

Key Factors for Effective Citizens Engagement in Smart City: The Case of Cork City

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Abstract

Citizens, residents and other stakeholders are not always fully empowered to engage in the development of their cities, particularly in smart city initiatives. 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. This paper reports results of the CorkCitiEngage project 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. We also presented key factors that could stimulate and maintain the citizens' engagement in smart city initiatives including volunteering practice; channels for participation; generation of concern-based engagement; improved hardware access and free Wi-Fi in libraries and public offices; up-skilling digital skills; and a localised city apps. The project used these indicators to analyse potential correlations with respect to citizens' engagement in smart city initiatives.

Keywords: Sustained Citizen Engagement, Crowdsourcing, Smart City, Learning City

Introduction

Smart city is an urban management idea that has gone from concept to mainstream within just a few years. 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, public lighting systems, and others. Information and communication technologies (ICT), sensors, actuators, mobile phones, GPS 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). And 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, 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. These gaps of involving the citizens in all the steps of smart city initiatives have been identified as key challenges in the successful scaling 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 in society – public bodies, private business, academic institutions, and citizens – in consultation, feedback, decision-making, and implementing projects.

Based on reviews of current awareness of the inter-correlation between citizen engagement and smart cities issues and crowdsourcing methodologies, this research carried out a series of surveys which produced the largest sample collected in Ireland, 3599 respondents, at a city level. These surveys were part of a project series conducted by Cork Smart Gateway and the International Energy Research Centre. From these data, key factors for citizen engagement in the smart city were identified.

Cork Profile

Cork is a half million population county, including the 123,000 residents of the Cork City, locating in the southern-most region of the Republic of Ireland. 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: the University College Cork and Cork Institute of Technology. While the economic growth is making Cork as a good place for investment, job opportunities, educational and training activities along with other urban amenities, these place enormous pressure on the infrastructure systems.

Cork County and Cork City recognise these infrastructure challenges 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. Cork Smart Gateway (CSG) was initiated as one of the solutions to meet the sustainable growth demands of the CASP area. The CSG utilise 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 Initiative is to improve the region's economy, environment and quality of life for its citizens.

Literature Review

The Smart City as an urban development trend motivates cities around the world to take advantage of ICT and other key conditions to (re-)design cities to cope with new global challenges. The literature on *Smart City* shows that agreement on the definition of a smart city is and how it can be created is still largely unexplored from a truly holistic perspective. Part of the reason for this is that *Smart City* as a definitive concept has emerged as a subject in academic research only over the past five years (Nam and Pardo, 2011; Alawadhi *et al.*, 2012; Neirotti *et al.*, 2014; Angelidou, 2014). The newness of the subject creates multiple opportunities for both academic research and practical applications in helping cities to reach their 21st-century goals (Glaeser, 2011). Another popular perception of a smart city is that it uses ICT 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 (Degbello *et al.*, 2016; Pham, 2014).

Citizen Engagement and Local Government

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 Citizens¹ and the EYE 2016² 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

¹ http://ec.europa.eu/citizenship/europe-for-citizens-programme/index_en.htm

² <https://epthintank.eu/2015/12/14/young-people-engaged-but-not-voting/>

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 with 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 mobilize citizens' resources to capitalize 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 especially of the Information Communications Technologies, 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.

Meanwhile, at the local government, pressure from budget cuts, revenue restructures, changes in service responsibilities, growing demands of the people for public services are felt even stronger. The local governments are the closet level of authorities dealing with daily demands of the people. Therefore, the pressure for them to find ways to cope with the situation becomes imperative. 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 the people than central governments and political parties in the Standard Eurobarometer 78 (EC, 2013), at 44% versus 27%, the 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. In addition, facing the budgeting drop, the local governments are looking into the participation of the public via citizen engagement to provide public services in new business co-production models. For instance, in (Bovaird, 2007) the planning and delivery of services resulted from citizen co-production efforts, in which citizens are involved early on and they share the responsibilities with the local government to solve the challenges in the delivery of the public services.

Bang (2009) argues the new forms of participation are creating groups of 'expert citizens' who are working within community organizations, therefore they understand and operate well "inside" the system of governance. The expert citizens are believed to have a deep understanding about 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.

The 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 the 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 necessities 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.'

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 the 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 of 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; and 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 and 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 the sentiments and social expectations of the 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 co-operation 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, 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).

In summary, 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).

Citizen Engagement in Cork Smart City

Following the smart city trend with a clear awareness of the challenges in engaging and empowering local citizens, Cork City Council and Cork County Council worked with IERC researchers to identify key factors for effective engagement with local people in its Smart Gateway Initiative, which is the smart city approach for a larger geographical region. In tandem, Cork is also positioning itself to develop as one of the world's first four pilot cities to pursue Learning City under UNESCO's Beijing Declaration. The two initiatives converged to bring together hard infrastructure and social capital – including local skills, community institutions, and digital technologies – in innovative ways for the stimulated economy, public service delivery and an attractive environment for all. Both initiatives required quantifiable indicators to measure progress and success while ensuring meaningful engagement and involvement of major sectors in society – public bodies, private business, academic institutions, and citizens – in consultation, feedback, decision-making, and implementing projects.

Throughout initial planning phase, discussions and underlining the five objectives of the initiative is a fundamental question of how to effectively engage with Cork citizens and involve them in consultation, feedback, decision-making, and implementation processes. The key question of effective engagement with citizens is 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, the Cork Smart Gateway Initiative would need both a technology platform for citizens engagement and an effective citizens engagement strategy (Pham, 2014).

This requirement was also apparent in the Cork Learning City initiative, which was promoted by the UNESCO. 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.

As a comparison, Cities in the C40 group, cities considered the 'smartest cities in Europe', have adopted Smart City (SC) as a development approach. However, none of the C40 cities have conducted a city-wide 360-degree view analysis with a focus on the general public, senior citizens, youth, and local authorities.

The authors of this paper researched key characteristics and indicators of the two initiatives pursued by Cork to come up with the idea of establishing a baseline citizens' engagement data, thus identifying channels, platforms and practices for the real engagement and involvement between the local authorities and their citizens.

Research design

Methodology: Crowdsourcing Method

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).

In this project, the crowdsourcing approach in the representative general public survey was demonstrated as a useful strategy for interested local people to 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. Results indicate that if residents are asked to contribute at the beginning of Smart City (SC) initiatives, they would tend to keep

track of progress on those initiatives. This motivation would help local authorities to sustain the public involvement not only in SC programmes but also in other public issues.

In Cork City's crowdsourced studies, the solution produced the following results to the stakeholders:

- A sizable baseline dataset of responses representing more than 2% of the city's total population
- Lower costs: from 3 to 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

With the inputs from 3599 respondents in the survey sets, CSG 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, 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 from three to 10 times cheaper than the traditional way of contracting the job to a service provider. The method innovated beyond best practice as it provided fast turnaround from the survey volunteers, high-quality data, and flexibility to marshal resources (Brabham, 2012). Since it's 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 the quality of each task 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, the participation of many social and community groups (Estellés-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.

The crowdsourcing method proved the real value of the collective intelligence and crowd wisdom of experts and the general public. It also gave the crowd a chance to validate itself from the emerging trend of SC, which facilitates the crowd contributions in much more ways that did not previously exist. 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.

Survey Design and Implementation

From the literature review, the researchers 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 (Schoorman 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 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. They also overlapped with key features of Learning City set by the UNESCO in 2013.

The collection of data were done through a deployment of five sets of surveys that detected 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 survey sets targeted a holistic view with contributions from five groups: representative general public, non-representative general public, youths from 15-18 years old, seniors, and local authorities working in the two councils. 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 Cork Smart Gateway and the key

features of Learning Cities. After the design stage, the questionnaires 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. Once the questionnaires had gone through the required review processes, they were officially launched to the targeted participants.

The public participation category measured in all five surveys for general public. The measurement of current practice in volunteering and their willingness to involve in future SC 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 of 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 Central Statistics Office's 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 analyzing (Umbach, 2004). Telephone interviews and post methods can be used as additional measures when the online method does not generate the desirable response rates.

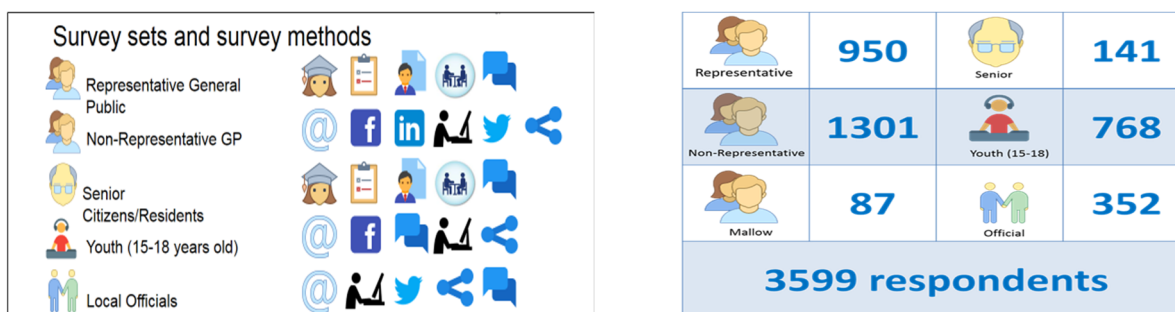


Figure 1 and 2: Survey methods used and the number of respondents in each and totals.

In this specific project, each set of the surveys was conducted with the most appropriate and cost effective methods. All research ethics concerns were addressed in each of the surveys, following codes of ethic regulated by the University College Cork's 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.

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.

Have Your Say – Non-Representative General Public (NonRep) 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 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

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.

Key Findings

The findings and recommendations were based on results from a comparative analysis and from an aggregated analysis. The comparative analysis is the comparison of the corresponding percentages among the five surveyed groups. The aggregated data set is the merged data according to the surveyed questions, regardless of their numbering in each of the surveys, and their variables from all 3599 respondents together.

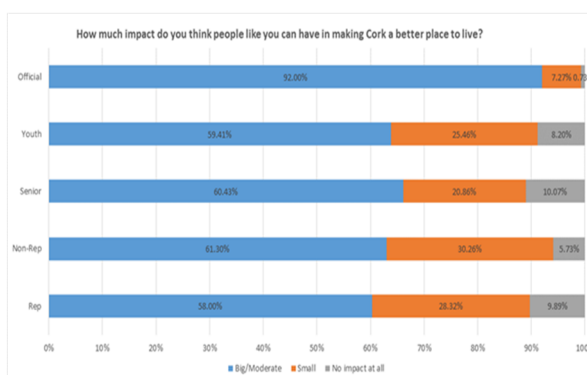
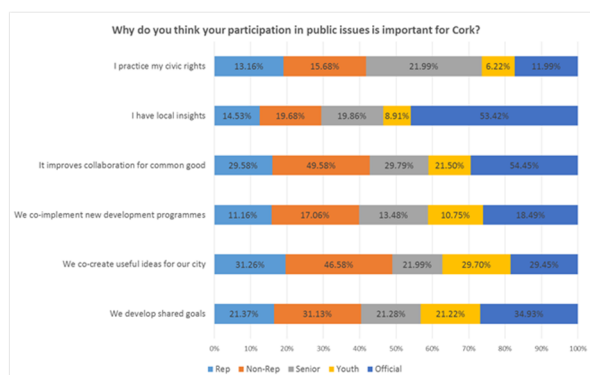
- Cork citizens highly value a shared and collaborative vision of their participation in public issues;
- Cork citizens strongly believe that they have big/moderate impact in making Cork a better place to live;
- However, Cork citizens indicated that there are have two few opportunities to them to participate in local decision-making;
- Top concerns on Cork citizens' minds are sustainable jobs, health and wellbeing;
- Two third 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 skillful in the use of digital tools such as email and text;
- 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 dominating 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 findings on specific topics measured in the research surveys.

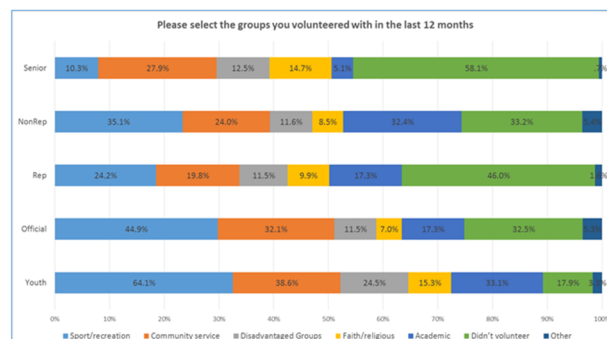
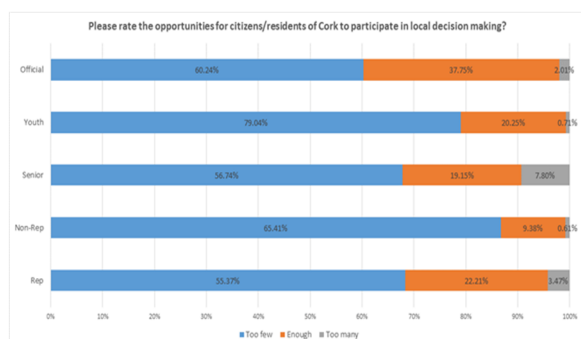
Public Participation

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 involve in the public issues, future SC projects, and their preference engagement methods. The main story line is that the people highly appreciate a shared and collaborative vision of their participation in public issues (Figure 3). They believed that their participation would have a positive impact on making Cork a better place to live (Figure 4). However, there are few opportunities for the people to participate in local decision-making (Figure 5).

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 they could involve, therefore, they responded low on both their participation practice (i.e. volunteering) and their willingness to participate in the future SC projects



Figures 3 and 4: 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.



Figures 5 and 6: 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. 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 at 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 skillfully 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 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 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 survey findings of this group 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.

Digital Skills

The digital skills of the respondents are on an average level overall when it comes to key digital tools including email and mobile phone. The two tools are also their desired communication methods when

public offices reach out to them. Facebook is the dominating social network platform, despite there were variations in the percentages of using it most often among the surveyed groups. Except for the senior respondents, most of the people would like to use a smartphone app desired specifically for Cork. When it comes to social media, Facebook was the dominant platform, especially high among the NonRep, the Rep and the *Youth* groups. YouTube was quite strong among the Youth and the NonRep groups, meanwhile, social media did not mean much to the *Senior* group. Figure 7 provides a more comprehensive view of the usage of social media among all of the participation groups.

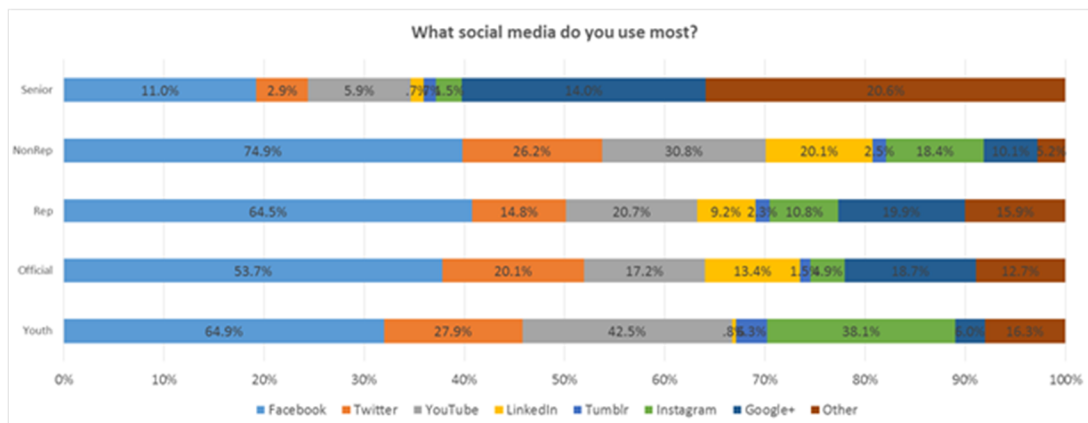
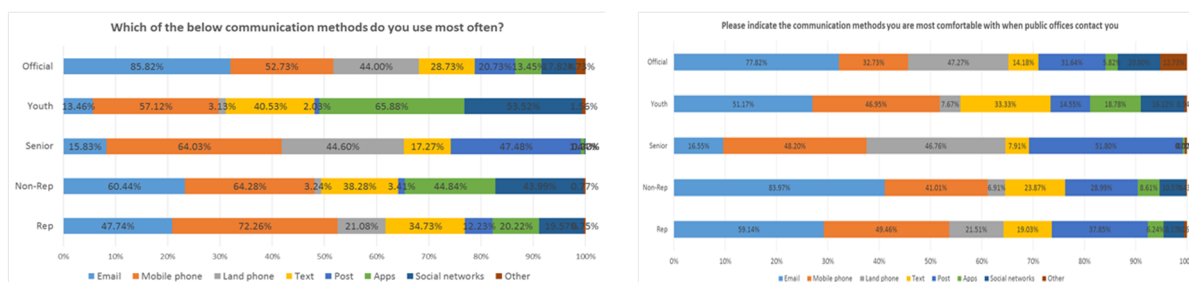


Figure 7: a comparative analysis of the social media platforms used by the different groups.



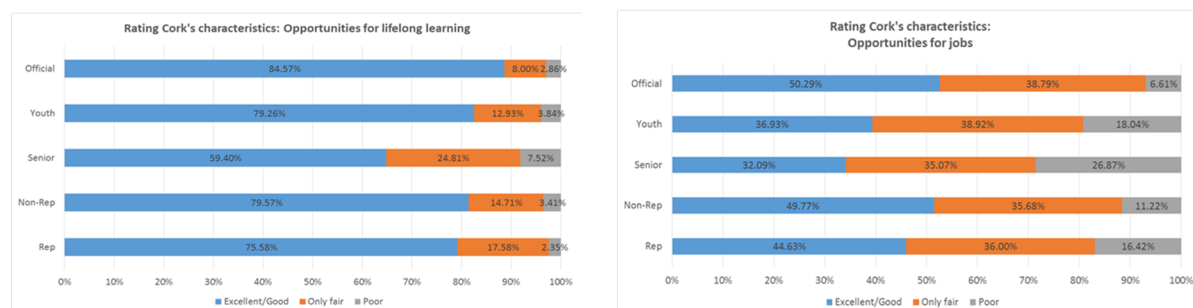
Figures 8 and 9: comparative analyses of the communication methods used most often by the people and their preferred methods used when communicating with public offices.

In particular, Figure 8 showed that mobile phone was heavily the most common communication method across all of the surveyed groups, the *Official*, the Non-Rep, and the Rep used email quite strong. 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 the local authorities. The *general public* (representative) and the *Seniors* 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, 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 really high in social networking, but they rated themselves on average for email and online services. Among the surveyed groups, the tech-savvy and the local authorities were the most skillful in those digital tools.

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, ranging from 60% to 85% selected the top ratings. This was especially relevant to the teenagers who responded education opportunities as their second most important matter for themselves and for Cork's future. Figure 9 indicated the rating among the surveyed groups which saw the *Official* group rated the highest ranking for Cork with opportunity for lifelong learning following by narrow margin of all the rest of the respondents. Regarding the opportunities for jobs in Cork, Figure 10 indicated

that a half of the *Official* and the *NonRep* groups considered positive (excellent/good), while other groups rated from more than 30% to 45% positive. The vote “Only fair” was consistent across all groups with very small differences. In terms of immigration friendly environment in Cork, most of the groups rated “Excellent/Good” at around 60%, except for the *Official* group, which rated at 46%.

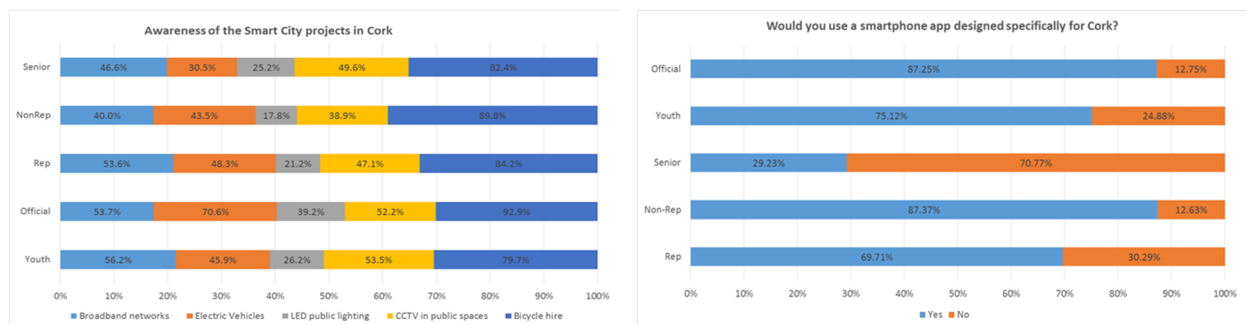


Figures 10 and 11: comparative analyses of Cork's key characteristics (lifelong learning and jobs) across all survey groups.

While the seniors and the teenagers did not have to deal with many public services, more than a half of the general public – representative – and the tech-savvy general public used online services including online payment, downloading forms, and getting the desired information. This rate was on 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 a good condition of connectivity. However, there is a growing number of people would use free Wi-Fi wherever they can. While mobile phone and smartphone usage are now in 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. There are a number of SC projects in Cork, however, the awareness, access, and usage (actively or inactively) was limited, at less than a half of the respondents had been aware of them. The projects broadband networks, electric vehicles, LED public lighting, CCTV in public spaces and bicycle hire. As demonstrated in Figure 12, the bicycle hire was the most recent addition to the public transport in Cork, therefore, the awareness of this project was dominant, 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 aware of the project 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. The seniors and the 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 the future SC projects were designed as participation willingness measurement, they also reflected on people's willingness to leverage on 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 the highest involvement and leverage of these ideas, followed by the tech-savvy general public and the general public.



Figures 12 and 13: 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 12 specified the percentages of each group in the participating respondents.

Discussions of the findings

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.

In the context of the emergence of new media and Information and Communications Technologies (ICTs) performance indicators such as knowledge-based social capital have gained ground compared to the physical outlook and infrastructure of cities. The research found that innovative use of ICT will foster sustainable city innovation that helps to improve the quality of life of its citizens (Schuurman et al., 2012). "An important differentiating element with the other city-concepts is the collaborative aspect between various city stakeholders, including citizens," (Schuurman et al., 2012). This aspect is enabled by the presence of ICTs which allow all relevant stakeholders to involve in smart city activities on interactive, participatory, and information based arrangements in cities.

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 two 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. For instance, those community-engaged platforms that 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 SC 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 who involve 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.

Digital Skills

Cork citizens are skillful 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 skillful with all of the key digital tools and as academic literature proved those group would learn new skills really fast when they need to. The advanced digital skills of these group, especially among the teenagers, create a good foundation for e-learning courses in training and education programme. Regarding the social networks, Facebook is the dominant platform, therefore, information targeting general public could leverage this channel. There should be a short snippet pushed on this platform 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 register – should help sustained engagement with them, together with periodical updates and prompt feedback. Digital up-skilling is important, especially for those groups who lack transferable skills but are willing to learn. Experience in other countries showed that teenagers and school students could spend time at community centres, day care centres, and another setting 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.

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's 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 mix modal approach in communicating with them would be appropriate with the relevance of the information should 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.

Conclusions

A city is a complex system of systems operating in the triumvirate of economic, social and physical authorities it is informative to view them as interdependent and interconnected. 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 about *Smart City* while creating new paradigms for cities leaders and stakeholders to understand and apply.

At the heart of all factors, the citizen engagement and participation in the SC presents a big challenge for such of the interdisciplinary research to take place. The Cork city case study is an attempt to move research away from the current predominance of theoretical concepts, test-lab innovations towards a robust survey-based study. The study only measured three key factors of public participation, digital skills, and access and usage of public infrastructure, however, the gaps from the perceptions to practices of the citizens have shed some lights on the way forward. And the CorkCitiEngage was just 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. Also, like the SC itself, the citizen engagement in a SC is only in its infancy. There are numerous opportunities for interdisciplinary research to take the topics serious so the adoption of SC concepts can actually enable people to harvest the true fruition of the progress.

Among the contributions to the literature in working methodologies, gaps and key factors in citizen engagement in a SC, this research also raises issues for future works to focus on:

Academic

- There is no universally agreed definition of 'smart city' among leading researchers and those cities that are pursuing a smart city agenda.
- Current research focuses mainly on technology and its roles and applications in the hard infrastructure of city physical environment. Policy for technology is also a research theme but has received very limited attention.
- 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 still 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-scale cities around the world while the medium sized cities are not being analysed.
- The quantity of research in different geographical areas is very 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.

Practical

- Cities are embracing a smart city agenda to address their urban challenges including increasing competition at a 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.
- Human capital, the empowerment of people, human interaction and involvement in the development of 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.

Consequently, the lessons show a wide range of areas for further research. 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 learnings and solutions for our cities to thrive.

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