefore, the total percentages of the choices add up to 100%

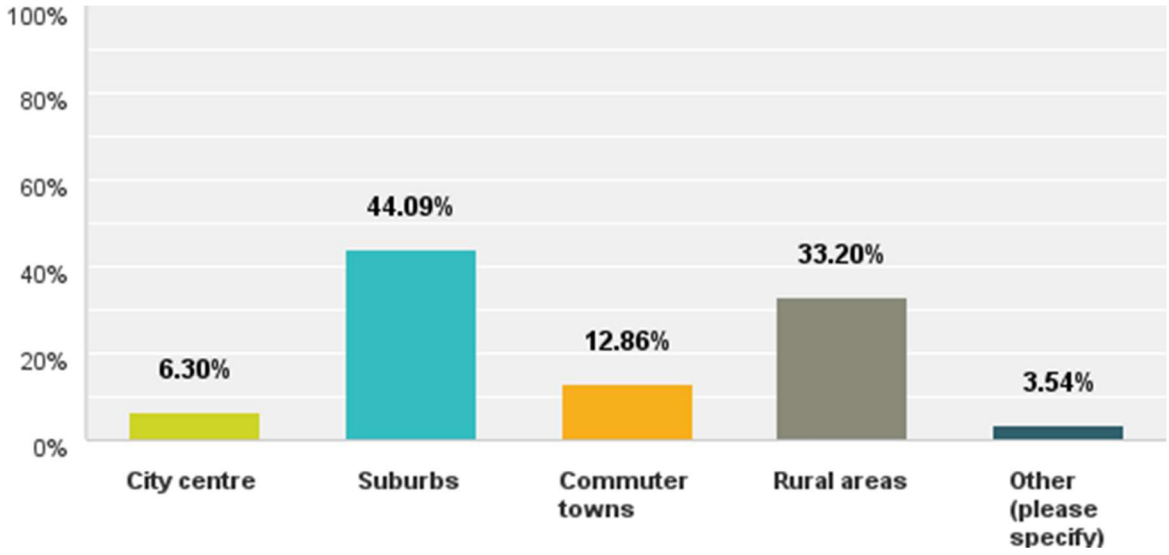
The majority of the respondents in this group, 86.09%, have been living in Cork either all of their life or more than 10 years. The remaining 13.91% of the respondents, including 4.59% who have been in Cork for less than a year, have been living in Cork less than 10 years. This group has the biggest percentage, 5%, of those who just came to Cork in less than a year. It is important in other future research to identify the reasons for their relocation for policy anticipation, new programme or available support.

Figure 5.15. How long have you lived in Cork? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



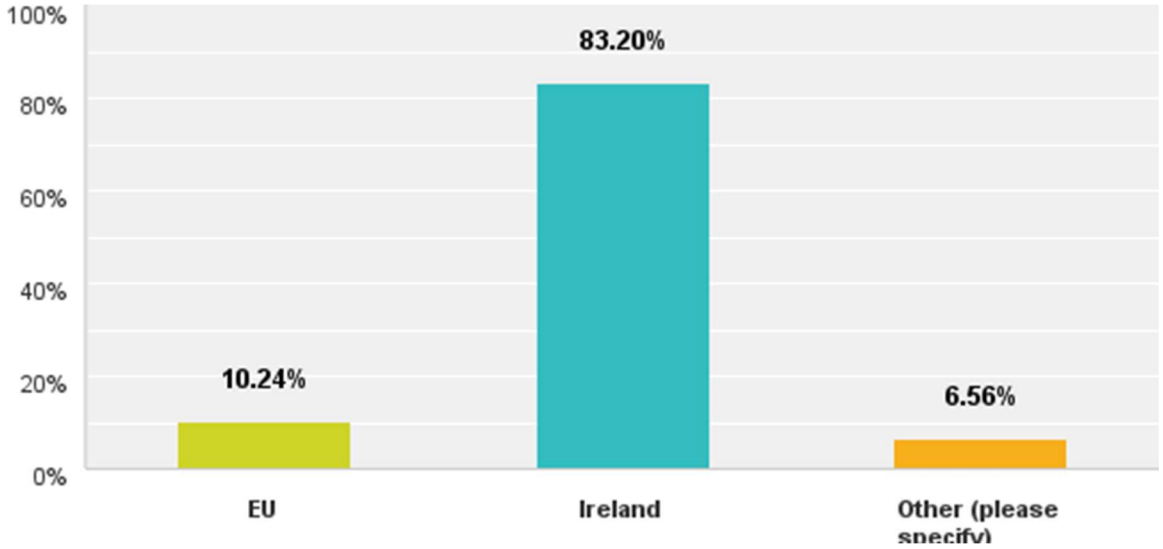
The respondents live mainly in suburbs, 44.09%, followed by rural areas, 33.2%, commuter towns, 12.86%, city centre, 6.3%, and the rest live outside of the survey areas (non-Cork counties).

Figure 5.16. Please indicate where you live in Cork. This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



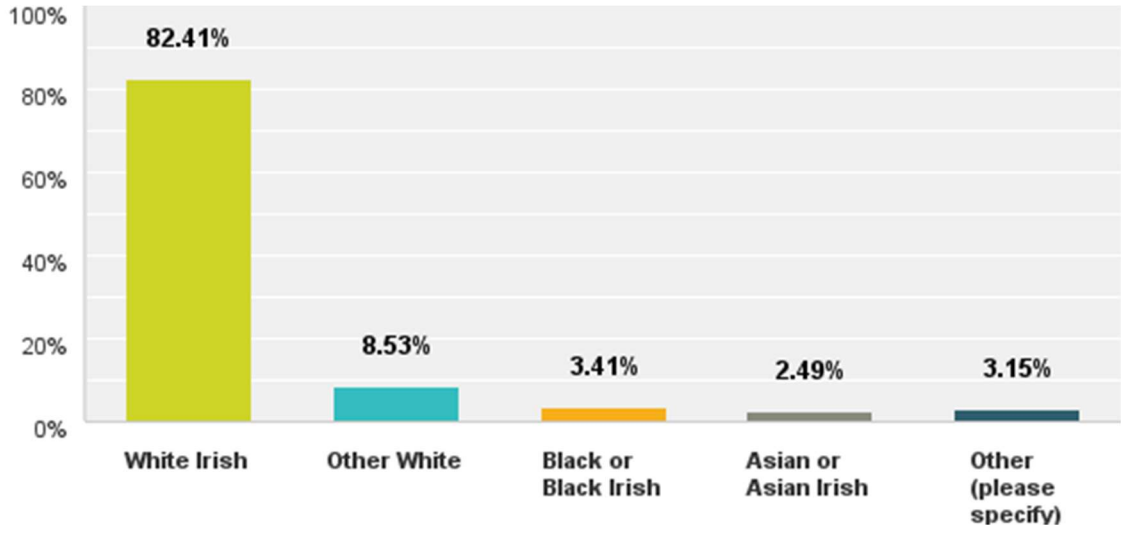
The majority of the adolescents in this group (83.2%) were born in Ireland while 10.24% of respondents were born in other countries in the EU. 6.56% come from non-EU countries.

Figure 5.17. What is your home country? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



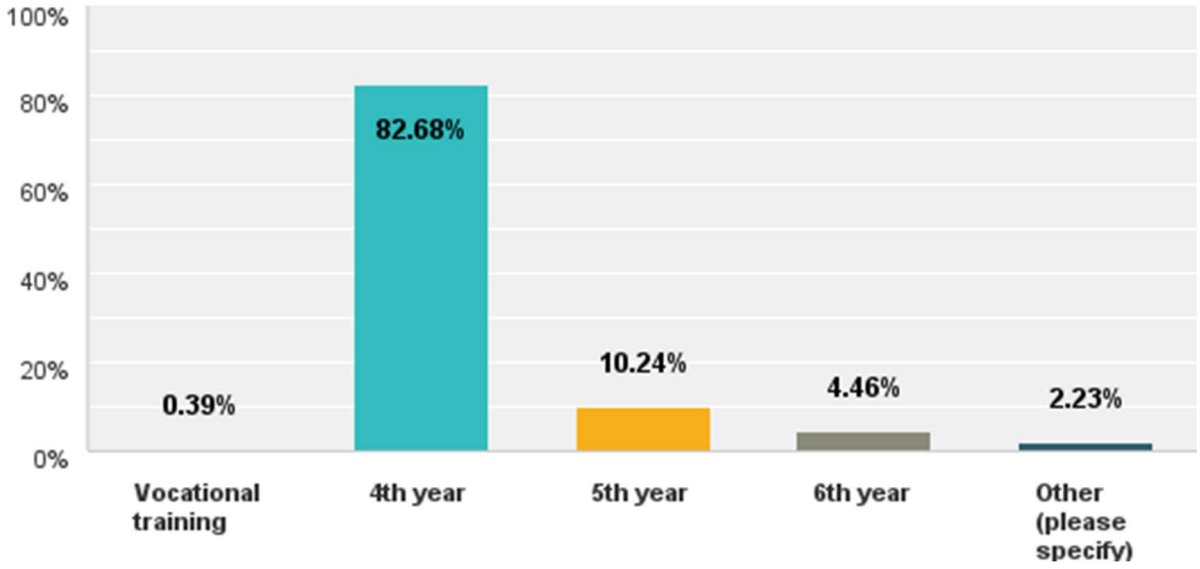
82.41% of the adolescents are white Irish. The figure for other white is 8.53% while the rest are Black, Asian and other ethnic groups.

Figure 5.18. What is your ethnic or cultural background? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



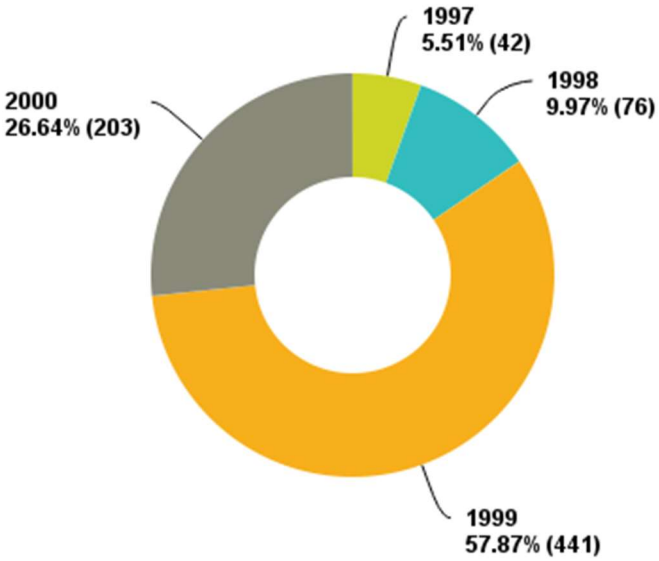
The majority of the adolescents group (82.68%) are the 4th-year students. Meanwhile, 15% of respondents are students in their 5th or 6th-year. Only 0.39% of respondents are following vocational training while 2.23% of respondents are studying other educational levels.

Figure 5.19. Please indicate your current level of education. This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



More than 85% of the adolescents group were born in the period of 1999-2000 while the remainder were born in 1997 and 1998, accounting for 5.51% and 9.97% respectively.

Figure 5.20. When were you born? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



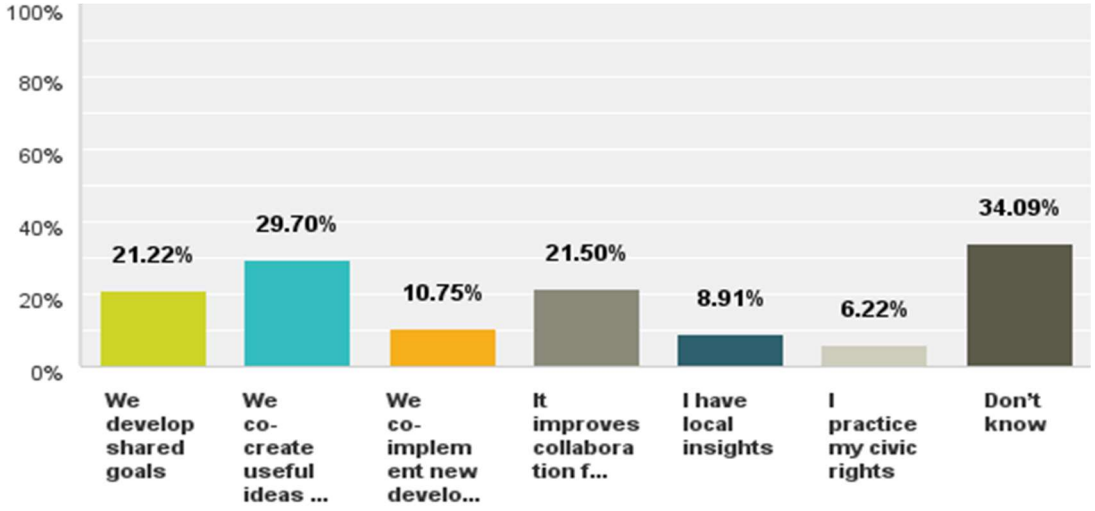
The adolescents describe themselves strongly in sport, sporting activities, in musical and travel. The word picture (Figure 5.21) shows the most frequent words input by the teenagers. The bigger the words are; the larger frequency they are used by the teenagers. Friendly, hardworking, artistic, kind, funny, political and creative are the common words the adolescents see themselves.

Figure 5.21. In what three words would you describe yourself? This question only one choice, therefore, the total percentages of the choices add up to 100%.

5.4.4 Public participation

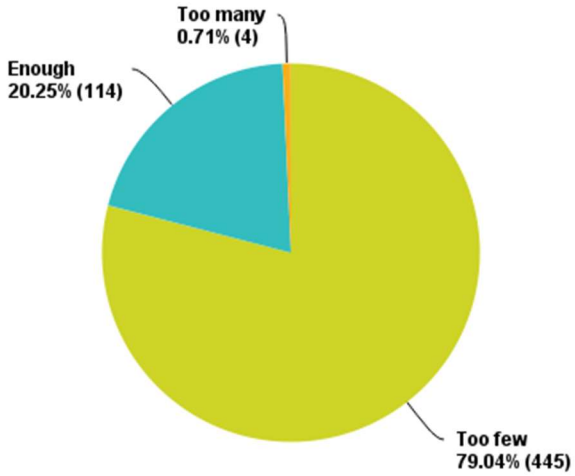
Regarding the reasons for the participation of young people in public issues in Cork, 34.09% of respondents do not know the reasons for their contributions. This is alarming but aligned with the common trends of difficult groups, including the younger people, to reach publically. Meanwhile, 29.70% of the respondents take part in public issues to co-create useful ideas. Other reasons are to improve collaboration for the common good (21.50%), develop shared goals (21.22%), and co-implement new development programmes (10.75%). The remaining respondents believed that they have local insights that could provide a benefit to public projects and that they need to practice their civic rights (6.22%). Apart from the larger percentage of 'Don't know', the other key results follow the trends of collaborative and share visions which are core in other groups.

Figure 5.22. Why do you think your participation in public issues is important for Cork? This question allows more than one choice, therefore, the results in each survey add up more than 100%.



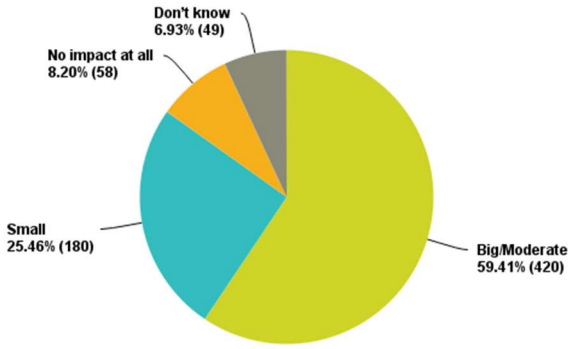
The majority of respondents (79.04%) thought they have too few opportunities in local decision making whilst only 0.71% of respondents believe that they have many opportunities to contribute to local decisions (Figure 5.23). About 20% of respondents are fairly satisfied with their chances to take part in local issues.

Figure 5.23. Please rate the opportunities for young people in Cork to participate in local decision making?This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



Regarding the impact of young people in making their city a better place (Figure 5.24), 59.41% of the respondents thought that they would have either a big or moderate impact, 25.46% thought they would have a 'small' impact while 8.20% said 'no impact at all' and 6.93% 'did not know' if they would have any impact on the development of Cork.

Figure 5.24. How much impact do you think young people like you can have in making Cork a better place to live? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



While many young people select that health and well-being (36.83%) are the most important issues to Cork's future, followed by the education opportunity, 18.90% (Figure 5.25). Less than 18% of respondents ranked other reasons included safe public spaces and sustainable jobs the most integral problems. Meanwhile, only 5.49% of respondents rated environmental protection as the most important issue to the development of Cork.

Figure 5.25. Please rank the following in terms of their importance to Cork's future Where 1 means "the most important". This question allows only one choice in each of the topics, therefore, the total percentages of the choices add up to 100% in each of the bars.

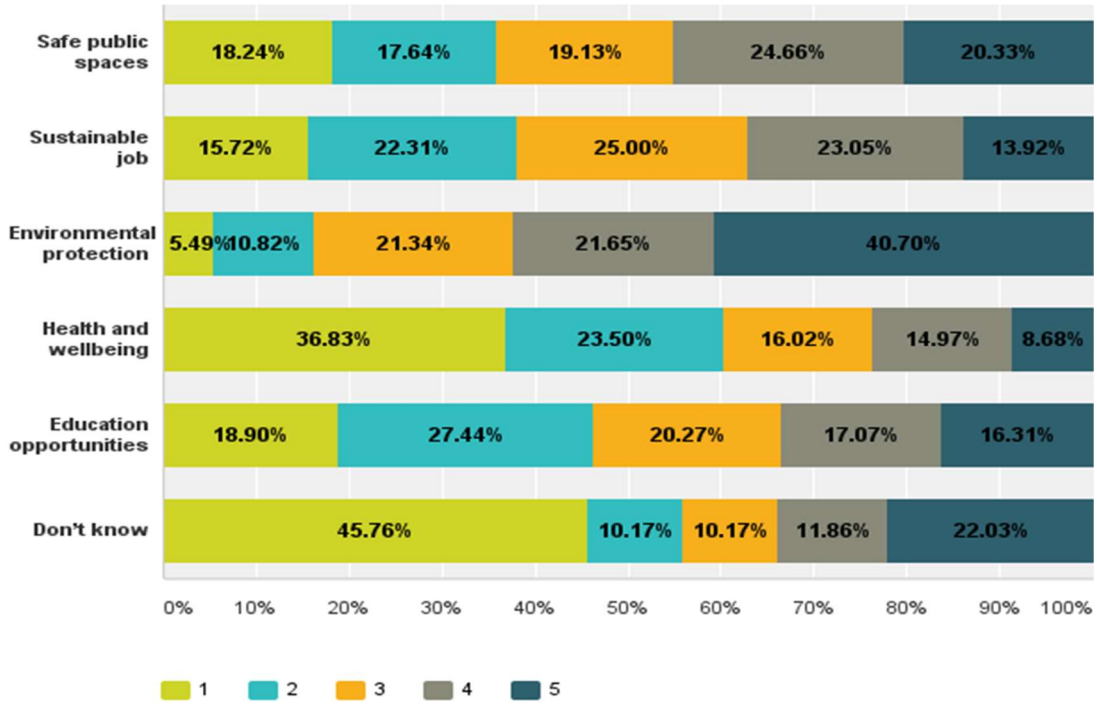


Figure 5.26 shows that the majority of the adolescents believed their city, Cork, has excellent opportunities for lifelong learning (79.26%) and an immigration-friendly environment (63.21%). The quality of public transport and active citizenship were rated as excellent by 59.38% and 45.45% youth respondents respectively. The figure for opportunities for jobs is 36.93%.

Figure 5.26. How would you rate the following characteristics of Cork? This question allows only one choice in each of the topics, therefore, the total percentages of the choices add up to 100% in each of the bars.

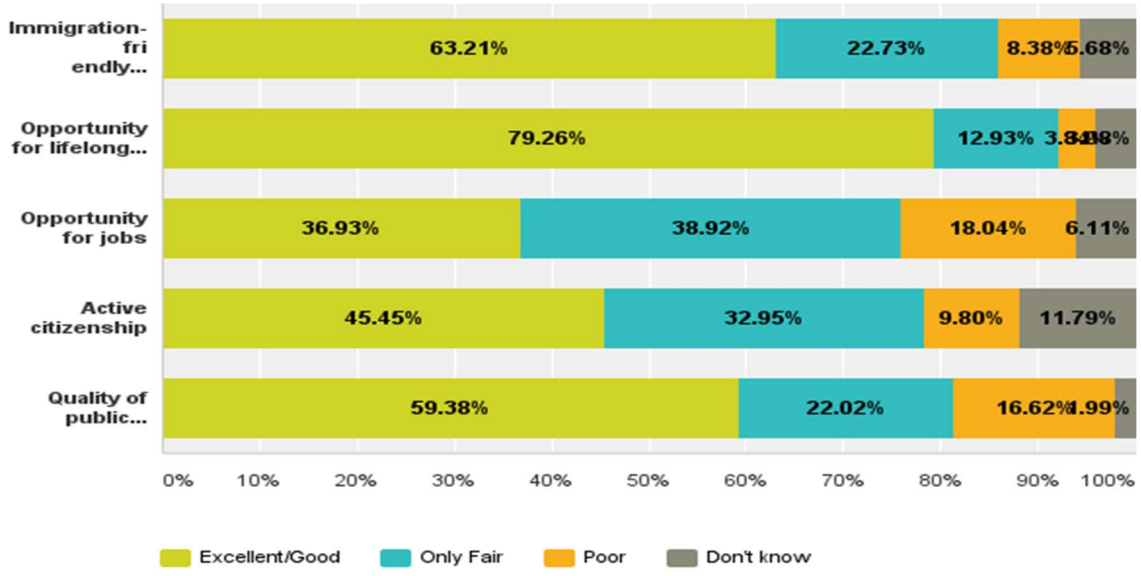
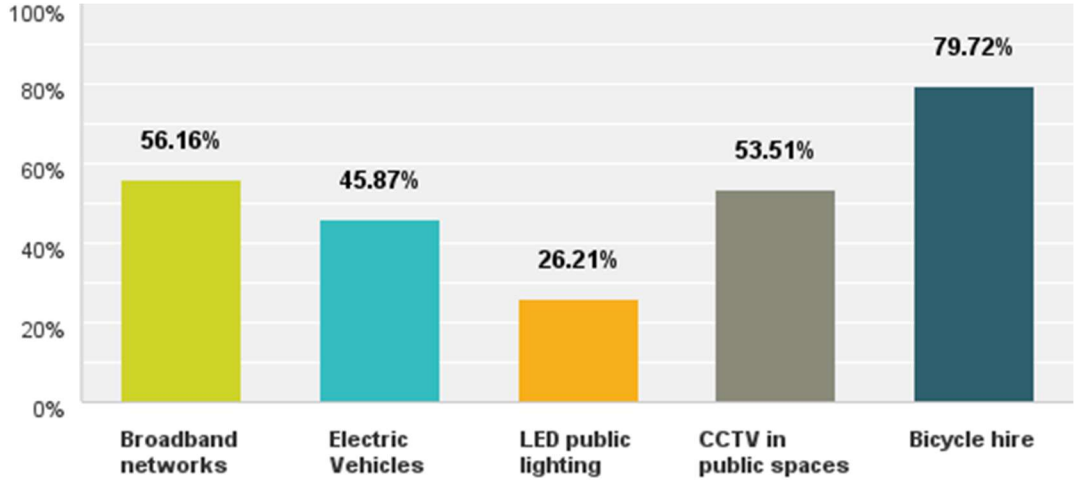


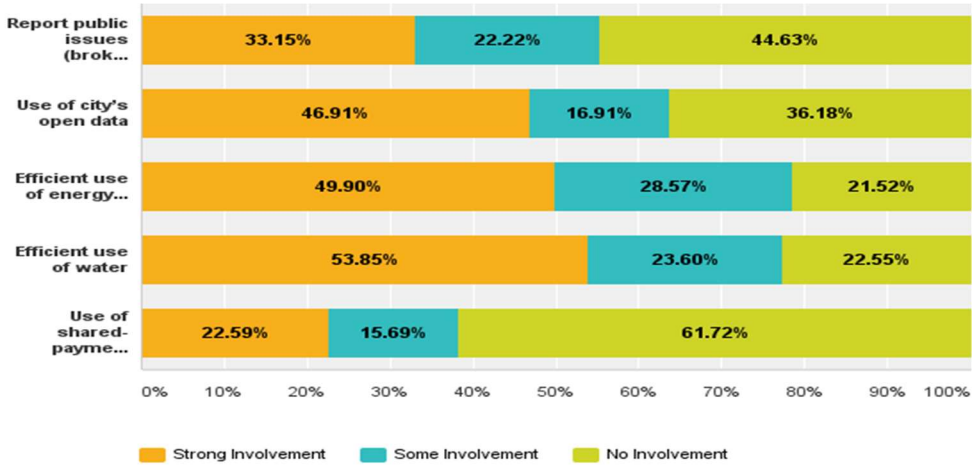
Figure 5.27 shows that bicycle hire, which selected by 79.72% of the adolescents group, is the most popular or well-aware-of Smart city project in Cork. Following projects are Broadband networks and CCTV in public spaces which were selected by more than a half of respondents. The figures for Electric vehicles and LED public lighting are 45.87% and 26.21% respectively.

Figure 5.27. Please indicate if you have heard about any of the following Smart city projects in Cork (tick all that apply). This question allows more than one choice, therefore, the results of the question add up more than 100%.



Regarding involvement and participation in public issues, Figure 5.28 shows that young people were strongest (53.85% strong, and 23.6% some involvement) in projects concerning the 'efficient use of water'. The 'efficient use of energy' also recorded high levels of involvement from the respondents (49.9% strong and 28.57% some involvement). The lowest area of involvement in smart city projects was the 'use of shared-payment car ride' with 61.72% saying no involvement at all.

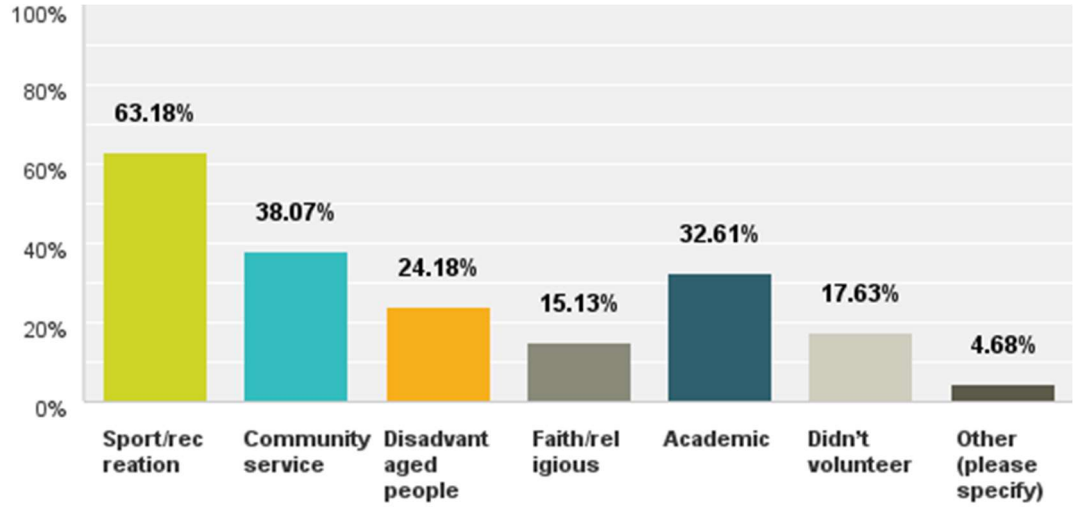
Figure 5.28. How much involvement do you want in the following future Smart city projects? (1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved'). This question allows only one choice in each of the topics, therefore, the total percentages of the choices add up to 100% in each of the bars.



Regarding volunteerism practices, Figure 5.29 shows that 63.18% of young people participated in sport/re-creation activities while about 38.07% of respondents volunteered

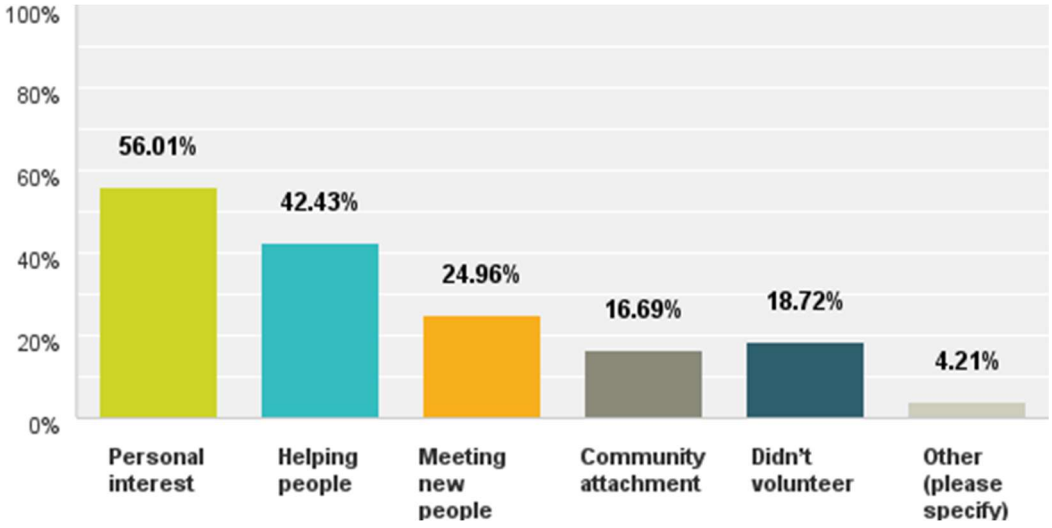
in community service and 32.61% respondents are or have worked in academic events. Other voluntary activities are supporting disadvantaged people (24.18% of respondents) and faith/religious events (15.13% of respondents). This group has the lowest percentage of 'Didn't volunteer' (17.63%) among all the surveyed groups.

Figure 5.29. Please select the groups you voluntarily participated within the last 12 months. This question allows more than one choice, therefore, the results of the question add up more than 100%.



Regarding motivations for adolescents to volunteer, 56.01% of respondents participated in volunteering activities to satisfy their personal interest (Figure 5.30). Meanwhile, helping people is the main purpose of 42.43% of respondents when taking part in volunteering. Other motivations for people to volunteer are community attachment (16.69%) and meeting new people (24.96%). 4.21% respondents are doing volunteer work for other motivations including 'forced to', 'through school', and 'CV for future reference'.

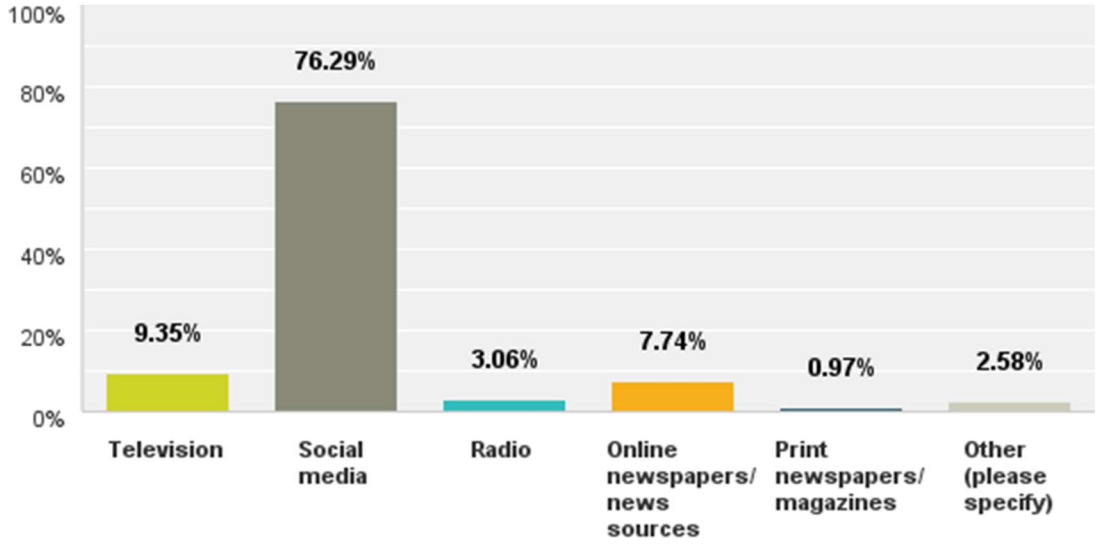
Figure 5.30. What motivated you to volunteer? This question allows more than one choice, therefore, the results of the question add up more than 100%.



5.4.5 Digital skills

The majority of adolescents mainly get information through social media which is selected by 76.29% of respondents. Other traditional sources are used by less than 10% of respondents (Figure 5.31).

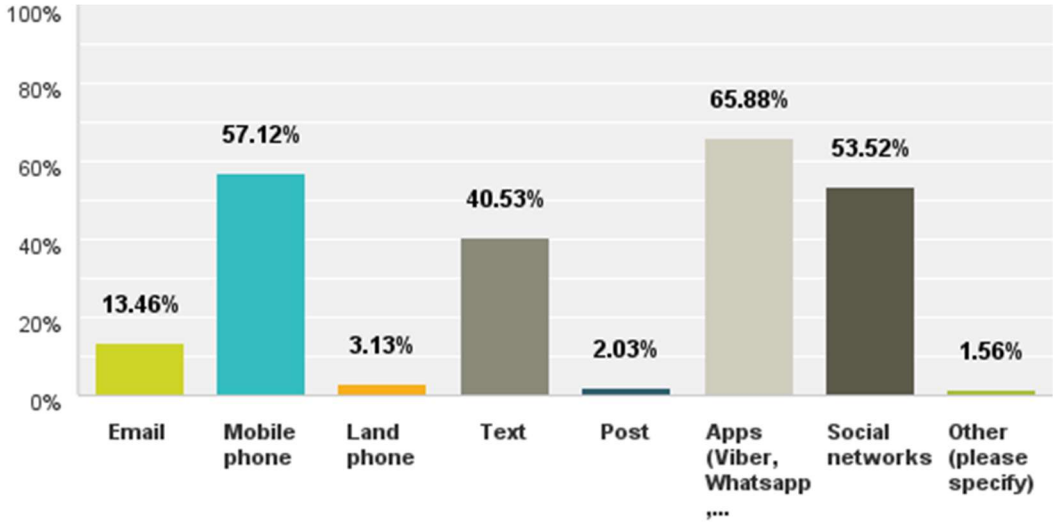
Figure 5.31. What are the primary sources of information that you use on daily basis? This question allows more than one choice, therefore, the results of the question add up more than 100%.



Young people in Cork often use mobile apps (65.88%), mobile phone (57.12%) and social networks (53.52%) for regular communications (Figure 5.32). Meanwhile, the text is the main communication methods of more than 40% of respondents. However, land-line phone

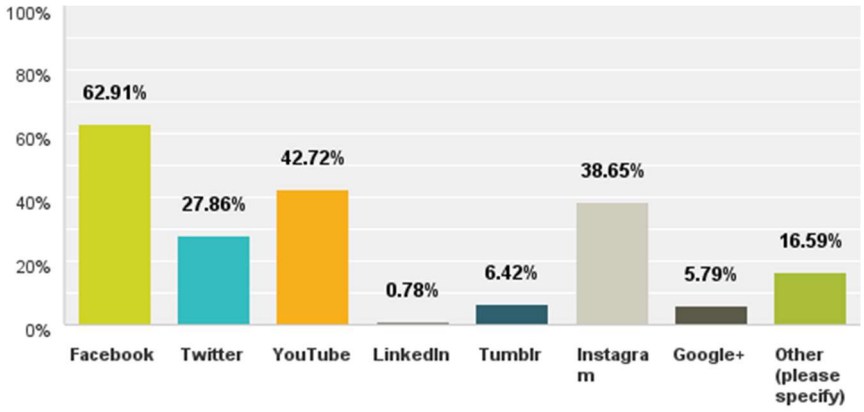
and post are among the least popular methods which are used by less than 4% of respondents.

Figure 5.32. Which of the below communication methods do you use most often? This question allows more than one choice, therefore, the results of the question add up more than 100%.



Among the social media networks, Figure 5.33 shows that Facebook is the most popular social media platform used by the adolescents group (62.91%), followed by YouTube (42.72%), Instagram (38.65%), Twitter (27.86%), Google+ (5.79%) and Tumblr (6.42%). Only 0.78% of respondents are using LinkedIn. Other includes mainly Snapchat, which is becoming more popular among this age group.

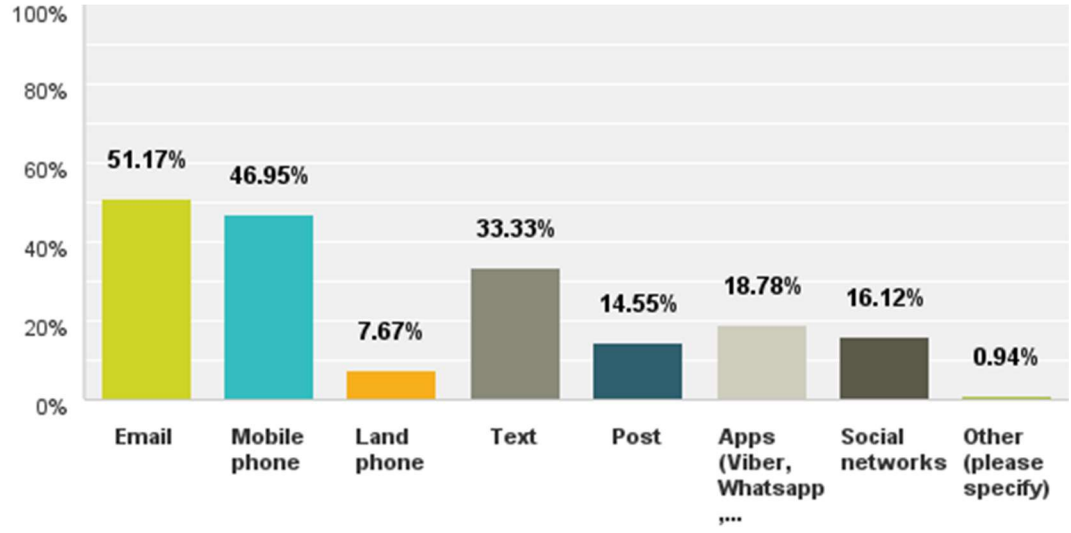
Figure 5.33. What social media do you use most? (Select two) This question allows more than one choice, therefore, the results of the question add up more than 100%.



Regarding their preferred means of communications, Figure 5.34 shows a 51.17% adolescents would like to be contacted by public offices via email. Mobile phone and text

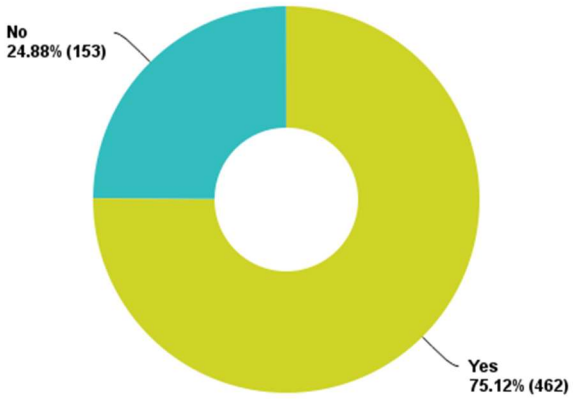
are also acceptable communication methods which were selected by 46.95% and 33.33% of respondents, respectively.

Figure 5.34. Please indicate the communication methods you are most comfortable with when public offices contact you (select two). This question allows more than one choice, therefore, the results of the question add up more than 100%.



The majority of adolescents (75.12%) are willing to use a smartphone app designed specifically for Cork (Figure 5.35). This is not as high as the percentage in the non-representative group or the official groups, even though this group rate themselves quite fluent in using apps and social media.

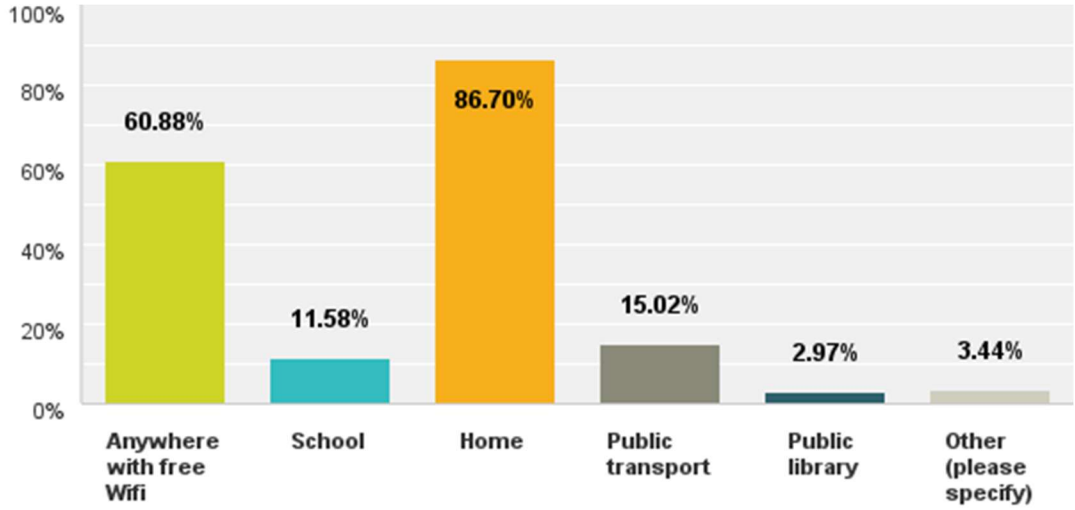
Figure 5.35. Would you use a smartphone app designed specifically for Cork? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



Regarding the access locations for being connected online, Figure 5.36 shows that 86.7% of adolescents access the Internet at home, followed by 60.88% using free Wi-Fi at any

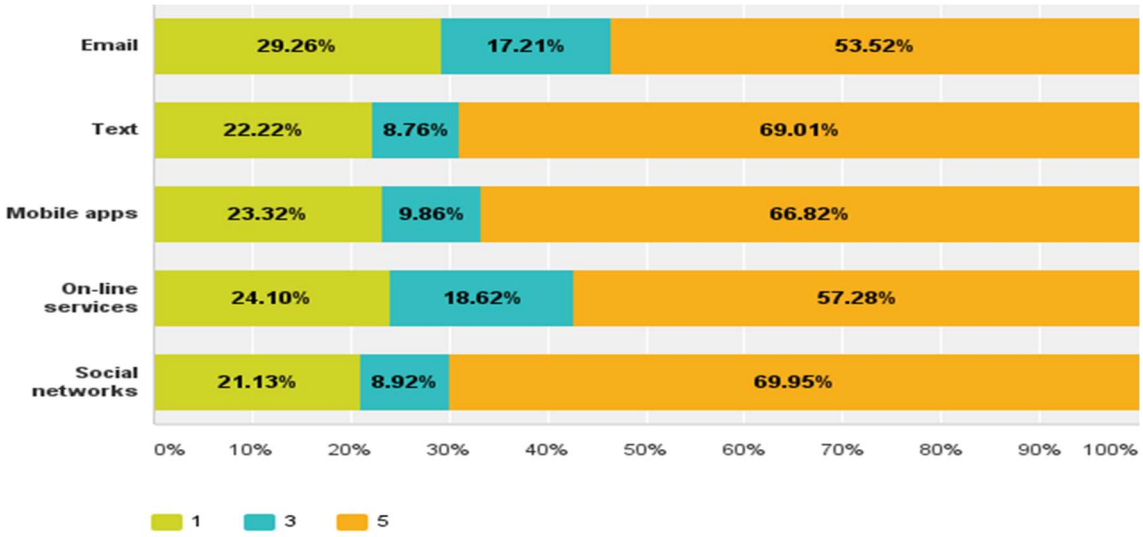
location and 15.02% of respondents using the Internet on public transport. 11.58% of respondents access the Internet at school while 2.97% access in public libraries.

Figure 5.36. Where do you access the Internet most (select two)? This question allows only one choice, therefore, the total percentages of the choices add up to 100%.



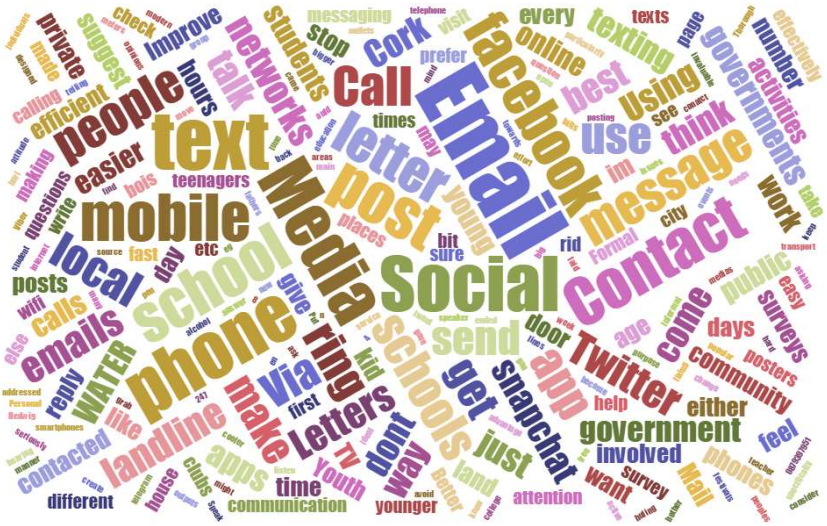
The majority of the teenagers claimed a level of 'very good', which means they have the ability to help others use email, text, mobile apps, online services, and social networks (Figure 5.37). 70% of the respondents rated themselves at the top level for using social networks, with Facebook, YouTube, and Instagram. 69% of the adolescents placed themselves at the top level in texting skills, followed by mobile apps, 67% at the top level, online services, 57% at the top level, and Email, 53.5% of top proficiency. 29.26% of the respondents rated themselves as weak or needing help with email skills.

Figure 5.37. How do you rate your skills in using the following digital tools? (Scale 1-5 where 1 is 'Very poor' (need help) and 5 is Very Good (can help others)). This question allows only one choice in each of the topics, therefore, the total percentages of the choices add up to 100% in each of the bars.



The adolescents suggest local government to contact with them via social media, email, mobile phone, school, and text. The word analysis (Figure 5.38) reflects that the adolescents are comfortable to be reached via modern technologies and many of them suggest the engagement via school. App, call, ring, Facebook or Snapchat are also good channel to push the information to this age group, informing them of issues that are relevant to them.

Figure 5.38. What would be your suggestions for local governments to effectively contact you? This is an open ended question, therefore this is a qualitative rather than quantitative analysis.



5.4.6 Key findings

The adolescent group sees itself as being skilful in digital skills, yet the majority of them are not yet in the workforce and do not have the experience that comes with responsibilities of dealing with government related issues. However, their attitude and practice toward public participation and how would they want to be involved in future activities are important. The method for accessing this group was through an online survey sent to them through the school and youth outreach support centre. Therefore, the respondents are not necessarily inclusive of all potential respondents of this group. However, their responses regarding their perceptions, digital skills, attitude and practice toward public participation are important, especially in programme and projects targeting or benefiting them as primary audience. The findings are:

- The adolescents respond positively on a shared and collaborative vision of their participation in public issues;
- 75%of the teenagers report that they have too few opportunities to participate in local decision making, while 20% indicate that there are enough opportunities;
- 59% of the teenagers strongly believe that they have a big/moderate impact in making Cork a better place to live. However, 25.5% of them believe they have only a small impact, while 8% report their participation would have no impact at all;
- The adolescents group are at a crossroads in their lives with a choice to enter into the workforce or pursue higher education opportunities. Therefore, they view their health and wellbeing and education opportunities as key concerns on their mind;
- Nearly 80% of this group rate Cork as an excellent/good place for lifelong learning, a very high rating among the surveyed groups.
- Similar to other groups, the teenagers want to be more involved in the efficient use of water and efficient use of energy. They also want to be involved in usage of the city's open data with a significantly higher percentage (63.82%) than in any other groups;
- The teenagers have a strong sense of volunteerism with 80% reporting volunteer experience mainly in sport and academic activities. Like most of other groups', the teenagers volunteer with a strong motivation of personal interest and helping people;
- Similar to the non-representative general public or the tech-savvy respondents, teenagers get their daily information mostly from social media (76%), while other traditional news sources show a low uptake (less than 10% in total);

- Different from the tech-savvy adults, the teenagers use apps (66%), mobile phone (57%), and social networks (54%). These are the most common communication methods they use; however, when it comes to methods they are most comfortable with for the public offices to communicate with them, they choose email (51%) and mobile (47%); text could be used when public office communicates with them too (33%);
- Facebook is the most common social network the teenagers use, however, YouTube and Instagram – the video and image-based sharing social networks – are becoming more popular to this group;
- They access Wi-Fi mainly at their home (87%) but wherever they can access free Wi-Fi, they use it (61%);
- The teenagers rate themselves at a very high proficient level in using all key digital tools with 70% claim the highest level in using social media (70%), the only moderately rated skill in this group is the email, which they want for the public office to communicate with them.
- 75% of the teenagers want to use a smart phone app designed especially for Cork. They are not as supportive as the tech-savvy adults in saying "Yes" and they are a little lower than the average percentage in the Cork 360 Degree View (77%).

5.4.7 Correlations analysis

The correlation analysis contains key variables: digital skills, public participation, impacts of their participation, and volunteering. Because of the specific age group and specific context of smart city development in Cork, the questions had to be straight forward and relevant to the locality.

Digital skills were addressed where respondents judged their own level of proficiency from 1-5 where 1 is 'Very poor' (need help) and 5 is 'Very Good' (can help others).

Public participation was measured by asking respondents to choose their level of involvement from 1-5 for identified Smart city projects. Likert scale at 1 is 'No involvement at all' and at 5 means 'Strongly involved'.

Impacts of the teenagers' participation in making Cork a better place to live was measured by using multiple choice questions which provided respondents with a series of volunteering activities and motivations for their participation.

The first indicators to be correlated were levels of proficiency of digital skills and volunteering rate. The null hypothesis for this correlation was: youths who had high levels of digital skills would be likely to volunteer. Such hypothesis was adopted from an umbrella theory that those who volunteered are more likely to participate in public issues. Furthermore, as reviewed in the earlier sections, the digital skills and their active online profile of the teenagers created opportunities to test the correlations in these newer assumptions.

The Pearson Chi-Square test was performed to detect the positive relations between the two indicators. The p-*value* was recorded at <0.05, therefore, the null hypothesis was accepted.

Teenagers who had good skills and used mobile apps and social networks had a high level of involvement in the volunteer-based projects. Also, the respondents who used and had strong skills in mobile apps and social networks were correlated with their high level of involvement willingness.

Going another level in-depth into the different digital skills by using the five key digital tools of email, text, mobile apps, online services, and social networks, there was a correlation between those who used and had good email skill with their willingness to report public issues, and the same was true with those who used and had good mobile apps skills. Those who used and had good skills in mobile apps were also correlated with volunteering activities.

A similar process was performed on the relationship between those who volunteered with their willingness to participate in smart city projects. The null hypothesis was accepted as the result of the test was at $p<0.05$. Therefore, there was a strong correlation between those who volunteered on a regular basis with their willingness to participate in the smart city projects.

Regarding the impact perception, there was a correlation between the respondents who volunteered with those who selected big or moderate impact in making their city a better place to live. Meanwhile, those who used and had good social network skills were correlated with those rated big or moderate impact in making their city a better place to live. Those who rated big or moderate on their impact were correlated with those who were involved in issues of efficient use of water. Table 5.12 outlines details of the positive correlation tests performed on the key topics.

Table 5.12. Pearson Chi-Square correlation tests recorded for digital skills, public participation and volunteering, and impacts

Digital skills	**Public participation**	**Volunteer**	**Impact**
Email	0.047		
Text			
Mobile apps	0.023	0.012	
Online services			
Social networks			0.024

N = 786; only recorded p<0.05

Again using Pearson Chi-Square analysis, findings showed that male teenagers who claimed to have the high proficient levels of using email, text, mobile apps are correlated to their willingness to participate in public issues, especially with the category of 'reporting public issues'. The male adolescents who use social network proficiently also found correlated with their perception of their participation at the local level as high impact.

Female teenagers were different as Table 5.13 shows. Those who claimed to have high digital skills in text, mobile apps, online services, and social networks were correlated with their volunteer activities. In other words, their digital skills were highly associated with their volunteering practice, which was one barometer for participation in this research context. Regarding public participation, female teenagers who use mobile app proficiently were correlated with their participation in energy issues.

Table 5.13. Pearson Chi-Square correlation tests recorded for gender in relation to digital skills, public participation, volunteering, and impacts

Gender	**Public participation**	**Volunteer**	**Impact**
Female	0.014 (Energy)*	0.013 (Email) 0.001 (Text)	

		0.024 (Online Services) 0.005 (Social networks)	
Male	0.006 (Email) 0.045 (Text) 0.045 (Mobile apps)		0.017 (Social networks)

Female N=305; Male N=333; Total N=638; only recorded p<0.05; (*) Digital skills categories in bracket

5.5 Leaders' views

The RQ4, using data from interviews with elected officials, authority leaders, business leaders, examines the perceptions, challenges, and solutions of the key leaders of the Smart Gateway Initiative. The analysis presents insights from interviews with the 12 leaders. The intent of the RQ4, as described in Chapter 4, is to compare key findings of the CorkCitiEngage surveys of residents and seek the officials' reasoning and strategies to lead the CSG initiative forward. The leaders are members of the Cork Smart Gateway Steering Committee, councillors of the Cork City Council and Cork County Council, leaders of key business groups, and leaders of local government offices. Each of the leaders spent an hour answering 13 questions from a semi-structured questionnaire and follow-up clarifications and elaborations. The interviews occurred from August to October 2016, soon after the initial results of the CorkCitiEngage surveys were submitted to the steering committee.

Interviews were recorded and transcribed for analysis. A total of 80 pages of text was categorised and analysed under three major headings of ***perceptions, challenges, and solutions***.

Table 5.14. List of the Interviewed Leaders

Roles	Quantity
Members of the CSG steering committee	4
City and County Councillors	3
Local government officials	3
CSG Programme Manager	1
Business	1
Total	**12**

5.5.1 Perceptions

5.5.1.1 Participation

The overall responses of the leaders align with the overall findings in the quantitative analyses. In general, elected and business leaders shared many perceptions with the public. Both believe Cork citizens have too few opportunities to participate in decision making. And the leaders share the opinion that citizen participation would make Cork a better place to live. Leaders said they value a shared, collaborative vision of citizen participation in public issues. The leaders cited various reasons for the existing status and offered strategies that might improve the interface between citizens and leaders of the Cork Smart Gateway Initiative. The reasons include limited methods for engagement, poor communication strategies, the Not-in-My-Backyard (NIMBY-ISM) attitude, duty-based citizen engagement, and the lack of feedback. Meanwhile, the leaders agree on the importance of engaging with citizens overall and for the Smart Gateway initiative.

A local councillor said: “We've been very poor as a local authority in communicating and engaging with the public. We don't have a great website.” Each councillor represents a much larger constituency since the town councils were abolished in 2014. The councillor said he knows that a certain amount of disengagement of councillors with constituents occurred

with the elimination of town councils, with subsequent resistance to local authority. Serving 50,000 people together with five other representatives, the councillor struggles to meet the demand of voicing up critical issues for his voters. He is increasingly using all available digital tools including email, social media, and text message in an attempt to communicate sufficiently with constituents to deal with the workload. He hopes some of the citizens' feedback and demand can be directly dealt with the local councils through better use of websites and apps.

Currently, city and county councils' websites allow citizens to access some information but have limited or no interactivity. The county council website is being revamped to include a few applications to give the citizens better access to the services offered by the local government. The councils' websites are offering forms for administrative applications, paying parking fines, register for electors' enquiries, planning enquiries, public library catalogues, and reporting faulty streetlights. The county council's website also has links to centralised payment systems for motor taxes and property taxes.

A member of the Steering Committee said: "We still have quite a lot of the traditional methods of engagement and participation … you engage with your local government through calls for submissions. These are usually written on a document that's released. You also engage with your local government by [contacting] your councillors which are how most people would engage in decision making."

A representative of the business community commented about the current citizen engagement situation saying: "It is quite mixed, and I would say there's no great direct engagement, generally speaking, with councils on major issues." He describes commonly used engagement models: people learn that official actions are taken through the city or county council members actively communicating the action to the people or through citizens, residential and business groups' interests offering their own policies. He says there is no problem with engagement on controversial issues. The NIMBY-ISM attitude gains centre stage although city and county officials must act in the best interests of an area covering half a million people. Traditionally official decision-making occurs in open display at a town, county or city hall. The physical limitation of the displays is also a barrier for stronger engagement with local citizens.

Echoing the view, a local government official said: “They [the citizens] don’t generally get involved in public consultation process unless it directly affects them.” If people must get a license, for example, or a planning application that requires them to go to the city or county council, they’ll do it. But leaders’ engagement with the general citizenry, he continued, the “silent majority,” generally occurs only when a consultation is required by the laws or regulations.

Among legal structures requiring citizen participation, another local government official explained, are local community development and other committees and the public participation network (PPN). He added: “The key is how well they're working and what quality do they deliver.” The official seconded his colleague’s perception that citizens, by and large, are not interested in strategic issues and limit their interest to short-term local issues. “You're always at a danger that the process is taken over by interest groups that have very narrow agendas, but they’re well-organised,” he said.

Another local government official echoed concerns with the current engagement limitation, saying “We as local authorities or as public sector organisations could probably improve our approach to it and, in particular, expose our approach to encouraging the participation.” He notified that there is a mind-set of a “double-edged sword” or “chicken and egg” which hinders offerings and encouragement of more engagement with citizens. He called the citizen engagement surveys done in this study a good example to start “testing the water” in citizen engagement. He said, “the citizen engagement survey was unique in terms of we were actually going right to the source, right to the citizen and getting their opinions and feedback on certain things.”

Sharing a similar view, a member of the steering committee said “It is [citizen engagement] a constant struggle, and we have tried various models over the years. I think there is still a perception that there is not enough engagement. I personally believe a lot of the problem is people aren’t aware of the opportunities for engagement.” She has been reaching out to many other colleagues in other cities around the world to learn about the best practices but is unaware of anywhere that has achieved the ideal level of engagement.

The same steering committee member cautioned that officials fear to stimulate engaged citizens to the point that citizen demand would overwhelm the governmental entity’s ability to meet the demands. In this “what if” scenario, she suggested that “if we engage too much

all we do is increase the service demands and be criticised for continuing to fail." This, as a consequence, impacts the poor feedback mechanism.

The CCC has been testing an approach that puts the responsibility on citizens for accessing weekly updated website information on its housing programmes. Treating citizens as active participants instead of passive bystanders, the housing unit reasoned, "We would not reach out by email, text messages. We put the onus on them to keep looking at the website. We wanted to create a system whereby we gave them an incentive and opportunity but that they took the onus of engagement on a weekly basis." So far, 15 months on, it works because it involves the immediate benefits for the targeted people.

Councillors recognize the need for engaging citizens in local decisions and in the Smart Gateway because, as one member of the steering committee said, "The best decisions are made when all the information is available, and the best decisions are made when people understand the risks and they have a full understanding of the information that is involved in the decision-making".

Another member of the steering committee expressed a similar sentiment: "I am a big fan of smart engagement, and I agree with the idea that the local authorities must do a lot more to make it easier for citizens to engage. The easiest and best way of stimulating engagement is to show them that when you make the effort that the engagement actually is taken into account." Members of the steering committee recognise these challenges in moving toward ideal citizen engagement: making engagement easier for all people, how to stimulate engagement, how to raise people's awareness about how they can engage, and making clear when and how they can engage and finally, linking citizens' engagement to official actions. They also take responsibility for greater citizen engagement. One member said: "It is up to the local authority on raising awareness and then making it easy for people to do so. It is all about making it easy."

One member of the steering committee suggested a specific in the "how to" challenge: "If you want to sell something, you have to advertise it. You have to go out and create a demand or an interest in it, and so that is perhaps not sufficiently happening. If the local government wants more active citizen engagement, I certainly think that it would be a first step developing some tools and then actually very proactively go out there and put that into people's faces." He supports the introduction of an engagement app to provide two-way

communications rather than the top-down, one-way view with no feed-back loop that is used by local governments. He said: “You need to say “Why am I doing this?” So from that perspective, I think it has to be two-way communication. It is very much a top-down approach that they built the infrastructure … but the citizens were the tail end of that and I think that was one of the valuable lessons we learned. They [local governments] have a lot of the key ingredients but unless you get the citizens engaged and motivated and active, you’re only going to get so far.”

One local councillor summed up the issue: “Proper communication and direct communication is really the way forward. Really, it is important because there is so much misinformation out there.”

5.5.1.2 Skills

The leaders are aware that successful public engagement with councillors and local governments requires both general digital skills and knowledge of specific applications. One steering committee expressed awareness this way: “A lot of people spend a considerable amount of time every day in the cyber world… whether that's via computers, their smart phones…” But while platforms, i.e. social media and such features as web forums, lend themselves to engaging citizens in an easy and cost-effective way, public awareness of possibilities is crucial. Even if tools are available for citizens to engage actively with their councillors and local governments, the average resident may have difficulty mastering them and doing so may be impossible for residents from disadvantaged backgrounds.

The non-native population, in particular, may have difficulty with electronic communication, another steering committee member noted. A steady flow of immigration over the last few years brought residents whose limited command of English is a barrier to engaging. “I suppose it is important that in government, be it local or national, you have to cater for your population,” the member said.

The business leader pointed to the need to help citizens learn to express their needs. He said: “We need to have a way of educating the members of the public to voice up what the citizens want and giving the citizens an opportunity to influence the various debates.” Effective citizen presentation of needs would aid the members of the councils such that they don't need to share or shift power and responsibility and can be more effective in representing the citizens in their local areas.

Another councillor expected a skills deficit in rural areas, saying "I think technology it is used differently in the urban areas than it is in rural areas. Now, you won't get the average farmer to understand smartphones." Contrary to this expectation, rural respondents surveyed in this study have the necessary digital skills and use the e-government public services better than their urban peers.

Success in stimulating citizen engagement depends on to some degree on which demographic is targeted. As with findings in RQ1 and RQ3, leaders reckon that a lot of younger people did not vote in 2016 elections and the best way of engaging them is through their smart phones and social media. The business leader suggested using a local app and text to push particular headlines informing people of what's happening and then use the app as a means of a survey. The app becomes an integrated interactive platform with feedback functions and information push via texts at the same time. He said, "It would address a lot of the people between 15 and 40 years of age." His observation is highly supported by the findings in RQ1, especially social media and app usage by this age groups. A simpler method of using texts and getting people on a text list would work as well because the majority people have mobile phones.

The leaders are addressing the skill gaps by working with organisations and groups such as Junior Chamber, who go into the community, particularly the ageing communities, to help the elders to develop simple skill sets including logging onto the computer and doing everyday day things like engaging with local authorities. A local government officer said the current structures including the Local Economic and Community Planning (LECP) can train people how to engage face to face and making them technologically literate. Such structures can also provide the skill training opportunity for the most disadvantaged people who are the less technologically literate. Agreeing with the approach, a member of the steering committee added that the skill issues can start in school and can include aspects such as how and why to engage with local authorities.

5.5.1.3 Access

The leaders agreed that addressing the skill gaps has to go along with the improvement of access to quality information, physical tools, and legitimate representation via councillors.

A member of the steering committee said: "I get a lot of information via newspaper apps. I go to the root of information sources that I consider as a reliable source and of high quality

but nevertheless, you know that the platforms become a way of accessing information and engaging in communication. And so I think that makes it an ideal vehicle for citizen engagement as well." This was emphasised as necessary in a local app in the RQ1 findings.

To provide access, a local official emphasised the need to optimise and invest in libraries or public offices where citizens can use electronic tools and learn about services available for them. The availability of physical tools can be a starting point in engagement that leads to more citizens contributing to the services. He said putting Wi-Fi into libraries along with good quality printing equipment would facilitate citizens' building their skill sets, which would, in turn, enhance engagement of citizens with government services and subsequent improvement of those services.

Another member of the steering committee pointed out that balancing resources and demands gets tougher because increasing demands at conflicting levels force setting priorities. He added: "How you make yourself relevant to them, our libraries by their nature understand the role of information, how to engage in all different levels." He expected, he said, that engagement of citizens and the value they realise for their money will self-regulate because the people decide what's important to them but elected officials must prioritise available resources. The view is shared by another local government official, who added that while enabling people to use services remotely is important, some people like face-to-face interaction. He agreed that for some issues, face-to-face discussion is important. He said the existing city trial messaging service make is possible for everyone to sign up to put reliable information in the hands of the citizens. He said the system could be upgraded to two-way communications on how local governments deliver services in a smart way and without the need for a face-to-face contact.

Regarding access to legitimate representation, the business leader said people can exercise their participation on an issue-by-issue basis and through that avenue, learn about other issues. For instance, one of the critical documents that a council produces is a development plan, projecting changes over the next 10 years in the city or the county. Local officials need to ensure convenient access to the information and discussions for both younger and older generations. As Generation Y and Millennials come to the fore, local government will need more portal and social media interaction while maintaining traditional interactions desired by older citizens, including town hall and face-to-face meetings with councillors. Once caution voiced by the business leader focuses on councillors' need to engage with voters'

issues instead of exclusively focusing on "their own thing." A local official linked the importance of citizens' assuming responsibility with their expanded role in governance. "You have power; you have a responsibility…Somebody must be accountable for the decision."

Another area of shared power envisioned in the Smart Gateway provides access to business and innovation sectors. A steering committee member noted the importance of nurturing start-ups, including investing public assets and encouraging adherence to business and technology models likely to lead to success.

In summary, access issues rest on the quality of information disseminated to the people, described by one councillor as "Information is power for people… Getting information out that is not completely twisted … for me that ends the disconnection."

5.5.2 Challenges

Cork Smart Gateway challenges emanate naturally from the complexity of the city as a system of systems with many people, policies, and processes entwined with multiple stakeholders and their differing goals and interests.

Primary responsibility for CSG rests with the councils; from this perspective, CSG promotes economic development, maintaining the environment and providing the best possible quality of life for the people who live, work and visit here. CSG must become a way of life for all people, one steering committee member said: "CSG isn't an initiative; it is a way of doing business and it is got to grow beyond just a project and become more embedded in the culture, in the policy, in the process and how we operate".

At the centre of changing the culture is citizen engagement. CSG officials have seen failures in technology-driven projects that ignored the importance of citizen engagement. Simply stated, if the people don't use the technologies embedded in smart cities projects, they fail; citizens engage when they understand how they benefit from smart technologies. CSG engages citizens to identify challenges and to find solutions that suit Cork. One member of the steering group said: "We carry out research and develop a lot of technologies… relevant to what people generally talk about, the smart cities and community space… [we need to know] how can we get the people to collaborate together not just on a technological level, but in terms of business models, motivations and a cooperation engagement so that we can

use more green energy and alleviate the load on the grid." Large-scale demonstration projects facilitate engaging with people because, as on councillor said, many people operate under "what's in it for me"; when they see something in an innovation that benefits them, they embrace it.

Leaders express agreement that "we can't do everything. We need the participation of the citizens and the residents and the many community groups." Each group brings unique perspectives and resources needed by other groups. Different constituents complement each other in achieving their own individual targets, while collectively contributing solutions to bigger challenges that benefit the whole.

5.5.2.1 Scope

A small-midsized city like Cork has no fixed model to follow in setting the scope (range, span) of its CSG. CSG is at an early stage, and stakeholders, including key leaders, continue to explore collaborative ventures that generate marketable solutions and answer non-monetary issues while being aware of the need to focus and set limit. A senior local government official stressed the need to "formulate the ends you want to achieve and then the means by which you achieve it". Another urged "getting the first one in the door and getting it done… proving that something works, true smart mechanisms will speak volumes." He encouraged the stakeholders to scale projects to fit Cork, "work on some kind of trial, and tweak it as goes…There is no better way of actually promoting and persuading our citizens to engage with it, than having the citizens themselves that have benefited from it saying this works."

Leaders emphasised that CSG projects must fall into the range that local governments can promote and handle. For example, an online ideas portal to which people share their ideas - an approach under experiment by LECP – could be helpful, but it requires huge resources and commitments. Working with and through participating organisations, many of which are already involved with CSG, was another steering committee member's suggestion: "Convince them and demonstrate to them why they should now take account of smartness and smart objectives, utility efficiency and all that into their day-to-day decision-making."

As leaders set the strategic scopes, they also work on practical, "low-hanging fruit" to help CSG get traction. One leader noted that "real-time event information, something as simple as weather alerts in the next four months" is relevant and popular. She said customising the

applications would engage people and encourage them to tailor information for their neighbourhoods. CorkCitiEngage, the leader continued, allows "[policy makers] go out to the communities and use various methods of gathering data," adding that the 5-year development plan could be an experiment with support from the CSG's tools.

5.5.2.2 Institutional context

Ireland's history of government centralised in the national capital underscores the institutional problems CSG leaders face. "The local government has been kept quite weak", said one member of the steering committee. "A lot of power has been centralised, so I think that is translated to citizens undervaluing local government elections and seeing that the centre of power is in Dublin and that national government is more important than local government". She called Ireland's "cultural attitude" wrong, in that some national politicians create unrealistic expectations and put little emphasis on personal responsibility. "A lot of power has been centralised, so I think that is translated to citizens undervaluing local government elections and seeing that the centre of power." She said, "All they want is being re-elected while the local governments have to deal with the expectations and lots of disconnections and distrust of local citizens and residents."

One councillor noted that local government leaders face the disconnection and distrust issues because of "misinformation or a clear misunderstanding of what our roles are. My role as a local representative is to deal with local issues at a local level and to ensure that the appropriate funding that we get locally here is spent in the right direction." He acknowledged some significant reform of local government but also "a lack of willingness to reform the national agenda".

The institutional context also includes the EU, which directs members to involve people in local decision-making. The national level maintains a consultation process. A local government official said a new model is needed of how consultation information participation system should work and "so then we'd be putting flesh on the bones of the legislative provisions that are there ready." He added that services delivered by state bodies locally spend quite a bit on coordinating with projects led by the central government network. Therefore, the CSG institutional context, he said, is "you try and build your ad hoc coalitions to try and achieve identified ends. If you're looking for institutional reform don't wait for that."

At the operational level, the leaders find a range of services and projects delivered by different organisations over which city council and county have no controls. They rely on formal networks and "start off relatively where you are rather than where you want to be at the start," one said.

For CSG, institutional barriers force the organisation to struggle for awareness that it exists, even within the very organisations that created it. A few CSG leaders noticed this invisibility. One local government official said: "We have to go beyond our existing structures, and our existing culture, and our existing attitudes towards citizen engagement, and by doing that we then start to build up a momentum behind the citizen engagement."

5.5.2.3 Resources

The leaders know that gaining resources, i.e. investment budget and human resource, is one of the biggest challenges facing CSG. A member of the steering committee called it "huge issues here … the fact that local authorities have such finite budgets." Lack of resources limits CSG's ability to propose anything large scale, such as seeking the opinion of the average citizen, a difficult, costly and time-consuming exercise.

Small ideas can leverage other programmes and schemes for funding, but smart technology projects require larger funds, and key technology members struggle for resources to initiate projects. Large-scale funding is available through open competitions at EU and national levels, leading technology members join the CSG in the hope that larger projects can be funded. For instance, local authorities could initiate a trial in use of solar energy at social housing that could help citizens understand why and how the solar panels had been installed on the roofs and battery banks in the basements. Such engagement would help test if the technology works when residents have to participate. Through that process, the people become aware of what is happening, engage and cooperate with members of the CSG.

The facilitation role became increasingly challenging when local authorities' workloads expanded as personnel were cut during the 2008 recession. A member of the steering committee noticed that "everybody is working very hard to just try to do the work they have." CSG leaders see that they lack staff members to work on citizen engagement. One said: "We need a team of people."

Even the low-hanging fruit approach, i.e. utilising social media and electronic engagement, requires human resource for monitoring what is coming in and how to respond. Leaders realise that budget constraints mean they must rely on voluntary groups. One suggested working with influencers and community leaders, including the local development groups, age alliance and the PPN to unify the groups.

Despite all the challenges, the leaders of the CSG expressed optimism that they can move forward to collaborate and form context-based solutions.

5.5.3 Solutions

The leaders bring different perceptions and agree on challenges facing the group. They focus on practical solutions on what to do and how to do it while remembering their ideal answers to the success of CSG. This section presents the solutions in the views of the key drivers who know where to direct the initiative to achieve their entwined motivations.

Figure 5.39. The most important words to the leaders in leading the Cork Smart Gateway Initiative. The size of the words, feedback, collaboration, and communication, comes from the frequencies in the leaders' answers.

5.5.3.1 ICT

Leaders agree that ICT solutions are essential to confront the challenges outlined in the RQ1 and discussion of their views. ICT solutions include web presentation, social media, text

message, local applications, available institutional structures, and others. In short, a mixed ICT-enabled model can help to address the challenges in engaging with citizens and in generating interest and participation in CSG.

A local government official suggested online as a starting point. For instance, the PPNs can test online interaction within their networks and share the experience with 800 community and voluntary organisations operating in the city. These multi-online channels of communication make it easy for people to put in their views while they also help those who deal with the information to handle the views when they come in. This softcopy format is easy to manipulate and could be effective and productive for proposed parties and responsible authorities. Echoing the view, a member of the steering committee said: "We're going to see more and more engagement happening online and using different technologies to enable more citizens to participate in this decision-making."

The business leader noticed the trend of e-government and predicted a lot more going forward, particularly to engage with young people. As shown in the RQ1 results, younger people work through their phones, laptops or tablets; that's where councils have to deliver their messages. The business leader noted that many people use social media, i.e. Twitter and Facebook or to a lesser extent Snapchat and WhatsApp because it is very easy to want to follow debates with hashtags or key words.

Another local government official said the reluctance of leaders to engage social media because they are risk-aversive. Apart from the common social network platforms, the city apps could be great if people use them, a member of the steering committee said. But she also predicted a challenge in retaining users by providing updated content, such as parking functions or discounts in shops. Failure to meet this challenge is causing declining interest in many cities that had introduced local apps.

Another quick win, one essential to CSG, is free public Wi-Fi, the leaders agreed. The leaders view other applications such as information kiosks or footfall counters as quick win solutions to find out what citizens actually want to do, what they're looking for, and what interests them.

However, the question remains of how to promote more people using ICT-enabled tools. A local councillor recommended that the movement can start with the councillors themselves in an ongoing learning process for all representatives to move to smart electronic technology

and stimulate two-way communication. He revealed that about 30% of his referrals come from online through social media (Facebook and Twitter or LinkedIn) or by email or website. He added: “It is not all about coming to the community hall for a meeting anymore now. It is all about how you engage with the people and the different platforms on which you do.”

Because ICT-enabled tools are associated with personal data, leaders are cautious about the privacy issues. The CSG manager said: “It is about trying to figure out this fine balance between infringing on citizens’ privacy and infringing on their rights versus using data to try to help them.”

A local government official stressed the need for officials to show citizens that their engagement influences decision-making. He and others expressed realisation that although effective citizen engagement depends on wise use of ICT, the technology itself is not the solution. Instead, ICT solutions enable two-way communication between the citizen and organisations and government officials.

5.5.3.2 Collaboration

The leaders recognise that collaboration is the key for CSG to move forward. It is a way of doing business and it is a way of promoting stronger engagement with many stakeholders, including citizens. A member of the steering committee pointed to the city’s “long tradition of collaboration, back to the early 1970s. We’re also lucky because of the size of the city, it is big enough to have all of the stakeholders that you need in the successful economy: the educators, the industry, the citizens but we’re also small enough in that it is possible for the leaders of those stakeholders to be familiar with the other leaders in the community.” Despite the long history of collaboration, others pointed to the need to raise local authorities’ awareness of how crucial ICT technology is in delivering all the services of the organisation. One added, “It is not just an initiative made up of a small number of people sitting at the table; smartness is a way of conducting your business. It is a part of the solution.”

The collaboration approach enables participation of resident groups, community groups and industrial groups such as the Cork Business Association and the Cork Chamber of Commerce. And as the business leader pointed out that groups ranging from political parties to sporting organisations must be included along with PPNs and the LCDCs, plus more traditional community groups such as charitable organisations, voluntary and environmental

groups. Schools and educational institutions also play a role, with feedback that helps assure organisers know how students and others use smart tools. Local authorities can help research institutions, one leader noted, by presenting the wholeness of ecosystems such as public lighting, energy services, or traffic management systems. He said, “There’s a lot of synergy options there. The local authorities sit at the hub of these and they can maybe help us come up with a system to bring all of these stakeholders together.”

Apart from the practical solutions and considerations, the leaders also outlined their ideals to leapfrog the city ahead. A local councillor said: “Cork Smart Gateway helps people to develop and understand smart technology ways in advancing their own business or their own community, and I think it gets the smart way of doing business...I think people are more educated now, and they are looking at how politics is done, they’re looking at how CSG has progressed, and they are taking a very educated view on how beneficial or how value for money that is, which can only be a good thing.”

Another leader added: “CSG will be a success if it would be having a community that understands what we are doing, what we would like to do, how what we are doing will affect them or they will understand that in terms of improving or making more use of technology where energy efficiency is at, we’re trying to make it more responsible. They get the connection between what we’re doing and how it will affect them. It is about trust and understanding more than anything.” The CSG manager considers successful engagement to be people participating in the project at various stages. The CSG is a two-way communication channel with citizens so they can submit ideas and know that the steering group will consider them and respond to possibilities for implementation. A local official said: “It is about giving every opportunity, every avenue, every media, but also being proactive and going out and seeking information as well.” That’s the ideal of a successful journey for the CSG, as the leaders see it.

5.6 Crowdsourcing

This final question, RQ5, describes the processes in which academics, local government, volunteers and civil organisations came together to collaboratively design and carry out a study to represent local interests around the deployment of smart city infrastructure. As mentioned in the Chapter 4, smart cities and current scholarship on the importance of community participation and engagement with such projects presented a good setting for an

experiment of crowdsourcing as an applicable method. The experiment tested crowdsourcing as a method that can provide inspiration for the design of low cost smart city data gathering projects. This part reviewed the processes of carrying out and managing a crowdsourcing-inspired smart city project in CorkCitiEngage project. It also reinstated some results as outcomes of the implementation of the crowdsourcing method. The results of this section were presented at the Smart Cities for Better Living with HCI and UX workshop in on 7 May 2016 in San Jose, California, USA. The paper was published in the main conference's proceedings. The main conference was the ACM CHI 2016, the top conference for Human-Computer Interaction.

5.6.1 Participation through Crowdsourcing

In the Cork Smart Gateway project, it is needed high fidelity information, from a breadth of city residents, but had very little budget. We adopted a data collection method inspired by crowdsourcing, in which interested local academics, industry, volunteers and social organisations collaborated in the study design and data collection. The strategy followed formal guidance to define and design relevant indicators for resident engagement, sample data, and experiments (Alonso and Lease, 2011).

The guidance included step-by-step tutorial to put the selected crowds to work for specific tasks. The first step was defining overall aims of the project with actionable objectives. This also involved the defining and designing exercises of what to assess in citizens/residents engagement in this data collection stage. Apart from literature review in citizen participation and engagement, the project had the opportunities to incorporate inputs from relevant experts and practitioners. After series of discussions and critical reviews, the project was approved to measure initial three key aspects of public participation, digital skills, and public infrastructure access and usage. An additional aspect was the regular updated demographical data. The three aspects comprised of ten indicators, which were later on measured by 20 questions in a questionnaire. The second step was designing the questionnaire and calculating samples. This was a crucial stage for the project to get the right expertise from its crowd. The Managing the crowd section below describes the expertise involved and what they would benefit from the project. The third step was designing the survey deployment strategies. The project aimed at collecting a holistic picture of Cork's citizens/residents, including children, seniors, local authorities, and general public, therefore, multiple strategies were employed according to the project's crowd

capabilities and authorities. For instance, city and county were responsible for the survey targeting local authorities via an online survey to be sent through their email systems. Clarification of this step is in the below section of Facts to Formation. The fourth step was running the survey research. The deployment plans were in place including specific time frames for each of the survey sets. Access channels to potential survey respondents and specific names of the tasks' champions from the crowd were provided to the involved people. This ensured transparency and authorities of the project, helping each participants to be sure about their parts in a complete picture of the project. The fifth and final step was collecting data and analysing results. The data collection task in this project varied because of the different deployment strategies. The data from most representative sample of general public were collected using student volunteers. More on this can be found in the following section of Managing the crowd.

Quality control was employed throughout the second step to the final stage of analysing results. The quality control for the questionnaire design, for example, was reviewed with experts, through pilot testing (twice for the survey targeting the general public), and continuous inputs from early survey respondents.

5.6.2 Facts to Formation

Prior to the project's formation, it was necessary to understand who are we working with, what are the resources we can access, how are we going to make the project relevant to those who would involve, impact, and benefit from it. All of those facts would have affected to costs, design, and deployment mechanism of the project. The crowdsourcing action rules (Alonso and Lease, 2011) provide guiding principles for the project formation with crucial considerations including picking the right crowdsourcing model, picking the right crowd, offering incentives, and identifying decision makers. The lead researcher analysed the rules and decided that the project should be a combination crowdsourcing model, which included a collective intelligent/crowd wisdom (Surowieki, 2005) a crowd creation, and a crowd funding model. The decision came natural because of the project's stakeholders, their demands, and commitments as described in the Managing the crowd section below. This was where the project got to be innovative in the way it picked the right crowd. The stakeholder exercise arose with specific actions including cultivating, stewarding, sustaining, and requiring interactive participation of the each and every stakeholder in the

selected crowd. Other action rules were explained in more details in the Managing the crowd section.

First, the lead researcher looked at the establishment and initiators of the Cork Smart Gateway: The initiative was originated by four key institutions of City Council, County Council, NIMBUS (a technology centre) in Cork Institute of Technology, and Tyndall National Institute, a technology research hub in University College Cork (UCC). These are established organisations with authorities, international reputations, and local familiarity. Therefore, the project should utilise those formal channels in accessing its target audience (i.e. survey respondents), in sharing and sponsoring of responsibilities, whether it is financial or non-financial contributions.

Besides the upfront and ongoing commitments, the key initiators also have their wider expertise resource and networks that the project can tap in. These factors allowed the project to follow a combination crowdsourcing model, which includes collective intelligent (crowd wisdom), crowd creation, and crowd funding. The project's framework was shaped with a projection of high success chance for reaching and engaging many people that resulted in good turn-out of survey respondents. The projection would work if the deployment methods were innovative and nimble. Since the project and its content were multi-disciplinary by design, it required lots of inputs from expertise and people familiar with subjects. A stakeholder mapping exercise came in to address the cross-cutting approach.

5.6.3 Managing the crowd

The crowd of the project was diverse. It involved local government offices, academics, citizens/residents, communities, industries, social organisation and many more (see Figure 5.40). They were identified and analysed to locate their shared responsibilities and interests in local context. Accordingly, the researcher engaged and sold the project to the stakeholders, offering benefits and seeking resources, access permission, and other help needed from each of the stakeholders. The stakeholders were pitched with outcomes and impacts that the project could contribute and/or compliment to their organisations or to individuals.

The stakeholder mapping was crucial prior to running the study and expertise was utilised from local academic pools and numerous practitioners. The mapping enabled the right expertise for the specific tasks, meanwhile locating expertise required homework to be done

for identifying potential similar interests. The tactic worked for Cork because the presence of two universities that have dozens of relevant academics. The expertise contribution was on merit basis and mutual benefits including access and resources for future research.

The strategy also composed series of surveys to collect relevant city residents' data and produce a baseline and analysis for Cork. Survey and questionnaire designs received quality inputs from UCC experts. Another layer of crowdsourcing for survey deployment was applied: using student volunteers from UCC and Cork Institute of Technology to carry out door-to-door interviews. The involvement of the student volunteers incorporated key instructions, trainings with household interviewers from Central Statistics Office, academic credits, token incentives, and volunteering recognitions.

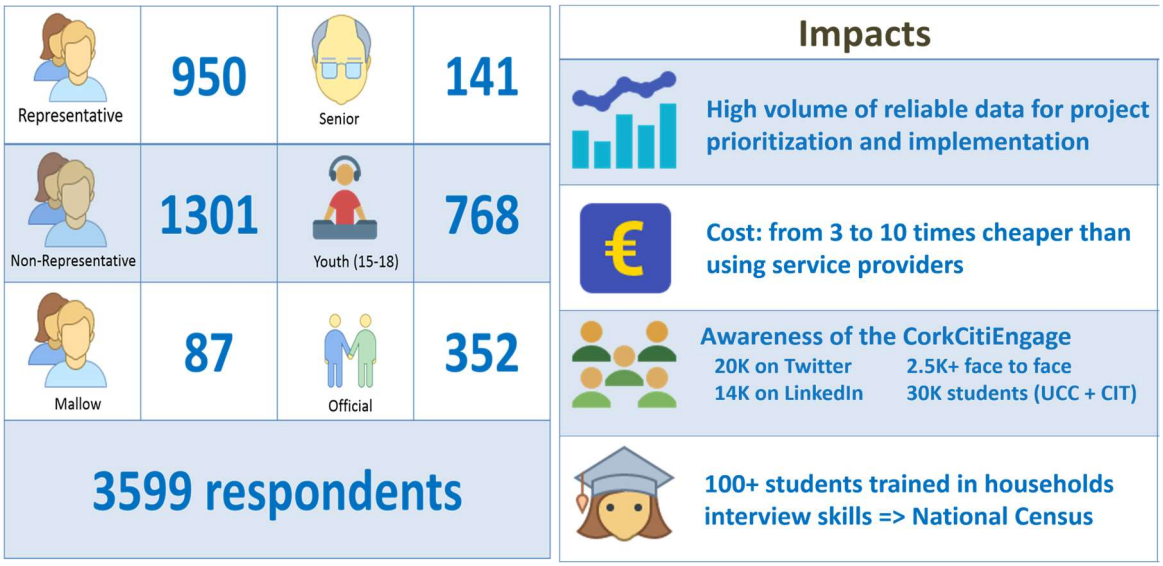
All of the employed tactics followed the crowdsourcing wisdoms and motivations including the opportunity to make money, the opportunity to develop skills (communication and interpersonal), the potential to leverage freelance work for students (Alonson and Lease, 2011). The professionals also benefitted from new approaches, networks, and recognitions within and outside their own organisations for community contributions. Other Web-based survey sets were designed to harness the greater contribution of the public. The survey distribution itself also leveraged the Web medium, email lists, and newer applications including Twitter, Facebook, and LinkedIn.

Figure 5.40. The Stakeholders mapping was a time consuming and challenging exercise. It required economic, political, social, and cultural understandings of the city. Layers of policies (i.e. EU, regional, national, local) enabled identification of responsibilities' boundary and overlapping or mutual areas of stakeholders, thus involving them at different tasks of the deployment plan

In Cork City's crowdsourced case, the solution produced the following results to the stakeholders:

- A sizable baseline data of more than 1% of the targeted area's total population
- Lower costs: At least 10 times cheaper than using a service provider for the door-to-door survey
- Large amount of residents and citizens become aware of the Cork Smart Gateway (20K on Twitter; 14K on LinkedIn, 2K+ face-to-face; 35K+ students and universities' staff)
- Series of data-driven analysis for project prioritisation and planning
- Almost 200 trained students for household survey interviewers
- New networks of authorities, academics, practitioners, and industries for research and business collaborations

Figure 5.41. Five sets of surveys (25 to 30-questions) collected a holistic view of all Cork residents. The surveys were the first systematic and widespread assessment for Cork in any local development initiatives. Crowdsourcing worked for all Web-based and face-to-face surveys. What works and what do not work within each of the mediums was great learning experience



5.7 Chapter summary

The research findings of the five interrelated specific research questions provide a holistic view to position Cork on a trajectory to shape a successful engaged, empowered and

involved local citizens/residents in the collective development of the city using smart city initiatives. This is also the overall aim of this research work.

The analysis results in the RQ1 presented the current status of Cork in the three key topics measured: participation in public issues, digital skills, and access and usage of key infrastructure. The key findings include the need for more engagement venues, methods and opportunities; better access to computers and Wi-Fi, and the positive attitude and willingness of Cork citizens and residents in engaging with public issues. These are the important quantifiable indicators and relevant evidence for local authorities and stakeholders to map out areas of impact for investment planning, policy implications, and deployment programme using the smart city context.

Meanwhile, the RQ2 explained the key verified quantitative results for the digital divide aspect within the boundary coverage of the Cork Smart Gateway. The findings, such as similar levels of digital skills, similar demand for online services and the need for better connection in both areas, provide evidence and insights for the interventions and investments. The quantified insights ensure that the investment in public online services, channels and means for dissemination of reliable information, or a local app will not only be benefiting urban citizens but also the people living in rural areas.

The RQ3 established the youth's profile in terms of their perceptions, volunteer practice, and awareness about public issues while portraying their digital skills and willingness to involve in smart city initiatives. The in-depth analyses about correlations of key variables provided insights on gender-based differences of this group. The combination of exploratory and in-depth profiling of the youth helps policy makers and practitioners who work with this group to better approach, engage, empower, and involve them into public issues that benefit themselves and larger communities that they are a part of. The understanding of this group is crucial because they could play the driving roles in the development of smart cities, especially when they are fluent in digital skills and enabled to practice and master collaborative innovations starting from their own communities.

From the driver seat, the leaders of the Cork Smart Gateway confirmed their similar perceptions about the current situations in citizens/residents engagement. In the RQ4, the leaders presented deep understandings about the starting points and potential barriers of the journey to lead Cork toward a successful Smart Gateway for economic and social

development purposes. They also outlined potential solutions to deal with the current positions with wide awake insights of the potential challenging factors such as limited resources, institutional constraints, and the project scoping exercises, on the way. However, they see the adoption of collaboration, which is a key characteristic of a smart city, and the infusion of ICT solutions into smart city projects as a key to tackling the citizen/resident engagement challenge. The leaders with their necessary tools and understanding will successfully engage, empower, and involve their local residents/citizens in smart city projects. They are pulling the important puzzles, participation of the local residents/citizens together to generate holistic solutions for Cork to move forward sustainably in terms of economy and society.

The CorkCitiEngage itself was an experiment to test the adoption of crowdsourcing method in tasks that require the intensive participation of the local people within a very limited financial resource. In the RQ5, the crowdsourcing method was proved working in the process of forming up the CorkCitiEngage project and the implementation of the data collection. The findings and discussions of this practical research question add an appropriate and cheap method for Cork and other cities to employ their projects in smart city initiatives, which stress and require strong collaboration and co-creation throughout different stages of the projects.

In summary, the five research questions responded to the key components that put Cork on the trajectory to have successful engaged, empowered and involved local citizens/residents in the smart city initiatives. The collective effort of all stakeholders provide Cork with a better chance to become a better place to live for its citizens/residents, investors, and talents.

Chapter 6

ANALYSIS AND CONCLUSIONS

6.1 Analysis

6.1.1 Cork at Baseline

The CorkCitiEngage project findings indicate that there are chances for CGS to map out better engagement strategy to engage and getting local people to participate in the planning, developing and implementing of the initiative, thus ensuring the benefits for involved participants. The followings are the key evidence-based recommendations:

- Harnessing Cork citizens' participation in city future development should be done regularly;
- Using multi-modal citizens' engagement models can be considered for sustained engagement; platforms and frameworks for the models can be designed based on the findings;
- Identifying and nurturing local champions and leaders in locally generated interventions should be considered, especially in energy, environment, health and wellbeing aspects;
- Leveraging the volunteering spirit of the Cork citizens should be part of everyday best practice thus helping them to participate with decision makers in government, academia, and industries;
- Improving hardware and free Wi-Fi in public offices and libraries or key public areas should be considered;
- Up-skilling the digital skills for older or less digitally experienced groups can be done using local volunteers (such as students);
- Creating a Cork smartphone app should be considered as a mechanism for citizen feedback and embedded with attractive incentives for participation;
- Utilising social media networks for pushing information to the citizens and recruiting them for official communication methods.

The results showed that there are chances for innovative use of ICT tools, which foster sustainable city innovation that helps to improve the quality of life of its citizens (Schuurman *et al.,* 2012). The findings also confirmed a strong presence of the collaborative perception (Schuurman *et al.,* 2012) among the Cork citizens. This aspect, if enabled by the presence of ICTs, can allow all relevant stakeholders to become involved in smart city activities on interactive, participatory, and information based arrangements in cities. In the

context of the emergence of new media and ICT performance indicators such as knowledge-based social capital have gained ground compared to the physical outlook and infrastructure of cities.

6.1.1.1 Public Participation

As stated previously, Cork citizens highly valued a shared and collaborative vision of their participation in public issues. They believed that their participation would have a positive impact on making Cork a better place to live. However, there are too few opportunities for the people to participate in local decision making. Based on these inputs, it is important to incorporate new citizen/resident engagement models for sustained engagement. One of such models, for instance, is those community-engaged platforms which bring the best of Cork citizens' experiences in engagement and participation in public issues at local level. There might be a special platform that they could generate, discuss, lead and coordinate for smart city project ideas. The platform could create or enable communities that can sustain themselves, and they too can make interventions that are meaningful and not necessarily all digital. Those involved would learn and accumulate their experience to be local champions and local leaders who could lead interventions that last, starting with areas of their concerns such as energy, environment, health and wellbeing. Both government and local people could come up with ideas that leverage the volunteering spirit that had been demonstrated as a strong practice among local people. Local communities also have their own demands, from the engagements and co-creation processes, there might be business ideas generated with locally connected people and for local people.

6.1.1.2 Digital Skills

Cork citizens are skilful users of email and text. The general public – representative – are confident with their skills in using online services, mobile apps, and social networks. The teenagers and the tech-savvy general public are very skilful with all of the key digital tools and as academic literature proved these groups would learn new skills really fast when they need to. The advanced digital skills of these groups, especially among the teenagers, create a good foundation for e-learning courses in training and education programme. Regarding the social networks, key platforms should be utilized for information dissemination for general public. Each of the popular social networks is more relevant to each of the demographical groups. There should be a short snippet pushed on the platforms to direct

and attract people to involve and register for a more formal method of communications such as email, which the majority of Cork citizens would like to be informed by. Other contact details could include clear data privacy policies for the participating audience.

New programmes targeting teenagers should utilise other social networking platforms including YouTube, Instagram, and Snapchat. The two-step communication method – first through social media for drawing interest and then get them registered – should help sustain engagement with them, together with periodical updates and prompt feedbacks. Digital up-skilling is important, especially for those groups who lack transferable skills but are willing to learn. Experience in other countries shows in the literature (Page 90) that teenagers and school students could spend time at community centres, day care centres, and other settings to help people with computer skills. The teenagers could use the activity as their volunteering commitment or credited working experience meanwhile, the older people could learn in their own comfortable environments.

6.1.1.3 Access and Usage of Public Infrastructure

Cork is considered as an excellent place for lifelong learning and education opportunities for its people. This can be a selling point to attract more young talent to Cork for higher education and to consider growing their career with companies and industries here. The presence of University College Cork and Cork Institute of Technology has a considerable contribution to Cork's learning environment and should be leveraged as part of future collaborations. Cork's residential internet connectivity is good compared to EU average (Cruz-Jesus *et al.,* 2015). Home connections enable most of the people to use the internet at home, and at some places with free Wi-Fi, Cork citizens are willing to use. However, the security issue was not raised as a concern in the questionnaire, therefore, it is might be a security policy consideration when providing this free service for people to use with confidence.

When it comes to public transport, half of the surveyed respondents rated excellent/good services, thus there is room for improvement. Bus and train services do not belong to the local government, however, other community-based services such as sharing a lift or ride on demand could help improve the situation, along with greener and more energy efficient infrastructure development. In those programmes targeting the general public, a mixed modal approach in communicating with them should be appropriate with the relevant

information and be highlighted for their attention. Innovative technology solutions could be used in enhancing safety in public space, in protecting the environment, and in providing people with reliable information whether it is jobs information, health and wellbeing, and education and training opportunities.

6.1.2 Rural versus Urban

The descriptive analysis provided some evidence on the differences between urban and rural respondents in a small city in Europe (pretty high connectivity among OECD, and OECD is a little higher than the world's average). It was a presumption that urban respondents were more engaged and comfortable with the concept of smart city and that they have some technology advantages. The main gaps are in digital skills and access. This work examines those gaps to shed some light on how best to promote sustained citizen engagement.

6.1.2.1 Access

The key analyses were focusing on the access issues with some insights on physical access such as computers, Wi-Fi, public services online and a more 'beyond access' issues including the demands for information and preferred means of communications (Underwood, 2007).

First, the most popular primary source of information for the people in both urban and rural areas is via social media. This was becoming a particularly important channel for the people, thus, the local governments should utilise this channel to push the local information, especially when 65% of the people in Cork responded as Facebook users and other less popular platforms including YouTube and Twitter. In a larger context, governments in the OECD, of which Ireland is a member, have been slowly using social media to engage with the public. Although there are challenges in the government use of social media identified in the OECD report, local governments can still utilise this channel to at least provide the local people with locally relevant information. Both Cork City and County Councils have their Facebook and Twitter accounts. However, the use of those social media tools depends very much on the frequency of the new relevant information and the interactive elements of the tools. As social media are now empowering individuals and organisations in a way that none of the traditional platforms before could do. Thus, being accessed to and having activities on social media is no longer a question of choice for governments, institutions or any other organisations when it comes to engaging with their citizens/residents and clients.

Television, radio, and online newspapers/new resources are only used by less than 50% of the people but they are still an important source of information. Therefore, important information in regard to local development, social welfare, changes in policies that would impact many people should be in those media. Private sectors have been effectively using those channels by providing snippets to direct interest people to their official websites and other repositories. Governments could learn from the private sector's experience rather than running their calls for consultations on certain issues in print ads that are costly and only reach a limited number of people.

Second, in regards to means of communications that people use and prefer to be contacted by the public office, mobile usage is at nearly 70%, followed by email at 53%. The high percentage of the people using mobile phones provides a unique opportunity for the local governments to consider the adoption of mobile government or m-government, a subset of e-government. The m-government platforms enable citizens to access and use the government information and services whenever they want and wherever they are (OECD, 2011; Ahmed, 2006). Cork City has provided a service of weather alert via text message to mobile phones of registered residents/citizens. However, there are many other applications such as reminders to renew licences, tax returns, tax and fee payments, public health alerts, special health care and social welfare schemes, and others.

Most of the people access their emails via their smartphones: therefore, m-government platforms could leverage other smartphone applications to provide people with easy access information and services. The governments could then advance toward a smartphone app that would encompass all m-government services with secure financial transaction protocols, like the banking apps, for the citizens/residents to use at their convenient. In Cork, 77% of the people want to use a smartphone app designed specifically for the local use and the demand should be considered. With the adoption of mobile technologies, governments can support and foster a more connected society for their citizens/residents and business; in return, their clients would help to enhance the government performance with their regular usage and feedbacks on the service delivery.

Third, the physical and invisible access issues are also important to review intensively at both local and national strategies. The overall home usage of Internet is a little lower than the national average, 77.6% on average in Cork versus 85% nationwide. The internet usage is related to the coverage of broadband and mobile phone penetration. While those in the

rural areas responded their Internet use closer to the national level, at 83% versus 85% nationally, the more broadband connectivity, the better people in the areas, given it rural or urban, can leverage the advantages of the information and knowledge economy. Especially, the research found that there are strong links between the availability of connectivity (i.e. broadband, mobile penetration) and rural socio-economic development (Erdiaw-Kwasie and Alam, 2015).

This project also found that the Internet access at public offices was extremely low, 3.4%. This reflects both the current computer/hardware and the Wi-Fi availability in the public offices. Accordingly, there is a strong demand for hardware access, nearly 30% of the people for the access to computer/tablet at public offices, 35% for the access to computer/tablet at public libraries, and 22% for the access to computer/tablet at community centres. Improving the access to hardware and Wi-Fi (connectivity) would help the citizens/residents to engage stronger and use the information for their personal decision making, thus improving their quality of life in the area. The access to online public services is also an important measure for both citizens' participation and service delivery. Over 50% of the people in Cork are obtaining information, downloading forms, submitting completed forms, and making online payments for their property tax, motor tax and the like. While the percentage is somehow reflecting the uptake, 70% of the people are using their mobile phone and there are ways, such as smartphone apps, to leverage those devices to increase the percentage of the people using the public services.

6.1.2.2 Participation

Overall, the people in Cork were willing to participate in public issues and they believed their participation would have a positive impact on their living environment. They did, however, respond that there were too few opportunities for them to do so. The 70% of the respondents in Cork were intended to participate in the surveyed public issues while 63% of them actually volunteered, which was one of the measurements for civic participation (Putnam, 2000). Literature demonstrated that those who intended to participate would have high possibility to actually participate in those activities to which they intended (Carpini *et al.,* 2004). Therefore, the public issues such as efficient use of water or energy could be incorporated in volunteer activities.

Cork has a number of academic, social, and civil organisations which are great nodes for collaborating volunteer initiatives that promote public participation in local issues using different formats of recreational, academic, and community service activities. Also, the access issues (i.e. hardware availability and connectivity) mentioned above can help to facilitate the participation of the people in the civic activities and gradually recruit them for other public activities.

The local app or other e-government or m-government platforms can integrate a dedicated function for the volunteer activities with some forms of rewards and incentives for the participant. Through those activities, local governments can groom the people toward e-participation, helping them to can experience the openness, inclusiveness, and ease of access to the local government. Consequently, local government can ensure that information is not only flowing from the government to the people but also from the people to the governments and among the people themselves (Chun *et al.,* 2012). Furthermore, the research found that a more open and accessible government was a factor that promotes greater e-participation because the people believe they might have an influence on policy-making processes (Macintosh, 2004; Reddick, 2011).

6.1.2.3 Skills

The project analysed the skills in using key digital tools of email, text, mobile apps, online services, and social networks. While the people rated themselves as quite proficient in using those tools, there were gaps between the people in rural and urban areas. It was the people in urban areas who are less skilful than their peers in the rural areas in using those key digital tools. The results from the access and use of public services over the Internet were also consistent; those in the rural use more than their peers in the urban areas and having better skill patterns. The question was framed as an access issue over the Internet rather than skills. However, the people who use those services must have the required skills for using computers/tablets/the Internet, apps, and other applications such as security verification and online payment validations. Thus, the higher percentages of those in the rural areas used the public services online reflected their practical skills.

The other question regarding conditions to help people to better use the public services over the Internet was also framed as an access issue. However, the computer skills assistance was one of the key variables which magnified the specific need of people in urban and rural

areas. Again, it was those in the urban areas who responded higher in this demand than their peers in the rural areas. Also, there are skill gaps among elderly groups, who find it difficult to catch up with the new tools. However, the availability of the smartphone and tablets with their design to provide the seniors with easy access and usage can be considered in upcoming programmes.

The results showed that one of the most sustainable activities for youth and secondary students' engagement is volunteering. For example, the students provide computer and Internet skills to special need groups, senior citizens and those who need digital assistance in urban areas. A few secondary schools in Cork and other civil groups have tried to set up some similar activities for transition year students, who are 15 to 16 years old and are required to have either volunteer or practical experience in their 4th year of secondary school. Those activities are growth opportunities supported by the m-government or e-government platforms. A locally focused social media app which could be dedicated to people and organisations to share their needs and find those who could help, is another example of sustained youth volunteerism.

6.1.3 Youth

The detailed analysis yielded positive results regarding Cork teenagers' digital skills, participation in public issues, and volunteering. The findings showed that the adolescents rated themselves in high scale in key digital tools including social networks, text, online service and mobile apps. There were correlations between those who use email, mobile apps, and social networks with their participation, volunteer, and their self-perceived positive impact in the local level.

Regarding gender differences, female teenagers were strongly correlated with volunteer activities when they use the key digital tools proficiently. Meanwhile, male adolescents were found correlated with public participation when they skilfully use email, text, and mobile apps.

Within the context of how to engage effectively with this special group, data showed that teenagers are willing to engage in public issues; digital tools are a big deal for them; and volunteerism is a big part of their lives. They have a strong motivation for participation but limited opportunities/strong sense volunteering/engagement.

Putting those findings in the context of the newest release of *the National Strategy on Children and Young People's Participation in Decision-Making 2015-2020*, results showed that the adolescents have opinions about and want to be involved in the decision-making process for city development projects. They are willing to volunteer their time and eager to learn. For a Smart city to successfully mature, it must grow from the bottom-up. In other words, today's youth are our energy citizens of tomorrow. Smart Cities need their input.

The youth analysis provided some profile and evidence on who are the teenagers that local government should target, what – participation practice and willingness to involve – to target, where – relevant activities – to target and how – utilising their digital skills and volunteering spirit – to target them. This will help local governments to successfully enforce new action plans in which, the local governments play a key role in involving children and young people directly in planning process for community element of Local Economic and Community Plans and many others.

For a smart city to successfully mature, it must grow from the bottom-up. In other words, today's youth are our tomorrow's citizens and residents who play great roles in workforce, and socio-economic drivers for the city. Smart cities need their input and the earlier the better and as the data shows they saw themselves are willingly to involve now.

6.1.4 Leaders' view

The qualitative analyses reveal that the local leaders and officials are aware of key challenges such as perception of the people in engaging with public issues and authorities, resources, institutional barriers, and key ICT infrastructure and applicable tools in driving CSG forward. Contrary to some literature on citizen engagement (Nabatchi and Farrar, 2011) (Page 79), local leaders and officials welcome the participation of citizens/residents, especially in the development of local solutions that need their local knowledge. The local leaders highlighted their tradition of collaboration with industries, academics and other government agencies, this confirm the literature on local government (Page 47 & 53) they also know that the inputs from local residents/citizens can strengthen the collective development goals of the city.

The leaders also recognise challenges of the local citizens/residents in digital access, skills, and participation, especially with hardware access in public offices and libraries. They plan

to address the challenges by utilising the on-going programmes and embedding the digital access improvement in upcoming initiatives that they can mobilise resources.

The leaders see ICT tools and solutions with great potentials to provide local residents/citizens with easier access to a better quality and quantity of relevant information and public services. Guided by the literature on the e-government implementation (Page 85), improvements of the two councils' websites, e-services and mobile-friendly applications are high on their agenda for upgrades. The leaders are ready to lead CSG forward with good visions of challenges they will encounter with some solution. But above all they are now more open to share authorities and responsibilities, starting with issues that are not requiring institutional changes.

6.1.5 Crowdsourcing

The crowdsourcing approach was demonstrated as a useful strategy for interested local people engage constructively with local government around important infrastructure decisions. The process of local interested experts collaboratively crafting the strategy and implementation plans, by itself, showed a new way of addressing the cost, design, and deployment challenges for effective local engagement. For instance, the informed residents would become more engaged if a relevant tool, such as a local mobile application, is available. They were asked to contribute at the beginning of the SC initiatives, they would tend to keep track on progresses. This motivation would help local authorities to sustain the public involvement not only in SC programmes but also in other public issues.

With the inputs from 3599 respondents in the survey sets, Cork SC initiatives can now plan for the projects that would attract business and residents' participation in their roles as service providers, users, and/or co-managers (LSE, 2015; Nam and Pardo, 2011). This would enable the ideal form co-creation and co-delivery of SC solutions for risk sharing and co-benefitting which the SC initiatives could offer (Breuer, Walravens and Ballon, 2014). While the benefits for Cork and its stakeholders are obvious, the crowdsourcing method generated lessons learned for other cities of similar size, SC oriented, and resource-constrained like Cork. The crowdsourced strategy was at least three times cheaper than the traditional way of contracting the job to service providers. The method was also fast turnaround, high quality, and flexibility (Brabham, 2010). Since it is a crowdsourced strategy, key stakeholders shared financial resources at much smaller portions (Lasrado and

Lugmayr, 2014). This enabled the strategy to move faster than other projects that hit finance thresholds. The strategy identified relevant expertise to utilise at every stage of design, planning and implementation, thus quality of each tasks received multiple professional and experienced eyes.

The employed crowdsourcing had really high flexibility in its deployment such as the recruitment of door-to-door interviewers, incentives, participation of many social and community groups (Estelle-Arolas and de-Guevara, 2012). This has worked particularly well in the data collection stage for the SC initiatives. It enabled local residents to learn about what's involve locally in a near future and to choose how they are going to be a part of it. This large, ambitious and successful project has raised many interesting issues that deserve further discussions. Through its focus on crowdsourcing, this project demonstrates constructive, collaborative and citizen-led methods for participating in decisions around local infrastructure. This stands in contrast with the approach of many cities, which merely attempt to make decisions more acceptable to citizens. It gave the cities options to cope with their current challenges of cost, design and deployment mechanism for this important mission. Leading the crowdsourcing solution, the researcher would be able to share key findings of the surveys, their implications and usages by stakeholders. Lessons about what work and what does not work can be discussed in the stages from designing, planning, and implementing.

The research method was employed in the SC-motivated small city, however, questions remain for the method to be used in other government problem-solving. The crowdsourcing method proved the real values of the collective intelligence and crowd wisdom of experts and general public. It also gave the crowd a chance to validate itself from emerging trend of SC, which facilitates the crowd contributions in many more ways that didn't exist in the past.

While resident engagement and participation appeared to be critical success factors for the SC programmes, crowdsourcing can add as another solution for cities to consider responding to the fundamental question of how to effectively engage with residents and involve them in consultation, feedback, decision-making, and implementation processes.

6.2 Conclusions

6.2.1 Overall

A city is a complexity of systems operating in the triumvirate of economic, social and physical environments. In an emerging literature, cities are now being viewed as interdependent and interconnected entities. Cities are of all shapes, sizes, stages of development, geographical positions, competitive advantages, needs, and aspirations. These features offer possibilities for interdisciplinary research that can both provide a deeper understanding of the smart city concept while creating new paradigms for cities' leaders and stakeholders to understand and apply.

As the smart city literature (Pages 45-46) demonstrates, at the heart of all factors, citizen engagement and participation in the smart city presents a big challenge the development of interdisciplinary. ***This Cork case study is an attempt to move research away from the current predominance of theoretical concepts and test-lab innovations towards a robust, survey-based study, combining demographic groups and quantitative data with qualitative analyses of relevant leadership's views and instruments.*** Quantitatively, the study measured three key factors of public participation, self-report of digital skills, and access and usage of public infrastructure. The gaps from the perceptions to practices of the citizens in engagement in public issues have shed some light on the way forward. This Cork case study is one of the first efforts to tackle the challenges of engaging the people with the initiatives and getting them to participate in the smart city initiatives from very early stages. Like the Smart city itself, the literature shows that deep citizen engagement in Smart Cities is only in its infancy. This study shows some evidence that there are substantial opportunities for interdisciplinary research to stabilise the universal understandings of smart city concepts, find ways of making citizen participation extensive, and enable citizens both to engage with such a process and be the beneficiaries of it.

This study set out to address the overarching research question: ***How can Cork as a medium sized city in Europe effectively engage, empower, and involve its local citizens/residents using smart city initiatives?*** Cork is defined as a medium-sized city in Europe and it faces competitions and magnitude challenges when competing with its capital city and regional cities of similar sizes in EU. As the literature shows in order for Cork to contest in the national, regional and global scales, it has to embrace the innovative ways of doing things.

Smart city offers such opportunities as it is an urban set of instruments for Cork to leverage the limited resources by collaborating with its citizens/residents, academics, industries and business. This research shows that there are tools and mechanism for Cork to do so and some of the tools (i.e. crowdsourcing) has been tested for practicality. Other cities of similar size as Cork can also leverage the methodologies, insights from research findings their implications, and usable tools from this study to apply innovatively in their own context with numerous priorities. While the magnitude may not be in favour for Cork and other similar size cities, they can actually turn this disadvantage into an advantage with a strong collaboration that this research had demonstrated among the two councils, academic institutions, organisations, business and local residents/citizens. The stakeholders' management exercise was under control because there were named parties involved and they were active and engaged. These conditions and the presence of the faced stakeholders rather than emailed or telephoned stakeholders enable Cork and those small and medium-size cities to avoid a serious challenge of communication and collaboration in mega or big cities.

As the literature shows, a city's citizens, residents, and other stakeholders are not always fully empowered to engage in the development of their cities, particularly in the way that smart city initiatives have developed across the world thus far. While greater engagement could be achieved with timely input from citizens, the development of more efficient and effective mechanisms for the collection and analysis of stakeholder feedback is required.

From the Cork at Baseline analyses, a few key elements stood out that could stimulate and maintain the citizens' engagement in smart city initiatives. These include diversified channels and platforms for participation; more volunteering opportunities; generation of concern-based engagement; improved hardware access and free Wi-Fi in libraries and public offices; up-skilling digital skills; and localised city apps. The analyses show that local people already have good intention and collaborative vision and they do care about the city and its future. Perhaps most of all, though, the awareness of the contribution that young people might make to the development of their city through all forms of engagement is the most striking outcome of this study. They will, after all, be the inhabitants and beneficiaries of what today's policy planners create for the future. As a result of this study, Cork has a smart opportunity to become the world leader in engaging its future citizens in the creating of the city that will be theirs.

While a variety of channels and platforms for public participation are available in some form (i.e. PPN, community centres, interest groups, websites, and mobile text service), each population group appears to have its own preferred channels and platform. Findings show the best way to reach the digitally skilful residents/citizens and the youth is via mobile-enabled platforms or local smart phone app. Meanwhile, the seniors are having limited opportunities via those advanced methods. Therefore, day care centres, community centres, shared interest groups are better forums for them. As the literature pointed out, aging population (Page 67) is on the rise, and findings of this research show that the seniors still want to engage and they believe they can share their experience with local authorities for city development. The seniors can contribute, especially in smart city projects that develop healthier living conditions for them. So local governments have to make extra effort to identify how the target groups of population would like to participate. Insights from the Cork at Baseline and its fuller report in the Appendices can provide a starting point for local authorities and relevant stakeholders to refer to.

Volunteering is an important activity for local people, which confirms citizen engagement literature (Page 74) that emphasizes volunteering as one of the important ways to strengthen social capital. Two third of the youth and general population involve in volunteering activities already and this research's findings show reasons (i.e. personal interests and helping others) for their volunteerism and how they can volunteer even more (i.e. available of information and opportunities). Thus, local governments can embed more community activities into the official development programmes to foster people's participation. This is one way to nurture local social capital among people and between the people and local authorities. Volunteering activities can be included as one of the functions in the localised city app for smart phone. During the process of this research and as data became available both Cork City and County have revamped their websites and added new functions for public services while free Wi-Fi and computers have been installed in public areas in their offices for citizens/residents to use. These are the right directions. Another possibility is that, together with better access to ICT tools, the digital skills of certain groups (i.e. seniors and marginalised groups) could be improved by getting the skilful youth involved to offer voluntary help. The availability of a collaborating vision and good intention of the people is there for devising mechanisms to benefit the common good and to connect all participants to public and communal affairs.

As Cork serves both rural and urban populace, the insights from the Rural versus Urban analyses identify drivers in access, digital skill and participation models toward a stronger collaboration between local governments and their citizens/residents using digital tools. As the literature on the digital skill gaps (Page 34 & 67) reveals, digitally challenged groups (i.e. seniors and marginalised groups) can be helped by student volunteers and collaborative initiatives of the other stakeholders.

The insights highlight the people's current practices (i.e. getting forms, paying fees online) in their accessing information and public services while underlining preferences in using different digital tools. As their perceptions about connectivity and hardware access issues were also captured, this can help local government to come up with strategies that harness the advantages and the means of providing people with better tools to use in local areas. The results show pragmatic approaches in leveraging community-based avenues for narrowing gaps in digital skills and access, thus allowing cities and regions to capture the full strength and energy of the places around people. The clear findings on communication styles expected from those groups could be stratified as cities have diverse population groups with a variety of needs and expectations. The smart city with applicable ICT tools can ease the process.

The findings also have some implications for technology application within the smart city agenda, which in turn has implications for the technology diffusion literature even though influences of the attributes may differ substantially across citizen segments. The exploratory data analyses suggested some clear needs of the citizens/residents, and in consequence the government can design and develop systems and applications that truly reflect those needs and goals, whether they can become online or not (Luna-Reyes and Gil-Garcia, 2011).

As already noted, young people are a special group that holds lots of potential in driving any local authority's smart city agenda forward. The quantitative analyses provide some evidence and understandings about this group's perceptions, practices and beliefs in participation in public issues and collaboration. Volunteering is a big deal for this group. It not only helps them to connect with their local setting via involvement in public issues but also to develop necessary social and participation skills. Therefore, it is particularly useful for this group to utilise their proficient digital skills to crowdsource ideas and launch activities among themselves and others. Local social or technology issues may be set as challenges for them to compete with each other, individually or in teams, with an emphasis

placed on those that promote volunteering spirit and usage of technologies and ICT tools. The data show that young people have their own patterns in using digital tools, and within them there are variations between genders. These are worth thorough consideration for empowering young people to be part of the decision-making process, not least through local participation activities and in the development of a Smart city.

The findings show that local leaders are ready to work with citizens/residents, which is a contradiction to some literature (Page 78), and other stakeholders for the shared goals of improving the quality of life and sustainable growth for the city and its surrounding areas. They understand the pressures for Cork to co-produce and co-create solutions that address local issues with local people. They know that by collaborating with people and other local stakeholders, they can play the catalyst role to enable social bonds among those participants. In their leadership role at the beginning of the journey, they voluntarily take on the driving seat responsibility, but they are also ready to step aside when ideas and innovative ideas take place.

While it is true that undertaking design processes that facilitate citizen engagement often involves apparently prohibitive challenges in cost, design and deployment mechanisms, particularly for small cities that have limited resources, crowdsourcing proves to be an effective tool to collectively develop required solutions addressing local challenges. The research findings show that Cork has access to stakeholders including academics, volunteers, civil organisations, and private sector bodies who can come together to collaboratively design and carry out studies to represent local interests, including the deployment of smart city initiatives. The field-work and analyses reported here indicate that a new way of translating crowdsourcing for use in government problem-solving is possible. It was comparatively inexpensive, creative in design, and flexible but collaborative in deployment, yielding multiple positive results including reliable data for project prioritisation and implementation. The Cork approach may yet become an international standard model.

In summary, Cork can leverage the quadruple helix model for innovative collaborations to effectively engage, empower, and involve its local citizens/residents using smart city initiatives. The quadruple helix refers to the strong involvement and collaboration of industry, universities, public authorities – who are the traditional pillars of the model – and the ordinary people. Together these set the new context for smart city development. ICT

tools, a collaborative mindset, local leadership, and multiple communication platforms are important to enable the processes and activities of engaging and collaborating with people and stakeholders. While ICT tools and communication platforms can be developed pretty fast and to specification, a collaborative mindset, the development of this thinking, and practices among local leaders take time to shift and grow. Like all new skills, these need continuous effort by the leaders of the Cork Smart Gateway at first; and then finding out about the benefits of regular outreach; so smart city initiatives set a new context for citizen engagement as the principles of the fourth part of the quadruple helix are both discovered and deployed.

An ideal would be for Cork citizens and residents to participate readily in local issues, whether it is about getting information, sending some feedback, or joining a local project and initiative through enjoying ease of access to relevant information wherever they are, with digitalised access capitalised for the benefits of cheaper dissemination costs and wider reach. Then it might become standard that opportunities and easy ways for people to engage and then participate in the development if their cities, at all levels of encounter, should be available by default. They can then easily contribute their knowledge, time, and effort as they wish and be able to work with others on common interest issues. That way, the cities can utilities a collective resource from people to build and grow the communal habitats called cities. And in that way too cities can function and thrive at their best. As the famous urbanist Jane Jacob put: "cities have the capability of providing something for everybody, only because, and only when, they are created by everybody." (Jacob, 1993).

6.2.2 Contributions, Limitations, and Recommendations for Further Studies

This research contributes to the rare literature that assesses the needs of citizens for the selection of design and implementation of ICT infrastructure in the public sector, and in doing so has demonstrated for the first time in the smart city literature a viable, low-cost, high value means of crowdsourcing citizen's understandings of themselves in their city context. Whereas, the majority of the available assessments have focused on government perspectives and government's perceptions of citizens' needs (Luna-Reyes and Gil-Garcia, 2011), the bottom line is that governments want to have trust from their people now have to earn such trust through being transparent and efficient in their businesses, whether in the policy making process, service delivery or in the openness and availability for people to access easily via popular channels that they actually use. Governments can also use citizens'

voices by collecting and reflecting them to transform the existing government policies or discussing new ones. Such discourse can promote collaborative decision-making processes by including the varied voices of the people at the beginning of new government policies (Chun *et al.,* 2012).

The research has been framed and analysed as a case study, which is a method that has perhaps less validity for generalisation but creates value as a bench-mark. The specific research questions offer an approach towards generating findings and results that could be applicable to many cities because they share many similar underlying challenges. The approaches and tools that were analysed in this thesis can be replicated easily by other cities. Whether the learnings that have arisen here about young people prove to be universal or not, further cross-cultural research will have the opportunity to show. However, the discovery of the potential power and impact of generational differences will, it is hoped, challenge other cities, policy makers and stakeholders to utilise the insights from the findings of this work in considering their own approach to not only the future of their cities but their citizens of the future.

Because the research had a specific focus it may consequentially contain sample bias in the way some survey sets were deployed via online data collection process. Subsequently, the descriptive analyses may represent a specific context-based interest. The surveys were conducted in Cork within the limitations of the boundary constraints of a particular cultural and socio-political context (Venkatesh *et al.,* 2013). Therefore, future research can examine potential those attributes and general drivers across different settings. One of the key themes for future research can be the incorporation of behaviour science in community-based pilot projects for digital participation. Then research can focus on developing and predicting users' intentions towards, use of, and satisfaction with e-government services, general access issues, and other public and local civic activities. This project used these indicators to analyse potential correlations with respect to citizens' engagement in smart city initiatives. It reports comprehensive and large picture results as an effort to provide relevant information for local authorities and stakeholders to map out areas of impact for investment, policy implications, and deployment programmes.

It was observed at the beginning of this thesis that the 'smart city' concept is still in its infancy, and cities world-wide are piloting initiatives according to trial and error methods. As a contribution to the development of a systematic and comparative literature, this thesis

has demonstrated the largest-scale survey-based and quantitative research that exists in the literature to data, and doing so in a low-cost and high value applicable way that may help both Cork as a regional city to make informed decisions as well as enable other cities to take a similar approach. Being of different sizes, shapes, forms, and having different priorities, advantages, and development goals, other cities could take this data as one model for conducting empirical and interdisciplinary research embedded in the operating practices of the day-to-day functioning of a local authority, as Cork has done. So information systems research of this kind would help to inform cities' leaders to adopt smart cities with the least learning costs. And from the information systems domain, future research might to advantage focus on the following:

- Data management and citizens' privacy
- Smart cities' open governance
- Secure information systems
- Local smartphone apps, integration with the existing IT systems
- Gamification-based apps; information systems (IS) for incentivized participation; avatar-based or real identification applications (sensitive issues)
- Ethical issues in adopting image-based and video analytics applications

Citizens, cities' leaders, industries, academics themselves and other stakeholders need to be better empowered through appropriate adoption of evolving digital technologies to improve the quality of their personal lives and local environments, and to co-create stronger involvement in making important local decisions. The smart city journey has just started, and it has opened opportunities for all stakeholders, and not least the academics, to collaborate and co-create shared values and appropriate solutions.

Given the growing number of smart city initiatives that are under deployment world-wide, case studies, empirical and evaluation research can add to the understanding of smart city phenomena. The topic requires many research disciplines to come together for possible learnings and solutions for our cities to thrive. This study has explored previously unchartered territory, both in terms of its method of creating a substantial survey population size and its discovery of the not-yet-enfranchised youth for whom digital engagement offers an opportunity for early-stage citizen engagement and so a new kind of enfranchisement in the interests of their own futures as citizens and in their own city's future.

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APPENDICES

Ethics Approval for CorkCitiEngage

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Long Pham
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IERC – International Energy Research Centre
Tyndall National Institute,
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Cork, Ireland.

Oifig an Leas - Uachtaráin Taighde agus Nuálaíochta
Office of the Vice President for Research and Innovation

Urlár 4, Bloc E,
Áras na hEolaíochta Bia,
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Food Science Building,
University College Cork,
College Road, Cork, Ireland.

T +353 (0)21 4903500
E vpresearch@ucc.ie
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6th October 2015

Dear Long,

Thank you for submitting your research (project entitled: *Cork Citizens/Residents Engagement Baseline Data Collection Project*) to SREC for ethical perusal. I am pleased to say that we see no ethical impediment to your research as proposed and we are happy to grant approval.

We wish you every success in your research.

Yours sincerely,

p.p. Mairéad Mooney

Mike Murphy,
Chair of Social Research Ethics Committee

Professor Anita R. Maguire BSc PhD CChem MRSC
Vice President for Research and Innovation

Ollscoil na hÉireann, Corcaigh
National University of Ireland, Cork

Household Survey Cover Page

HOUSEHOLD SURVEY COVER PAGE*:
INTRODUCTORY GUIDE AND VISIT RECORD

INTERVIEWER NAMES:	Address:

GUIDE

INTRODUCTION: Our names are _____ (Show ID).

PURPOSE: *Give more details on the survey (Introduce yourselves and the survey as above if the respondent is different to the person who answered the door):* We're interested to know your views on citizen engagement and participation in decision making. This is your chance to have a say.

The purpose of this survey is to determine what people think about participation in public issues, digital skills and usage of public infrastructure. This survey is part of an independent evaluation being conducted by the International Energy Research Centre residing in the Tyndall National Institute, UCC. A postcard about this was sent to you last week to let you know of our call in advance.

The survey should take about 15 minutes and you must be over 18 to participate. It is mainly a "tick box" exercise and there will be an opportunity to give more in-depth views in selected open-ended questions.

Do you wish to take part in this survey? YES ☐ NO ☐

If "Yes" you must read the following Data Protection Notice and have the Respondent sign where indicated to acknowledge this.

"Before commencing this survey I am obliged to provide you with the following **Data Protection Notice**"

- Your participation in this survey is **voluntary.**
- Personal data is defined in the Data Protection Acts, 1988 and 2003 (the "DPA") as information that can be used to identify you as an individual.
- The purpose of this survey is to determine what people think about participation in public issues, digital skills and usage of public infrastructure and personal data *may* be collected in the course of your participating in this survey.
- Any / all personal data will be held securely and confidentially and will not be disclosed to any third parties.
- Any/ all personal data collected will be processed in accordance with the DPA. All data collected will be aggregated and will be processed solely to compile the results of this survey. Any/ all identifying elements will be removed and once the results of the survey are compiled any/all personal data will be permanently deleted.
- The results of this survey (not your personal data) will be shared with Cork Smart Gateway, a new economic and social development initiative initiated by Cork City Council, Cork County Council, the Tyndall and CIT.
- Note that you have a right to ask for a copy of any personal data held about you and to have any inaccuracies in such personal data corrected. If you wish to avail of this right, please write to: The Data Protection Officer, University College Cork, Western Road, Cork
- Consent – By signing below, you confirm this data protection notice has been read & explained to you and you consent to the information collected in the course of this survey being processed in the manner set out above.

Signature of Respondent:_____

If the respondent is not available now, ask: Can we fix an appointment for us to call again?

Note of appointment details, day/date and time:

VISIT RECORD (Visit = every attempt made to reach the respondent/household)
Maximum of 5 attempts to reach someone in a house before deciding that you won't call back

Visit No	Date	Time	Q.1) RESULTS OF THE VISIT 1 = Completed questionnaire 2 = Partial questionnaire 3 = Nobody home 4 = Contact with Target Respondent but NO questionnaire completed 5 = Contact with somebody other than Target Respondent 6 = Address is not valid (unoccupied, demolished) 7 = Other (please specify)	Q.2) IF CONTACT BUT NO INTERVIEW (answers 4 & 5 at Q.1) 1 = Appointment made 2 = Refusal 3 = Physically or mentally unable or ill 4 = Language barrier 5 = Left questionnaire with household 6 = Other (please specify)	Q.3) IF REFUSAL (answer 2 at Q.2), *code all that apply* 1 = Bad timing 2 = Not interested 3 = Don't know enough about subject/too difficult for me 4 = Waste of time and/or money 5 = Concerned about privacy 6 = Never do surveys 7 = Other (please specify)
1					
2					
3					
4					
5					

Note of day/date and time to return to collect the questionnaire (Q.2, answer 5):

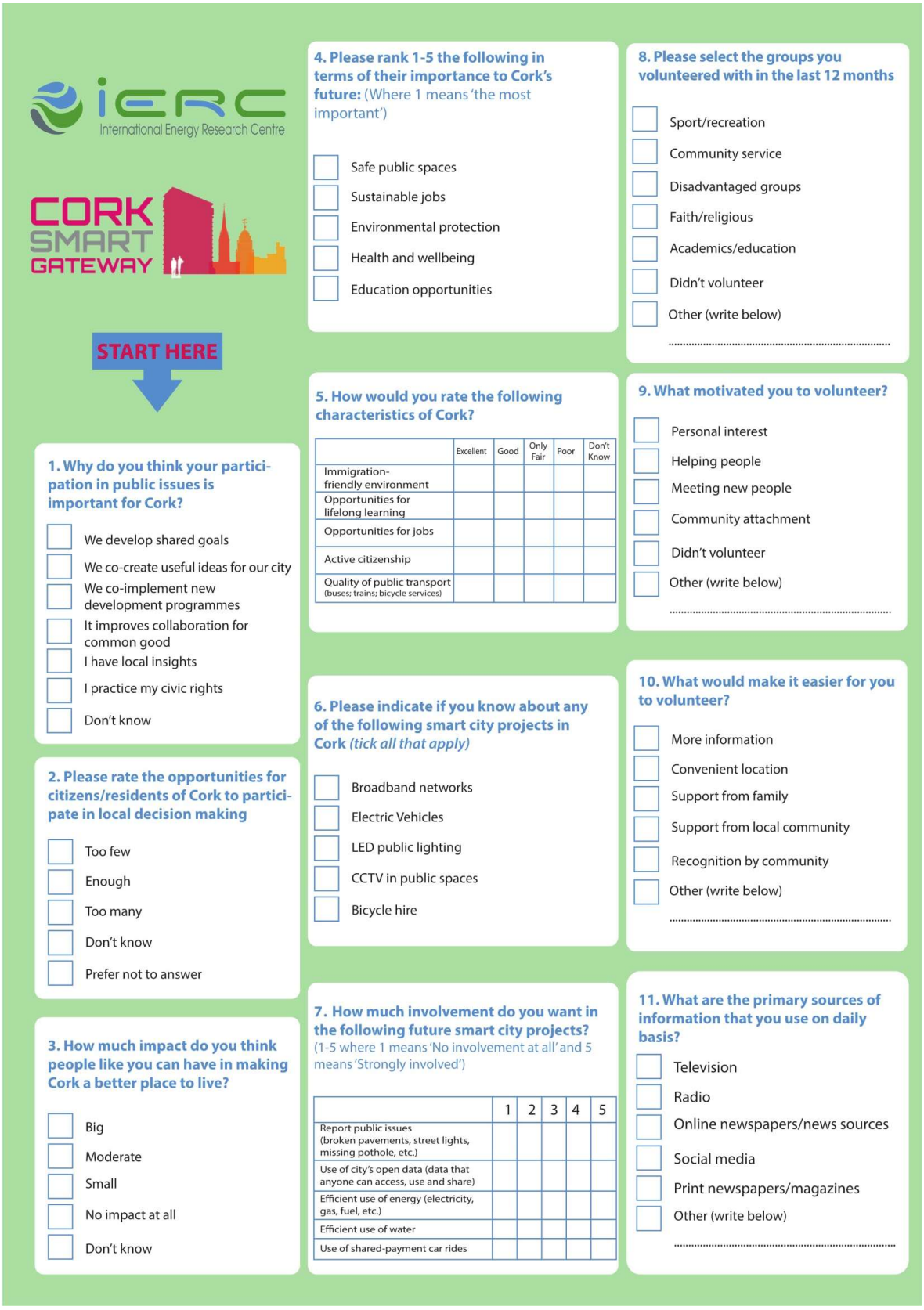
Please also fill:

Did the person whose last birthday it was fill out the questionnaire (tick box if yes) ☐

Did more than one person in the household fill out the questionnaire (tick box if yes) ☐ If yes, how many? ☐

* The Household Survey Cover Page is customised from the UCC/Cork City Council Regeneration Survey, 2015.

Face to face Questionnaires



iERC International Energy Research Centre

CORK SMART GATEWAY

START HERE

1. Why do you think your participation in public issues is important for Cork?

- ☐ We develop shared goals
- ☐ We co-create useful ideas for our city
- ☐ We co-implement new development programmes
- ☐ It improves collaboration for common good
- ☐ I have local insights
- ☐ I practice my civic rights
- ☐ Don't know

2. Please rate the opportunities for citizens/residents of Cork to participate in local decision making

- ☐ Too few
- ☐ Enough
- ☐ Too many
- ☐ Don't know
- ☐ Prefer not to answer

3. How much impact do you think people like you can have in making Cork a better place to live?

- ☐ Big
- ☐ Moderate
- ☐ Small
- ☐ No impact at all
- ☐ Don't know

4. Please rank 1-5 the following in terms of their importance to Cork's future: (Where 1 means 'the most important')

- ☐ Safe public spaces
- ☐ Sustainable jobs
- ☐ Environmental protection
- ☐ Health and wellbeing
- ☐ Education opportunities

5. How would you rate the following characteristics of Cork?

	Excellent	Good	Only Fair	Poor	Don't Know
Immigration-friendly environment					
Opportunities for lifelong learning					
Opportunities for jobs					
Active citizenship					
Quality of public transport (buses; trains; bicycle services)					

6. Please indicate if you know about any of the following smart city projects in Cork *(tick all that apply)*

- ☐ Broadband networks
- ☐ Electric Vehicles
- ☐ LED public lighting
- ☐ CCTV in public spaces
- ☐ Bicycle hire

7. How much involvement do you want in the following future smart city projects? (1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved')

	1	2	3	4	5
Report public issues (broken pavements, street lights, missing pothole, etc.)					
Use of city's open data (data that anyone can access, use and share)					
Efficient use of energy (electricity, gas, fuel, etc.)					
Efficient use of water					
Use of shared-payment car rides					

8. Please select the groups you volunteered with in the last 12 months

- ☐ Sport/recreation
- ☐ Community service
- ☐ Disadvantaged groups
- ☐ Faith/religious
- ☐ Academics/education
- ☐ Didn't volunteer
- ☐ Other (write below)

.....

9. What motivated you to volunteer?

- ☐ Personal interest
- ☐ Helping people
- ☐ Meeting new people
- ☐ Community attachment
- ☐ Didn't volunteer
- ☐ Other (write below)

.....

10. What would make it easier for you to volunteer?

- ☐ More information
- ☐ Convenient location
- ☐ Support from family
- ☐ Support from local community
- ☐ Recognition by community
- ☐ Other (write below)

.....

11. What are the primary sources of information that you use on daily basis?

- ☐ Television
- ☐ Radio
- ☐ Online newspapers/news sources
- ☐ Social media
- ☐ Print newspapers/magazines
- ☐ Other (write below)

.....

12. Which of the below communication methods do you use most often? (select two)

- ☐ Email
- ☐ Mobile phone
- ☐ Land phone
- ☐ Text
- ☐ Post
- ☐ Apps (Viber, Whatsapp, Snapchat)
- ☐ Social networks
- ☐ Other (write below)

.....

13. Please indicate the communication methods you are most comfortable with when public offices contact you (select two)

- ☐ Email
- ☐ Mobile phone
- ☐ Land phone
- ☐ Text
- ☐ Post
- ☐ Apps (Viber, Whatsapp, Snapchat…)
- ☐ Social networks
- ☐ Other (write below)

.....

14. What social media do you use most?

- ☐ Facebook
- ☐ Twitter
- ☐ YouTube
- ☐ LinkedIn
- ☐ Tumblr
- ☐ Instagram
- ☐ Google+
- ☐ Other (write below)

.....

15. Would you use a smartphone app designed specifically for Cork?

- ☐ Yes
- ☐ No

16. Where do you access the Internet most (select two)**?**

- ☐ Anywhere with free Wi-Fi
- ☐ Work
- ☐ Home
- ☐ Public offices
- ☐ Public Transport
- ☐ Other (write below)

.....

17. How do you rate your skills in using the following digital tools?
(Scale 1-5 where 1 is 'Very poor' (need help) and 5 is Very Good (can help others))

	1	2	3	4	5
Email					
Text					
Mobile apps					
On-line services					
Social networks					

18. Please indicate your interaction with public authorities or public services over the Internet for private purposes in the last 12 months
(Select all that apply)

- ☐ Obtain information
- ☐ Download forms
- ☐ Submit completed forms
- ☐ Make online payments (i.e. property tax, motor tax, etc.)
- ☐ Didn't have to

19. What would help you to better use public services over the Internet?

- ☐ Access to computer/ tablet at public libraries
- ☐ Computer skills assistance
- ☐ Access to computer/ tablet at public offices.
- ☐ Access to computer/ tablet at community centres
- ☐ Other (write below)

.....

20. What would be your suggestions for local governments to effectively engage with you? (write below)

.....

.....

.....

.....

.....

21. What is your gender?

- ☐ Male
- ☐ Female

22. When were you born?

23. Country of birth

24. Country of citizenship

25. What is your ethnic or cultural background?

- ☐ White Irish
- ☐ Other White
- ☐ Black or Black Irish
- ☐ Asian or Asian Irish
- ☐ Other (write below)

.....

26. Marital status

- ☐ Single
- ☐ Married
- ☐ Separated
- ☐ Divorced
- ☐ Widowed
- ☐ Partner

27. How long have you lived in Cork?

- ☐ 1-3 years
- ☐ 4-7 years
- ☐ 8-10 years
- ☐ 11-15 years
- ☐ 16-19 years
- ☐ 20+ years

28. Please indicate where you live in Cork

- ☐ City centre
- ☐ Suburbs
- ☐ Commuter towns
- ☐ Rural areas
- ☐ Other (write below)

.....

29. Please indicate your current level of education

- ☐ Primary / Lower secondary
- ☐ Upper secondary & high certificate
- ☐ Apprenticeship / Vocational
- ☐ Third level
- ☐ Post graduate

30. Employment situation

- ☐ At Work
- ☐ Unemployed
- ☐ Student
- ☐ Retired
- ☐ Looking after home/family
- ☐ Unable to work due to sickness or disability

Online Questionnaires

Representative sample

Perceptions

Smart City uses Information and Communications Technology (ICT) to boost economic activity, enhance quality of life, and promote the protection of the environment and natural resources. It does so by collecting relevant data, analysing them, and providing authorities and residents with relevant information and evidence to make informed decisions regarding policies and daily life activities. The Cork Smart Gateway Initiative and the International Energy Research Centre would like to learn about your views on how to deliver a Smart City together effectively, especially in engagement with Cork's citizens/residents like yourselves.
Your participation is very much appreciated. All collected data are anonymous and in aggregated format for the final report.

ELECTRONIC CONSENT:
Please indicate your consent to voluntarily contribute 'Agree'

* 1. Why do you think your participation in public issues is important for Cork?

- [ ] We develop shared goals
- [ ] We co-create useful ideas for our city
- [ ] We co-implement new development programmes
- [ ] It improves collaboration for common good
- [ ] I have local insights
- [ ] I practice my civic rights
- [ ] Don't know

* 2. Please rate the opportunities for citizens/residents of Cork to participate in local decision making:

- ( ) Too few
- ( ) Enough
- ( ) Too many
- ( ) Don't know
- ( ) Prefer not to answer

* 3. How much impact do you think people like you can have in making Cork a better place to live?

- ( ) Big
- ( ) Moderate
- ( ) Small
- ( ) No impact at all
- ( ) Don't know

4. Please rank (1-5) the following in terms of their importance to Cork's future:
(Where 1 means "the most important")

	Safe public spaces
	Sustainable jobs
	Environmental protection
	Health and wellbeing
	Education opportunities

* 5. How would you rate the following characteristics of Cork?

	Excellent	Good	Only Fair	Poor	Don't know
Immigration-friendly environment	○	○	○	○	○
Opportunities for lifelong learning	○	○	○	○	○
Opportunities for jobs	○	○	○	○	○
Active citizenship	○	○	○	○	○
Quality of public transport (buses; trains; bicycle services)	○	○	○	○	○

* 6. Please indicate if you know about any of the following Smart City projects in Cork*(tick all that apply)*?

- ☐ Broadband networks
- ☐ Electric Vehicles
- ☐ LED public lighting
- ☐ CCTV in public spaces
- ☐ Bicycle hire

Engagement Willingness

* 7. How much involvement do you want in the following future Smart City projects?
(1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved')

	1	2	3	4	5
Report public issues (broken pavements, street lights, missing pothole, etc.)	○	○	○	○	○
Use of city's open data	○	○	○	○	○
Efficient use of energy (electricity, gas, fuel, etc.)	○	○	○	○	○
Efficient use of water	○	○	○	○	○
Use of shared-payment car rides	○	○	○	○	○

* 8. Please select the groups you volunteered with in the last 12 months

- ☐ Sport/recreation
- ☐ Community service
- ☐ Disadvantaged groups
- ☐ Faith/religious
- ☐ Academic/education
- ☐ Didn't volunteer
- ☐ Other (please specify)

* 9. What motivated you to volunteer?

- [ ] Personal interest
- [ ] Helping people
- [ ] Meeting new people
- [ ] Community attachment
- [ ] Didn't volunteer
- [ ] Other (please specify)

* 10. What would make it easier for you to volunteer?

- [ ] More information
- [ ] Convenient location
- [ ] Support from family
- [ ] Support from local community
- [ ] Recognition by community
- [ ] Other (please specify)

Your Skills

11. What are the primary sources of information that you use on daily basis?

- [ ] Television
- [ ] Radio
- [ ] Online newspapers/news sources
- [ ] Social media
- [ ] Print newspapers/magazines

* 12. Which of the below communication methods do you use most often? (select two)

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

* 13. Please indicate the communication methods you are most comfortable with when public offices contact you (select two)?

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

* 14. What social media do you use most?

- [ ] Facebook
- [ ] Twitter
- [ ] YouTube
- [ ] LinkedIn
- [ ] Tumblr
- [ ] Instagram
- [ ] Google+
- [ ] Other (please specify)

15. Would you use a smart phone app designed specifically for Cork?

- ◯ Yes
- ◯ No

* 16. Where do you access the Internet most (select two)?

- [ ] Anywhere with free Wifi
- [ ] Work
- [ ] Home
- [ ] Public offices
- [ ] Other (please specify)

* 17. How do you rate your skills in using the following digital tools?
(Scale 1-5 where 1 is 'Very poor' (need help) and 5 is Very Good (can help others))

	1	2	3	4	5
Email	◯	◯	◯	◯	◯
Text	◯	◯	◯	◯	◯
Mobile apps	◯	◯	◯	◯	◯
On-line services	◯	◯	◯	◯	◯
Social networks	◯	◯	◯	◯	◯

* 18. Please indicate your interaction with public authorities or public services over the Internet for private purposes in the last 12 months (Select all that apply)

- [ ] Obtain information
- [ ] Download forms
- [ ] Submit completed forms
- [ ] Make online payments (i.e property tax, motor tax etc.)
- [ ] Didn't have to

* 19. What would help you to better use public services over the Internet?

- [ ] Access to computer/tablet at public libraries
- [ ] Computer skills assistance
- [ ] Access to computer/tablet at public offices
- [ ] Access to computer/tablet at community centres
- [ ] Other (please specify)

20. What would be your suggestions for local governments to effectively engage with you? (Open-ended question, answers within 50 words)

About You

* 21. What is your gender?

- Male
- Female

* 22. When were you born?

* 23. Country of birth

* 24. Country of citizenship

* 25. What is your ethnic or cultural background?

- White Irish
- Other White
- Black or Black Irish
- Asian or Asian Irish
- Other (please specify)

* 26. Marital status

- ◯ Single
- ◯ Married
- ◯ Separated
- ◯ Divorced
- ◯ Widowed
- ◯ Partner

* 27. How long have you lived in Cork?

- ◯ 1-3 years
- ◯ 4-7 years
- ◯ 8-10 years
- ◯ 11-15 years
- ◯ 16-19 years
- ◯ 20+ years

* 28. Please indicate where you live in Cork

- ◯ City centre
- ◯ Suburbs
- ◯ Commuter towns
- ◯ Rural areas
- ◯ Other (please specify)

* 29. Please indicate your current level of education

- ◯ Primary/lower secondary
- ◯ Upper secondary & high certificate
- ◯ Apprenticeship/Vocational
- ◯ Third level primary
- ◯ Postgraduate

* 30. Employment situation

- ◯ At Work
- ◯ Unemployed
- ◯ Student
- ◯ Retired
- ◯ Looking after home/family
- ◯ Unable to work due to sickness or disability

Non-Representative sample

Perceptions

Smart Gateway* uses Information and Communications Technology (ICT) to boost economic activity, enhance quality of life, and promote the protection of the environment and natural resources. It does so by collecting relevant data, analysing them, and providing authorities and residents with relevant information and evidence to make informed decisions regarding policies and daily life activities.

The Cork Smart Gateway Initiative and the International Energy Research Centre would like to learn about YOUR VIEWS on how to deliver a Smart Gateway together effectively. The survey 'Have Your Say' will collect people's opinions regarding participation in public issues, digital skills and usage of public infrastructure. The study is an important one that will have a vital role in assessing Cork citizens/residents perceptions of citizens/residents engagement and participation in decision making.

Your participation is very much appreciated. All collected data are anonymous and in aggregated format for the final report. You can stop taking the survey at any time if you wish to do so. Participants have a chance of winning a mini iPad if they complete the survey.

ELECTRONIC CONSENT:
Please indicate your consent to voluntarily contribute by continue with the survey.

**The Cork Smart Gateway initiative is being driven by Cork City Council, Cork County Council, Nimbus Research Centre and Tyndall National Institute. The Cork Smart Gateway aims to establish Cork as an attractive place to live, work and visit by applying smart solutions and utilising best in class technologies to drive economic growth, improve public services and promote better engagement between residents, visitors and the Local Authorities.*

* 1. Why do you think your participation in public issues is important for Cork?

- ☐ We develop shared goals
- ☐ We co-create useful ideas for our city
- ☐ We co-implement new development programmes
- ☐ It improves collaboration for common good
- ☐ I have local insights
- ☐ I practice my civic rights
- ☐ Don't know

* 2. Please rate the opportunities for citizens/residents of Cork to participate in local decision making?

- ○ Too few
- ○ Enough
- ○ Too many
- ○ Don't know
- ○ Prefer not to answer

* 3. How much impact do you think people like you can have in making Cork a better place to live?

- ◯ Big
- ◯ Moderate
- ◯ Small
- ◯ No impact at all
- ◯ Don't know

4. Please rank the following (1-5) in terms of their importance to Cork's future:
(Where 1 means "the most important")

- ☐ Safe public spaces
- ☐ Sustainable jobs
- ☐ Environmental protection
- ☐ Health and wellbeing
- ☐ Education opportunities

* 5. How would you rate the following characteristics of Cork?

	Excellent	Good	Only Fair	Poor	Don't know
Immigration-friendly environment	◯	◯	◯	◯	◯
Opportunities for lifelong learning	◯	◯	◯	◯	◯
Opportunities for jobs	◯	◯	◯	◯	◯
Active citizenship	◯	◯	◯	◯	◯
Quality of public transport (buses; trains; bicycle services)	◯	◯	◯	◯	◯

* 6. Please indicate if you know about any of the following Smart City projects in Cork (tick all that apply)?

- ☐ Broadband networks
- ☐ Electric Vehicles
- ☐ LED public lighting
- ☐ CCTV in public spaces
- ☐ Bicycle hire

Engagement Willingness

* 7. How much involvement do you want in the following future Smart City projects?
(1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved')

	1	2	3	4	5
Report public issues (broken pavements, street lights, missing pothole, etc.)	○	○	○	○	○
Use of city's open data	○	○	○	○	○
Efficient use of energy (electricity, gas, fuel, etc.)	○	○	○	○	○
Efficient use of water	○	○	○	○	○
Use of shared-payment car rides	○	○	○	○	○

* 8. Please select the groups you volunteered with in the last 12 months

- ☐ Sport/recreation
- ☐ Community service
- ☐ Disadvantaged Groups
- ☐ Faith/religious
- ☐ Academic
- ☐ Didn't volunteer
- ☐ Other (please specify)

* 9. What motivated you to volunteer?

- [ ] Personal interest
- [ ] Helping people
- [ ] Meeting new people
- [ ] Community attachment
- [ ] Didn't volunteer
- [ ] Other (please specify)

* 10. What would make it easier for you to volunteer?

- [ ] More information
- [ ] Convenient location
- [ ] Support from family
- [ ] Support from local community
- [ ] Recognition by community
- [ ] Other (please specify)

Skills

11. What are the primary sources of information that you use on daily basis

- [ ] Television
- [ ] Radio
- [ ] Online newspapers/news sources
- [ ] Social media
- [ ] Print newspapers/magazines

* 12. Which of the below communication methods do you use most often? (select two)

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

* 13. Please indicate the communication methods you are most comfortable with when public offices contact you (select two)?

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

* 14. What social media do you use most?

- [ ] Facebook
- [ ] Twitter
- [ ] YouTube
- [ ] LinkedIn
- [ ] Tumblr
- [ ] Instagram
- [ ] Google+
- [ ] Other (please specify)

15. Would you use a smartphone app designed specifically for Cork?

- ◯ Yes
- ◯ No

* 16. Where do you access the Internet most (select two)?

- [ ] Anywhere with free Wifi
- [ ] Work
- [ ] Home
- [ ] Public offices
- [ ] Other (please specify)

* 17. How do you rate your skills in using the following digital tools?
(Scale 1-5 where 1 is 'Very poor' (need help) and 5 is Very Good (can help others))

	1	2	3	4	5
Email	◯	◯	◯	◯	◯
Text	◯	◯	◯	◯	◯
Mobile apps	◯	◯	◯	◯	◯
On-line services	◯	◯	◯	◯	◯
Social networks	◯	◯	◯	◯	◯

* 18. Please indicate your interaction with public authorities or public services over the Internet for private purposes in the last 12 months (Select all that apply)

- [ ] Obtain information
- [ ] Download forms
- [ ] Submit completed forms
- [ ] Make online payments (i.e property tax, motor tax etc.)
- [ ] Didn't have to

* 19. What would help you to better use public services over the Internet?

- [ ] Access to computer/tablet at public libraries
- [ ] Computer skills assistance
- [ ] Access to computer/tablet at public offices.
- [ ] Access to computer/tablet at community centres
- [ ] Other (please specify)

20. What would be your suggestions for local governments to effectively engage with you? (Open-ended question, answers within 50 words)

About You

* 21. What is your gender?

- Male
- Female

* 22. When were you born?

* 23. Country of birth

* 24. Country of citizenship

* 25. What is your ethnic or cultural background?

- White Irish
- Other White
- Black or Black Irish
- Asian or Asian Irish
- Other (please specify)

26. Marital Status

- Single
- Married
- Separated
- Divorced
- Widowed
- Partner

* 27. How long have you lived in Cork?

- ◯ 1-3 years
- ◯ 4-7 years
- ◯ 8-10 years
- ◯ 11-15 years
- ◯ 16-19 years
- ◯ 20+ years

* 28. Please indicate where you live in Cork

- ◯ City centre
- ◯ Suburbs
- ◯ Commuter towns
- ◯ Rural areas
- ◯ Other (please specify)

* 29. Please indicate your current level of education

- ◯ Primary/lower secondary
- ◯ Upper secondary & high certificate
- ◯ Apprenticeship/Vocational
- ◯ Third level primary
- ◯ Postgraduate

* 30. Employment situation

- ◯ At Work
- ◯ Unemployed
- ◯ Student
- ◯ Retired
- ◯ Looking after home/family
- ◯ Unable to work due to sickness or disability

Seniors

Perceptions

Smart City uses Information and Communications Technology (ICT) to boost economic activity, enhance quality of life, and promote the protection of the environment and natural resources. It does so by collecting relevant data, analysing them, and providing authorities and residents with relevant information and evidence to make informed decisions regarding policies and daily life activities. The Cork Smart Gateway Initiative and the International Energy Research Centre would like to learn about your views on how to deliver a Smart City together effectively, especially in engagement with Cork's citizens/residents like yourselves.
Your participation is very much appreciated. All collected data are anonymous and in aggregated format for the final report.

ELECTRONIC CONSENT:
Please indicate your consent to voluntarily contribute 'Agree'

1. Why do you think your participation in public issues is important for Cork?

- [ ] We develop shared goals
- [ ] We co-create useful ideas for our city
- [ ] We co-implement new development programmes
- [ ] It improves collaboration for common good
- [ ] I have local insights
- [ ] I practice my civic rights
- [ ] Don't know

2. Please rate the opportunities for citizens/residents of Cork to participate in local decision making?

- ( ) Too few
- ( ) Enough
- ( ) Too many
- ( ) Don't know
- ( ) Prefer not to answer

3. How much impact do you think people like you can have in making Cork a better place to live?

- ( ) Big
- ( ) Moderate
- ( ) Small
- ( ) No impact at all
- ( ) Don't know

4. Please rank the following (1-5) in terms of their importance to Cork's future:
(Where 1 means "the most important")

	Safe public spaces
	Sustainable jobs
	Environmental protection
	Health and wellbeing
	Education opportunities

5. How would you rate the following characteristics of Cork?

	Excellent	Good	Only Fair	Poor	Don't know
Immigration-friendly environment	○	○	○	○	○
Opportunities for lifelong learning	○	○	○	○	○
Opportunities for jobs	○	○	○	○	○
Active citizenship	○	○	○	○	○
Quality of public transport (buses; trains; bicycle services)	○	○	○	○	○

6. Please indicate if you know about any of the following Smart City projects in Cork (tick all that apply)?

- ☐ Broadband networks
- ☐ Electric Vehicles
- ☐ LED public lighting
- ☐ CCTV in public spaces
- ☐ Bicycle hire

Engagement Willingness

7. How much involvement do you want in the following future Smart City projects?
(1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved')

	1	2	3	4	5
Report public issues (broken pavements, street lights, missing pothole, etc.)	○	○	○	○	○
Use of city's open data	○	○	○	○	○
Efficient use of energy (electricity, gas, fuel, etc.)	○	○	○	○	○
Efficient use of water	○	○	○	○	○
Use of shared-payment car rides	○	○	○	○	○

8. Please select the groups you volunteered with in the last 12 months

- ☐ Sport/recreation
- ☐ Community service
- ☐ Disadvantaged Groups
- ☐ Faith/religious
- ☐ Academic
- ☐ Didn't volunteer
- ☐ Other (please specify)

9. What motivated you to volunteer?

- [ ] Personal interest
- [ ] Helping people
- [ ] Meeting new people
- [ ] Community attachment
- [ ] Didn't volunteer
- [ ] Other (please specify)

10. What would make it easier for you to volunteer?

- [ ] More information
- [ ] Convenient location
- [ ] Support from family
- [ ] Support from local community
- [ ] Recognition by community
- [ ] Other (please specify)

Skills

11. What are the primary sources of information that you use on daily basis?

- [ ] Television
- [ ] Radio
- [ ] Online newspapers/news sources
- [ ] Social media
- [ ] Print newspapers/magazines

12. Which of the below communication methods do you use most often? (select two)

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

13. Please indicate the communication methods you are most comfortable with when public offices contact you (select two)?

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

14. What social media do you use most?

- [ ] Facebook
- [ ] Twitter
- [ ] YouTube
- [ ] LinkedIn
- [ ] Tumblr
- [ ] Instagram
- [ ] Google+
- [ ] Other (please specify)

15. Would you use a smartphone app designed specifically for Cork?

- ( ) Yes
- ( ) No

16. Where do you access the Internet most (select two)?

- [ ] Anywhere with free Wifi
- [ ] Work
- [ ] Home
- [ ] Public offices
- [ ] Public transport
- [ ] Other (please specify)

17. How do you rate your skills in using the following digital tools?
(Scale 1-5 where 1 is 'Very poor' (need help) and 5 is Very Good (can help others))

	1	2	3	4	5
Email	( )	( )	( )	( )	( )
Text	( )	( )	( )	( )	( )
Mobile apps	( )	( )	( )	( )	( )
On-line services	( )	( )	( )	( )	( )
Social networks	( )	( )	( )	( )	( )

18. Please indicate your interaction with public authorities or public services over the Internet for private purposes in the last 12 months (Select all that apply)

- [ ] Obtain information
- [ ] Download forms
- [ ] Submit completed forms
- [ ] Make online payments (i.e property tax, motor tax etc.)
- [ ] Didn't have to

19. What would help you to better use public services over the Internet?

- [ ] Access to computer/tablet at public libraries
- [ ] Computer skills assistance
- [ ] Access to computer/tablet at public offices.
- [ ] Access to computer/tablet at community centres
- [ ] Other (please specify)

20. What would be your suggestions for local governments to effectively engage with you? (Open-ended question, answers within 50 words)

About You

* 21. What is your gender?

- Male
- Female

* 22. When were you born?

* 23. Country of birth

* 24. Country of citizenship

* 25. What is your ethnic or cultural background?

- White Irish
- Other White
- Black or Black Irish
- Asian or Asian Irish
- Other (please specify)

26. Marital Status

- Single
- Married
- Separated
- Divorced
- Widowed
- Partner

* 27. How long have you lived in Cork?

- ◯ 1-3 years
- ◯ 4-7 years
- ◯ 8-10 years
- ◯ 11-15 years
- ◯ 16-19 years
- ◯ 20+ years

* 28. Please indicate where you live in Cork

- ◯ City centre
- ◯ Suburbs
- ◯ Commuter towns
- ◯ Rural areas
- ◯ Other (please specify)

* 29. Please indicate your current level of education

- ◯ Primary/lower secondary
- ◯ Upper secondary & high certificate
- ◯ Apprenticeship/Vocational
- ◯ Third level primary
- ◯ Postgraduate

* 30. Employment situation

- ◯ At Work
- ◯ Unemployed
- ◯ Student
- ◯ Retired
- ◯ Looking after home/family
- ◯ Unable to work due to sickness or disability

Youth

About You

Smart City uses Information and Communications Technology (ICT) to boost economic activity, enhance quality of life, and promote the protection of the environment and natural resources. It does so by collecting relevant data, analysing them, and providing authorities and residents with relevant information and evidence to make informed decisions regarding policies and daily life activities. The Cork Smart Gateway Initiative and the International Energy Research Centre would like to learn about your views on how to deliver a Smart City together effectively, especially in engagement with Cork's youth like yourselves.
Your participation is very much appreciated. All collected data are anonymous and in aggregated format for the final report. You can stop taking the survey at any time if you wish to do so.

ELECTRONIC CONSENT:
Please indicate your consent to voluntarily contribute 'Agree'

* 1. How long have you lived in Cork?

- ◯ Less than a year
- ◯ 1-3 years
- ◯ 4-7 years
- ◯ 8-10 years
- ◯ 11-15 years
- ◯ 16-18 years

* 2. Please indicate where you live in Cork:

- ◯ City centre
- ◯ Suburbs
- ◯ Commuter towns
- ◯ Rural areas
- ◯ Other (please specify)

* 3. What is your home country?

* 4. What is your ethnic or cultural background?

- ◯ White Irish
- ◯ Other White
- ◯ Black or Black Irish
- ◯ Asian or Asian Irish
- ◯ Other (please specify)

* 5. Please indicate your current level of education

- ◯ Vocational training
- ◯ 4th year
- ◯ 5th year
- ◯ 6th year
- ◯ Other (please specify)

* 6. When were you born?

- ◯ 1997
- ◯ 1998
- ◯ 1999
- ◯ 2000

* 7. What is your gender?

- ◯ Male
- ◯ Female

* 8. In what three words would you describe yourself? (open-ended question)
(E.g. sport, musical, political, travel, cultural characteristics or preferences)

Cork and its future

* 9. Why do you think your participation in public issues is important for Cork?

- [ ] We develop shared goals
- [ ] We co-create useful ideas for our city
- [ ] We co-implement new development programmes
- [ ] It improves collaboration for common good
- [ ] I have local insights
- [ ] I practice my civic rights
- [ ] Don't know

* 10. Please rate the opportunities for young people in Cork to participate in local decision making?

- ( ) Too few
- ( ) Enough
- ( ) Too many
- ( ) Don't know
- ( ) Prefer not to answer

* 11. How much impact do you think young people like you can have in making Cork a better place to live?

- ( ) Big
- ( ) Moderate
- ( ) Small
- ( ) No impact at all
- ( ) Don't know

* 12. Please rank the following in terms of their importance to Cork's future
Where 1 means "the most important"

	Safe public spaces
	Sustainable job
	Environmental protection
	Health and wellbeing
	Education opportunities
	Don't know

* 13. How would you rate the following characteristics of Cork?

	Excellent	Good	Only Fair	Poor	Don't know
Immigration-friendly environment	○	○	○	○	○
Opportunity for lifelong learning	○	○	○	○	○
Opportunity for jobs	○	○	○	○	○
Active citizenship	○	○	○	○	○
Quality of public transport (buses; trains; bicycle services	○	○	○	○	○

Participation Willingness & Skills

* 14. Please indicate if you have heard about any of the following Smart City projects in Cork (tick all that apply)

- [ ] Broadband networks
- [ ] Electric Vehicles
- [ ] LED public lighting
- [ ] CCTV in public spaces
- [ ] Bicycle hire

* 15. How much involvement do you want in the following future Smart City projects?
(1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved')

	Strongly involved (5)	4	3	2	No involvement at all (1)
Report public issues (broken pavements, street lights, missing pothole, etc.)	○	○	○	○	○
Use of city's open data	○	○	○	○	○
Efficient use of energy (electricity, gas, fuel, etc.)	○	○	○	○	○
Efficient use of water	○	○	○	○	○
Use of shared-payment car rides	○	○	○	○	○

* 16. Please select the groups you voluntarily participated with in the last 12 months

- [ ] Sport/recreation
- [ ] Community service
- [ ] Disadvantaged people
- [ ] Faith/religious
- [ ] Academic
- [ ] Didn't volunteer
- [ ] Other (please specify)

* 17. What motivated you to volunteer?

- [ ] Personal interest
- [ ] Helping people
- [ ] Meeting new people
- [ ] Community attachment
- [ ] Didn't volunteer
- [ ] Other (please specify)

18. What are the primary sources of information that you use on daily basis?

- ( ) Television
- ( ) Social media
- ( ) Radio
- ( ) Online newspapers/news sources
- ( ) Print newspapers/magazines
- ( ) Other (please specify)

* 19. Which of the below communication methods do you use most often?

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

* 20. What social media do you use most? (select two)

- [ ] Facebook
- [ ] Twitter
- [ ] YouTube
- [ ] LinkedIn
- [ ] Tumblr
- [ ] Instagram
- [ ] Google+
- [ ] Other (please specify)

* 21. Please indicate the communication methods you are most comfortable with when public offices contact you (select two)

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat...)
- [ ] Social networks
- [ ] Other (please specify)

22. Would you use a smartphone app designed specifically for Cork?

- ( ) Yes
- ( ) No

* 23. Where do you access the Internet most (select two)?

- [ ] Anywhere with free Wifi
- [ ] School
- [ ] Home
- [ ] Public transport
- [ ] Public library
- [ ] Other (please specify)

* 24. How do you rate your skills in using the following digital tools?
(Scale 1-5 where 1 is 'Very poor' (need help) and 5 is Very Good (can help others))

	1	2	3	4	5
Email	○	○	○	○	○
Text	○	○	○	○	○
Mobile apps	○	○	○	○	○
On-line services	○	○	○	○	○
Social networks	○	○	○	○	○

* 25. What would be your suggestions for local governments to effectively contact you? (Open-ended Question, answers within 50 words)

Officials

Introduction

Smart City uses Information and Communications Technology (ICT) to boost economic activity, enhance quality of life, and promote the protection of the environment and natural resources. It does so by collecting relevant data, analyse them, and provide authorities and residents with relevant information and evidences to make informed decisions regarding policies and daily life activities.

The Cork Smart Gateway Initiative and the International Energy Research Centre would like to learn your views about how to deliver a Smart City together effectively, especially in your engagement with Cork citizens/residents.

Your participation is very much appreciated. All collected data are anonymous and in aggregated format for the final report.

ELECTRONIC CONSENT:
Please indicate your consent to voluntarily contribute 'Agree'

Cork and its Future

* 1. How would you rate the following characteristics of Cork?

	Excellent	Good	Only Fair	Poor	Don't know
Quality of public transport (buses; trains; bicycle services)	○	○	○	○	○
Opportunities for jobs	○	○	○	○	○
Opportunities for lifelong learning	○	○	○	○	○
Active citizenship	○	○	○	○	○
Immigration-friendly environment	○	○	○	○	○

* 2. Please rank the following in terms of their importance to Cork's future:
(Where 1 means 'the most important')

- [ ] Safe public spaces
- [ ] Sustainable jobs
- [ ] Environmental protection
- [ ] Health and wellbeing
- [ ] Education opportunities
- [ ] Don't know

Perceptions on Citizens/Residents engagement

* 3. What, in your opinion, is the primary driver of Citizens/Residents engagement with local authorities?

- [ ] EU policy
- [ ] National policy
- [ ] CCC senior management
- [ ] CCC middle management
- [ ] Citizens/residents
- [ ] Community organisations
- [ ] Other (please specify)

* 4. Do you think Citizens/Residents engagement with local authorities is important for Cork? If yes, why?

- [ ] We develop shared goals
- [ ] We co-create useful ideas for our city
- [ ] We co-implement new development programmes
- [ ] It improves collaboration for common good
- [ ] Citizens/Residents have local insights
- [ ] Citizens/residents practice civic rights
- [ ] Don't know

* 5. How would you rate your practice in Citizens/Residents engagement as a local government official?

- ( ) Less than I would like
- ( ) Sufficient
- ( ) More than necessary
- ( ) Don't know
- ( ) Prefer not to answer
- ( ) Don't have to

* 6. As a local government official, how do you rate the opportunities for Cork Citizens/Residents to participate in local decision making?

- ○ Too few
- ○ Enough
- ○ Too many
- ○ Don't know
- ○ Prefer not to answer

* 7. What would make it easier for you to get more involved with Citizens/Residents engagement in the course of your work at CCC? (select two)

- ☐ More free time
- ☐ More information
- ☐ Fewer commitments
- ☐ Payment of expenses
- ☐ More convenient location
- ☐ Support from line manager
- ☐ Engagement as part of my work program
- ☐ N/A

* 8. Please rate the extent to which you perceive the following to be barriers to citizens/residents engagement

- ☐ Awareness
- ☐ Lack of a culture of involvement by citizens
- ☐ Information
- ☐ Opportunities
- ☐ Time
- ☐ Support from colleagues
- ☐ Resources
- ☐ Recognition by employer

Your role and Citizens/Residents engagement

* 9. Which of the following best describes the nature of your role within CCC?

- ◯ Management only
- ◯ Management with citizens/residents facing
- ◯ Administration only
- ◯ Administration with citizens/residents facing
- ◯ Support only
- ◯ Support with citizens/residents facing
- ◯ Other (please specify)

* 10. In your role as a local government official, what has been the focus of your activity in engaging with Citizens/Residents? (Select all that apply)

- ☐ Disseminating policies
- ☐ Gathering information/consultation
- ☐ Responding to requests
- ☐ Going through administration procedures
- ☐ Providing policy consultation
- ☐ Other (please specify)

* 11. From your perspective as a Council Official, how much impact do you think people can have in making Cork a better place to live?

- ◯ Big
- ◯ Moderate
- ◯ Small
- ◯ No impact at all

* 12. Please indicate communication methods you are most comfortable with when engaging with Citizens/Residents (select two)

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat…)
- [ ] Social networks
- [ ] Other (please specify)

* 13. Personally and at work, which of the below communication methods do you use most often?

- [ ] Email
- [ ] Mobile phone
- [ ] Land phone
- [ ] Text
- [ ] Post
- [ ] Apps (Viber, Whatsapp, Snapchat…)
- [ ] Social networks
- [ ] Other (please specify)

* 14. Please indicate your current employment status within CCC

- ( ) Full-time permanent
- ( ) Part-time permanent
- ( ) Full-time contract
- ( ) Part-time contract
- ( ) Fixed term contract
- ( ) Other (please specify)

* 15. How long have you worked in local government?

- 1-3 years
- 4-7 years
- 8-10 years
- 11-15 years
- 16-19 years
- 20+ years

About You

* 16. Personally, how active are you as participative Citizen/Resident?

- ◯ Highly active
- ◯ Moderately active
- ◯ Active when I see real need
- ◯ No active at all
- ◯ Don't know

* 17. Personally, how much involvement would you like to have in the following future Smart City projects? (1-5 where 1 means 'No involvement at all' and 5 means 'Strongly involved')

	1	2	3	4	5
Reporting public issues (broken pavements, street lights, missing pothole, etc.)	◯	◯	◯	◯	◯
Use of city's open data	◯	◯	◯	◯	◯
More efficient use of energy (electricity, gas, fuel, etc.)	◯	◯	◯	◯	◯
More efficient use of water	◯	◯	◯	◯	◯
Use of shared-payment car rides	◯	◯	◯	◯	◯

* 18. Please indicate if you have heard of any of the following Smart City projects in Cork (tick all that apply)

- ☐ Broadband networks
- ☐ Electric Vehicles
- ☐ LED public lighting
- ☐ CCTV in public spaces
- ☐ Bicycle hire

* 19. Please select the groups you have volunteered with in the last 12 months:

- [ ] Sport/recreation
- [ ] Activities for my own community
- [ ] Disadvantaged people
- [ ] Faith/religious
- [ ] Education
- [ ] Didn't volunteer
- [ ] Other (please specify)

* 20. What motivated you to volunteer?

- [ ] Personal interest
- [ ] Helping people
- [ ] Meeting new people
- [ ] Community attachment
- [ ] Didn't volunteer
- [ ] Other (please specify)

* 21. What would make it easier for you to volunteer?

22. What are the primary sources of information that you use on daily basis?

- ( ) Television
- ( ) Radio
- ( ) Online newspapers/sources
- ( ) Social media
- ( ) Print newspapers/magazine
- ( ) Other (please specify)

* 23. What social media do you use most?

- [ ] Facebook
- [ ] Twitter
- [ ] YouTube
- [ ] LinkedIn
- [ ] Tumblr
- [ ] Instagram
- [ ] Google+
- [ ] Other (please specify)

24. Would you use a smartphone app designed specifically for Cork?

- ( ) Yes
- ( ) No

* 25. What is your gender?

- ( ) Male
- ( ) Female

* 26. To which age group do you belong?

- ( ) 18-24
- ( ) 25-30
- ( ) 31-35
- ( ) 36-40
- ( ) 41-45
- ( ) 46-50
- ( ) 51-55
- ( ) 56-60
- ( ) 61+

* 27. Please indicate your highest level of education

- ◯ Upper secondary
- ◯ High certificate
- ◯ Apprenticeship/Vocational
- ◯ Bachelor Degree
- ◯ Postgraduate

* 28. Please indicate where you live in Cork

- ◯ City centre
- ◯ Suburbs
- ◯ Commuter towns
- ◯ Rural areas
- ◯ Other (please specify)

* 29. How long have you lived in Cork?

- ◯ 1-3 years
- ◯ 4-7 years
- ◯ 8-10 years
- ◯ 11-15 years
- ◯ 16-19 years
- ◯ 20+ years

Semi-Structure Interview Questionnaire

Questions for semi-structured interview for Long Pham's PhD research

Topic: Successful Citizens/Residents Engagement in Cork Smart Gateway

Audience: Movers and shakers of the Cork Smart Gateway

Time: Appx 1 hour

1. What do you think about the current situations of residents/citizens participation in local government decision making?
2. What precise activities or actions would you propose that the city and county councils should take to facilitate such citizen engagements?
3. One difficulty in citizen engagement has been interesting residents and citizens in participating with governing bodies. Many people have limited experience participating in government other than voting, and an increasing percentage do not even vote. What would you propose that the city and county do to stimulate citizen and resident engagement in local government?
4. Another aspect of citizen participation that is undeveloped deals with elected official's unwillingness to share power with their constituents. Given that governmental bodies are legally liable for their management of taxpayer resources, what regulations or policies would you propose to set the nature and extent of citizen participation in decision making?
5. What would improve the situation for councillors and for citizens/residents?
6. What do you think of the role of communications technologies in the process of improving the residents/citizens engagement with the local government? E.g. Electronic communications from smart phones to information kiosks and meters monitoring water and electrical usage have become widespread throughout the world. Some early Smart city participants used data from citizens' smart phone input to monitor attitudes and behaviours.
7. Can you name some ways that electronic technologies could be used in Cork to stimulate two-way communication between citizens and elected councils?
8. What activities and outcomes can you envision that would create a successful engagement (initiative/strategy/movement) with residents/citizens?

9. Which socio-economic traits do you think will stimulate or restrict Cork residents'/citizens' participation?
10. In addition to local officials, who and what organizations do you think can help to promote stronger citizens/residents participation in local activities?
11. What else could be done from govt./academics/industry/resident/social organisations?
12. What do you think the Smart Gateway should do differently than other deployed initiatives to have a successful residents/citizens engagement in its strands?
13. What are the three words that you think the most important in upbringing a successful residents/citizens engagement in a long run?