

PLANNING IN CYBERENVIRONMENTS:
AN ANALYSIS OF THE IMPACTS OF OPEN DATA IN CHICAGO

BY

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DISSERTATION

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ABSTRACT

Technologies and the Internet have greatly enhanced the production and communication of information, increasingly impacting on our lives and cities. They have also fostered open access to information and the sharing of it via open data platforms. As a result, many cities are now embracing new modes of open data management. However, the impacts of open data extend beyond data management, transparency, and accountability to influencing governance and community participation.

The purpose of this dissertation is to analyze open data as part of the “smart city,” analyzing its potentialities and implications for urban planning based on Cyberenvironments, a collaborative and open approach. I chose Chicago as a case study, where open data is a bridge to Chicago becoming a smart city. The research analyzes the impacts of open data in Chicago, and focuses on changes in governance and the role of non-governmental actors, such as participants in the civic technology community that has gained the trust of citizens, institutions, organizations, and companies.

I employed quantitative and qualitative methods, as previous approaches have been highly dominated by quantitative methods lacking a qualitative perspective. Thus, in this exploratory research, qualitative and quantitative methods are integrated by analyzing a single case study. An online survey was included in order to provide a more detailed characterization of the community that I defined as the “Chicago civic technology community” (CCTC). I then conducted semi-structured interviews of experts and decision makers from different institutions involved with initiatives, plans, and projects regarding open data in Chicago.

Chicago has a dynamic open data movement supported by the local government, non-government organizations, universities, and citizens interested in sharing and providing urban

solutions. The Chicago open data portal was launched in 2010 and relaunched in 2011. It was then supported by the Chicago Technology Plan in 2013, which provided a framework, vision, and strategies turning Chicago into a technology-based city. The plan incorporated a “civic innovation” strategy to empower citizens to use open data. However, since 2010 citizens have been using requesting and transforming data. The data transformation, occurring in collaborative environments, is helping the City of Chicago to spur better decision-making and efficiency. The role of citizen as “civic innovators” is crucial in accelerating this dynamic civic ecosystem.

In this dissertation, what I identified the Chicago civic technology community goes beyond a temporal open data movement or simple network to become an engine of innovation building knowledge-based collaborative environments. The civic technology community’s human capital shows how highly skilled citizens can take advantage of open data, add value to raw data, and transform data into knowledge; the Chicago civic technology community has developed an active environment for interaction and the sharing of knowledge. However, this dynamic may actually increase the gap between highly skilled citizens and less skilled citizens, reinforcing existing patterns of exclusion. Thus, the issue is not only access to the information alone, because people require the capacity to transform data into knowledge.

Thus, this dissertation presents a shift of paradigm from the “information age” to the “knowledge age,” and the implications of this in a planning context. The main implication involves the evolution from “e-planning,” based on networks and information, to “knowledge planning” (k-planning), based on Cyberenvironments and knowledge. This dissertation’s main finding is that k-planning represent a new venue in planning, offering a comprehensive and contextualized understanding of “planning in Cyberenvironments,” where “urban space” and “time” work together simultaneously to build such Cyberenvironments. K-planning addresses the real-time dimension by utilizing the “acceleration” of space and time simultaneously as “the acceleration of territorial development.”

In term of policy implications, open data means more than simply the availability of online datasets—it requires the development of a dynamic civic innovation space, crucial for both countries and cities. Thus, cities need policies directed at strengthening human capital and reducing the gap between highly and low skilled citizens.

K-planning offers an alternative to the development of smart cities beyond mere technology operation. I define K-planning for generation of urban development and for regeneration of existing cities; both cases taking into account “genius loci” (origin) and “milieu innovator” as an outcome. K-planning can be applied to the urban generation of smart cities and regeneration for smarter existing cities.

K-planning is about synergies, innovation, and integration; it is about partnership based on ownership (specific achievements) and the contribution made by stakeholders for better policy making and promoting a culture of available, open, and relevant data. The aim is to nurture collective knowledge to meet the needs of the civil society via better governance, consensus building and policy making.

*To my mother Hilda Lupa and father Avelino Vicentelo,
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CHAPTER 1

INTRODUCTION

1.1. Motivation

This research is motivated by the increasing impact of information and communication technologies (ICTs) on the lives of people and cities. Virtual social networks, emerging technologies and mobile devices have changed the nature of human interaction by enabling information access and social connections in ubiquitous ways in real-time without the limitations of physical proximity. This research explores the relationship between planning and ICTs because it seeks to insert urban planning into the debate of technologies in future cities. This dissertation discusses the impacts of a “network society” in which planning occurs in *cyberspace* (network, human, time and space), and addresses the unexplored perspective of the “ubiquitous society,” in which planning can occur in Cyberenvironments (collaborative, human, real-time and space), a new perspective that this dissertation brings to the literature. This collaborative dimension of Cyberenvironments can contribute to the planning process and can be reinforced by the linkages between e-planning and collaborative planning.

Planners should go beyond considering technologies as simply tools; and urban planning should strive to address the urban challenges originated by increasing uses of emerging technologies. Mitchell (2000) argues that we are living in a type of nervous systems. These highly connected nervous systems teems with flows of data and information that can provide the opportunity to not only enable community access but also to create informed and collaborative communities that are part of a new urban ecosystem using technologies, networks and knowledge.

To Build a Smart and Accessible Information Society:

Cities should recognize that information and communication technologies are essential to the vibrant social, economic and cultural life of the city. Cities should invest in information and communication technology infrastructure so as to strengthen services

across multiple sectors, and to build an intelligent digital nervous system supporting urban operations. They should strengthen the use of information technology in education, reduce the digital divide, and increase the access of residents to information. (Shanghai Declaration of the World Expo 2010, themed “Better Cities Better Life”).

This research explores the open data that is part of the smart city and analyzes its impacts and potential in the planning context, based on the intersection between e-planning and collaborative planning perspectives. The theoretical approach of this research proposes that the intersection leads to “planning in Cyberenvironments.”

There is an emerging open data movement that seeks to increase transparency and make information available to the citizenry. The World Bank, the United Nations, government agencies, state governments and local governments have recently launched open data initiatives for implementation on the national, regional and local levels. These open data initiatives allow citizens and developers to use data as a raw material and to create new content. This content can be produced and disseminated through web and mobile applications that can facilitate access to services, provide data visualization and help to solve problems involving transportation, environment, public safety and public utilities among others (Desouza & Bhagwatwar, 2012).

Open data at the local level had become crucial for transparency and accountability practices, and the communication between local governments and citizens has evolved. In the past, there was simple access to documents and reports. Now cities are faced with having to adopt new ways of open data management. Many cities maintain open data web portals involving large number of spatial datasets accessible by the public. However, the impacts of open data portals and initiatives go beyond data management, transparency, and accountability: they impact governance and community participation. As such, there are cities with infrastructures to support access and highly skilled communities, placing them in better positions than others to address impacts of open data. Thus, many cities are adopting changes to increase community participation and to reduce exclusion.

I chose Chicago as a case study, where open data is providing a bridge toward becoming a smart city. Here we can see the evolution of open data; it began as web portals for transparency and, after few years, become a technology plan in 2013. This research analyzes the impacts of open data on Chicago, and focuses on the changes that have taken place in governance and community participation. It also seeks to identify the potential of Cyberenvironments to affect planning practices.

1.2. Purpose

This research examines the open data in Chicago as a case study. This includes analyzing, through a theoretical approach the efficient governance, community participation and potentialities of open data in planning practices. This research seeks to further assess open data by considering the new civic technology and changes introduced by e-governance. This represents an evolution in terms of the level of community participation based on a collaborative and purposeful participation, highly interested in seeking solutions to urban concerns. This work provides a characterization—including the strengths and weaknesses—of this type of knowledge-based community. The research seeks linkages with community participation in planning practices and the role of planners in this new Cyberenvironment based on a collaborative, knowledge-based, and open approach.

1.3. Research questions

This dissertation seeks to address these following research questions:

- Which non-governmental actors are actively involved in value-added open data processing and dissemination?
- How is innovation in non-governmental processing of open data changing governance in Chicago?
- Is ‘genius loci’ the innovative asset for Cyberenvironments? What is the Chicago genius loci?
- What implications do the applications of these data innovation channels have for planners?
- What are the key components that a smart city requires from a planning perspective?

This dissertation has seven chapters. Chapter one provides an introduction to the motivations for conducting this research. The initial approach emerged after studying the relationship between planning and the information and communication technologies, and seeking to insert urban planning into the debate about technologies in future cities. This chapter presents the purpose for conducting this research in terms of seeking to explore the impacts of the open data in Chicago and its potentialities and implications for urban planning.

Chapter two presents a literature review of relevant research. It discusses planning theories, from rational planning, to collaborative planning, and to e-planning perspectives, and investigates relationships and different dimensions of planning theory and its relationship to information and communication technologies. The chapter discusses the network society, the implications of e-planning—that should experience changes because urban environments are strongly linked to technologies that impact cities and planning in time and space.

Chapter three presents the research design of this exploratory research. This includes the dissertation process model, which is built upon a single case study. This chapter includes a detailed explanation of the processes of data collection and data analysis used in this research, involving an online Chicago Civic Technology Survey and semi-structured face-to-face interviews conducted in Chicago.

Chapter four presents the analyzed findings from multiple data sources. These involved the technology plan, programs, and initiatives in Chicago. This chapter provides an overview of open data, its evolution in the United States, and its adoption by local governments such as the City of Chicago.

Chapter five provides an examination of the results and provides an analysis of the online survey and interviews. It provides a characterization of the Chicago civic technology community and analyzes the interviews conducted that involved participants including experts and decision-makers working on projects related to open data and smart cities.

Chapter six offers a discussion of this research, using in-depth reflections about the findings, and develops theories which address the impacts of the open data on community participation and governance. The chapter also presents implications in the planning context, bringing the perspective of k-planning (knowledge planning) in Cyberenvironments and the new role of planners in this scenario of smart cities and the emerging civic technology communities.

Finally, chapter seven provides several conclusions about this research. There, I seek to contribute to the debate of future cities and the implications of employing Cyberenvironments in planning process. In addition, this chapter includes lessons learned and the implications for future research.

CHAPTER 2

LITERATURE REVIEW

2.1. Theoretical relationship between urban planning and information and communication technologies

Theoretical approach to e-planning

Rational planning is based on scientific rationality and the control of systems that involve structured decision-making. It has been criticized for being too instrumental and for being embedded in a technocracy (Alexander, 2000) where the procedural dimension can affect power relations by controlling access to information and decision-making processes using information control tools (Yiftachel, 1998; Forester, 1989). In the early 1960s, urban planning was closely-linked to the rational approach, influenced by cybernetics. The city was proclaimed to be a “cybernetics system” and planners developed “cybernetic urban models” implemented by computer-driven urban control systems. From a rational planning viewpoint the city was considered to be a “unity,” a “nerve center,” and an “organism system” with complex structures and subsystems, in which urban areas were regarded as purposive machines for enabling the human inhabitants to optimize their urban environments (Swanson & Johnson, 1964).

During the 1980s, the “communicative turn in planning theory” (Healey, 1992) and communicative planning emerged as an alternatives to rational planning becoming a new focal point for planning theory (Mandelbaum, Mazza, & Burchell, 1996; Nunes, 2010; Sager, 1994). This approach understood planning in terms of communicative action based on interactive and communicative activities. The communicative process constructed meaning from information created by different actors such as planners, decision makers and community members (Innes, 1995, 1998).

Social, political and economic complexities are part of the information age (Castells, 1997), and different planning perspectives have incorporated information and communication technologies. As such, the “e-planning” scenario emerged as a new frontier for the planning

discipline in both practice and theory. The distinctions between rational planning and e-planning are still unclear: rational planning traditionally focused on the scientific method of control systems, while e-planning involves the monitoring systems that support feedback for the multilevel procedures of the planning process (Horelli & Wallin, 2010). This approach to e-planning is limited to planning practices, where e-planning focuses on tools and their applications with the purpose of improving the conventional decision-making processes. However, e-planning could also involve a theoretical approach linked to the theory of collaborative planning, in which this research seeks to provide understanding to communities by information and communication between the actors involved. E-planning has the potential to provide an integrative approach between rational and communicative planning because e-planning is characterized by the extensive use of information and communication technologies, and based on communication, can develop links between rational and communicative planning, developing an integrative approach between both.

E-planning has been associated with tools and technical procedures involved in planning practices seeking to improve efficiency and effectiveness of urban systems. However, e-planning is also regarded as an instrument of collective action, and e-planning steers communication and collaboration among stakeholders involved in consensus building. E-planning has challenges to address such as potential exclusion of groups of people with limited access to technologies. However, there is an enormous potential in e-planning considering the increasing level of technological adoption by people and communities.

Network society

Most recent characterizations of the digital society describe how access to the Internet and access to electronic devices, and thus social networks, involves access to information and knowledge. However, access to information is only the first stage. The next stage involves processing information and transforming data into knowledge.

Castells (1997) argued that the information age, or information society, is based on networks, connections, and interactions as the dominant social structures that have reshaped

cultural identities. The information age demands new adaptation of spatial theory considering this scenario of social, cultural, and technological transformations that rise the network society. The network society is a social structure form of the information age, comprised of linkages between the technological paradigm and the social organization—a characteristic of the information age (Castells, 1997). The network society manifests itself in many different forms that have been shaped by culture, institutions, and history. There are two social forms of time and space in the network society: the “space of flows” and “timeless time” (Castells, 1997). Castells (2009) emphasized that “space and time expresses the power relation of the network society.” Networks transform old power forms and power relations. New power forms represent multilayered power relationships expressed through codes of information and visualization diffused by global networks. In the information age, new power forms have been empowered by information and communication technologies. They have become crucial in the realm of power as sources of power and counter-power (Castells, 1997, 2007). Castells’ perspective on power relations involves structured nodes, hubs, and connections of humans in organized relationships. Nevertheless, there exist fuzzy connections, incomplete and unstructured interactions in which power relations also emerge.

The network society has been impacted by mobile and instant technologies, and these impacts make feasible connections and interactions anywhere and anytime. Thus, it is possible to consider that we are indeed immersed in, and living in, the “ubiquitous society” that transforms our perceptions and interactions in urban spaces and time (Kim, 2008). This ubiquitous society could be considered an evolution of the network society by emerging instant communications and technologies. This involves intelligent applications throughout the city that are sensing and tracking the surroundings of people connected by smart mobile devices as part of the “sentient city” (De Waal, 2011). This can create controversial concerns because it leaves open the question of who is managing the streams of data that are being generated. This also raises concerns about the boundaries between the private and public sphere.

The information age should also impact physical space and be part of the physical community because networks are important to communities in social, economic, cultural and political terms. The impact of the “network society” also has implications in planning. Castells

emphasized that the information age demands spatial transformation, and this is a fundamental change required of contemporary cities that need to address this social and cultural change in forms of space that need to express the society and their changes. Mitchell (1999) argued that virtual networks demanded that cities be transformed by the physical and virtual interaction. The network society in planning points out the focus on the “dynamic of cities,” which offers an appropriate arena for developing community participation using communication and technologies considering this dynamic interactions (Beauregard, 2005).

Scholars have incorporated the new social forms of “time and space” into their research and have begun exploring the relationship between “network and society” and “network and city,” which has come to be known as the “network city” (Graham and Healey, 1999; Beauregard, 2005). The theoretical approach of new social forms introduced by changes in time and space has not yet been introduced in terms of planning practices, where still planners are still taking into consideration old social forms and old understanding of the relationship between time and space, without considering contemporary changes introduced by the “information age.” Graham and Healey argue that often planners in practice assume that cities and places are object-centered, understanding these as single static unitary independent object, and disconnected of the sense of time. However, contemporary cities are working in complexity by dynamic networks rather than static, and expanding the range of economic, social and cultural interactions.

Others scholars have studied networks in terms of the relationship between “networks and collaborative planning,” arguing that “collaboration builds networks” (Innes, 1998). Innes (1998) emphasizes that social and political complexity have an increased role in networks, and it is necessary to analyze networks in different settings, identifying patterns of the networks. These different settings and patterns can facilitate understanding of networks in the planning context. For instance, promoting collaboration between different groups may increase social cohesion among different networks.

Planning has experienced evolution from rational planning. In planning practice, were elaborated rational computational models based on Cybernetics and control systems, where these computational models were thought to provide control of urban systems and services using

decision analysis. Nowadays, these models need to be fast enough, adaptive to change and complexity-driven models. According to Batty (2014), new social interactions are constantly in flux and we cannot devise theories and models fast enough. Furthermore, previous theories from fields such as from transportation, urban economics, social physics, and regional science, “seem a long way from anything that now characterizes our system of interest.” Batty pointed out that we are experiencing the transition of the physical to the virtual cities, and also living the transition of society interactions within the physical space to incorporate non-material interactions and time. All these variations and constant changes will require also admitting that theories and practices will be in constant change. Batty indicated about shifting theories that “their liquidity and temporality is their dominant characteristic.” Thus, this dissertation seeks to face changes and relationships in space and time added by open data, clearly part of the non-material interaction which contemporary cities are beginning to address or will address in the future.

Information and Communication Technologies in Planning

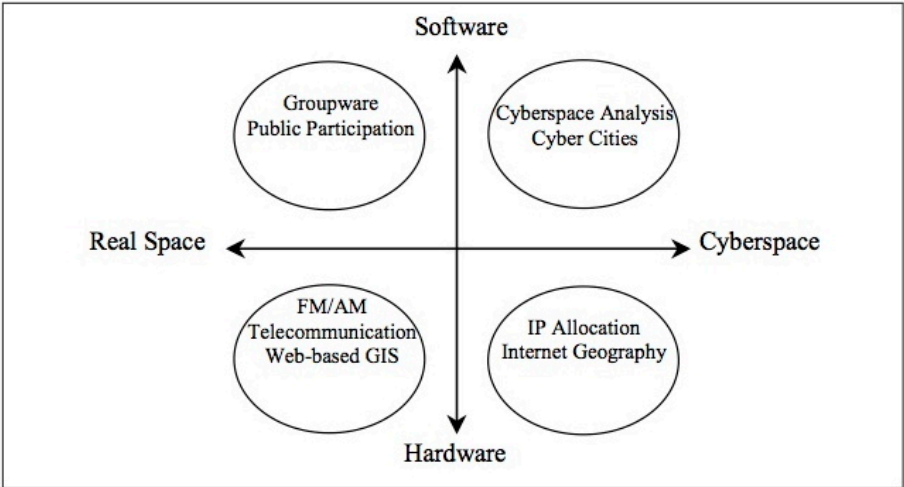
From its inception urban planning has been assisted by technology. “Planning support systems” have all relied on technology for the reliable production of information, management and analysis. These include geographic information systems (GIS), urban information systems (Han and Kim, 1989), and the ubiquitous GIS (Kim and Jang, 2011). Thus, technologies have been used increasingly in planning practices to facilitate management and deliver information internally and to the public. The representation of space began as simple graphic representation by maps incorporating initial technological tools; this was then improved by the introduction of geographic information systems (GIS).

Recently, considering the extensive use of information and communication technologies (ICTs), there are ubiquitous geographic information (UBGI) and ubiquitous sensor networks (USNs). These USNs are oriented to capture urban data on infrastructure, city environments and human behavior in real-time and by sensors data collection. In addition, it is possible to consider the generation of informal data collected by users, who are using different mobile devices and applications to capture information. The informal data collection can be improved when it is

shared by users, and as usual, it is real-time information that provides a pulse, an instant picture of information flow. People share information about public transportation, congestion, events and weather among others. Technologies within the planning process have been used as tools and systems to improve the decision-making process and to support efficient and effective data management.

Information and Communication Technologies (ICT) infrastructures have impacted cities [Figure 1] and affected physical and virtual spaces (Shiode, 1999). Cities are embedded in networks of these infrastructures, acting as a nervous system (Mitchell, 2000) which alters the relation between “time and space.” In fact, ICT in the urban context have served as infrastructures for, and tools applicable to, management, political, and social purposes. Most studies thus far have focused on the impact of ICT in urban and socio-economic contexts (Kim, 2008).

Figure 1: Interaction between technology and urban planning



Source: Shiode, 1999.

ICTs change constantly and can subsequently change planning practices. Nonetheless, many changes in urban planning remain incomplete (Drewe, 1996) because the effects of ICT on cities have been seen as simple, narrow, and linearly cause-and-effect in nature (Graham and Marvin, 1996). Due in large part to the rapid changes in the demands and capabilities of ICT, their relationship to urban planning [Table 1] have proven difficult to study (Graham & Marvin, 1996; Maeng and Nedović-Budić, 2008).

Table 1: Technology development and urban development

Period	Technology	Urban form & development
Early industrial (1820-1869)	<ul style="list-style-type: none"> • Railroad 	<ul style="list-style-type: none"> • Initial urban growth (e.g., population influx in cities)
Late industrial (1870-1919)	<ul style="list-style-type: none"> • Electricity • Elevator • Telephone • Automobile 	<ul style="list-style-type: none"> • Expansion of cities • Beginning of urban dispersal (suburbanization)
Mass production metropolis (1920-1969)	<ul style="list-style-type: none"> • Road building (e.g., highways) 	<ul style="list-style-type: none"> • Massive residential suburbanization • Beginning of commercial suburbanization
Post-metropolis (1970-present)	<ul style="list-style-type: none"> • Personal computer • ICT (e.g., Internet) 	<ul style="list-style-type: none"> • Decentralization of metropolitan regions (e.g., polycentricity of suburban employment centers) • Urban revitalization with technological advances • Global city network

Source: Maeng & Nedovic-Budic, 2008.

Emerging technologies can create opportunities in planning. For instance, Kim (2008) argues that “break traditional power structures by delivering and receiving services anywhere and anytime, a city in ubiquitous technology space.” Online public participation and other types of groupware have the potential to improve data handling and increase opportunities for public participation (Shiode, 1999, 2000). It has been suggested that Internet access in particular might promote decentralized and interactive communication among the different actors (Fley, 2005).

2.2. Smart City and Governance

Smart city

The United Nations estimated that by 2010 50.6% of the world’s population will live in cities, and by 2050, that number will rise to 70%. More specifically, 86% of the population of developed countries and 67% of the population of developing countries will be living in cities (UN, 2008). The United Nations estimates that there will be a need for over 10,000 new cities to house three billion new urban inhabitants by 2050.

Cities have played a crucial role in the economic development of countries. For instance, as regards developed countries, Auckland generates 47.5% of the GDP of New Zealand, Vienna generates 36.9% of the GDP of Austria, and Tokyo generates 34.1% of the GDP of Japan [Figure

1]. In developing countries, this trend is more significant: Buenos Aires generates 63.2% of the GDP of Argentina and Santiago generates 49.1% of the GDP of Chile [Figure 2] (UN-HABITAT, 2011).

In an increasingly urban world will inevitably raise economic, social and environmental problems, while also increasing challenges and opportunities for cities that need to address these problems. This will serve to intensify the role that technologies will play in urban development for new sustainable smart cities. In this vein, United Nations Secretary General Ban Ki-Moon (2010) argued that “new ideas from smart cities around the world are pointing the way toward sustainable urbanization.”

There are many initiatives designed to make existing cities “smarter” and to develop new smart cities from scratch. Previous studies have used diverse approaches in attempting to understand this concept. Most of these approaches have been engineering-based because they focused on technological issues, and there remains a gap regarding other facets, such as the social and urban dimensions.

The smart city has its origin in other theoretical concepts, such as the virtual city (Martin, 1978), the informational city (Castells, 1989), the telecity (Fathy, 1991), and the intelligent city (Latterasse, 1992). In the early 1990s, the term “smart city” was coined to signify urban development’s turn toward technology, innovation, and globalization.

Smart city definitions

The majority of smart city research has been conducted by private corporations such as IBM, CISCO, and Siemens, among others, which are all developing smart city projects. These studies have influenced the smart city definition; they emphasized the efficiency of the smart city in term of energy consumption, smart grids, sensors, transportation and administrative services.

Some definitions of smart cities emphasize that technologies constitute the core of an artificial intelligent nervous system within a city that is self-monitoring, self-responding, and self-optimizing (Juan, Wang, Leckie, and Li, 2011), where interconnection, interoperability,

intelligence, real-time information, and feedback are all facets of smart cities. Smart cities thus feature integrated and centralized control systems that involve the use of software, hardware, and networks. These provide cities with integrated decision support systems that can analyze large amounts of complex data and information and thereby help decision-makers make intelligent choices regarding the optimization of infrastructures and services.

Smart cities based on their application have been seen as “smart layers.” These smart layers include: 1) perception layer, 2) the network layer, and 3) the application layer. The “perception layer” obtains information by means of sensors, radio-frequency identification (RFID), and global positioning systems (GPS). The “network layer” transmits the information obtained to the “application layer,” which analyzes the information using intelligent technologies (Kehua Su, Jie Li, & Hongbo Fu, 2011).

There is a gap between academia and private companies in the research on smart cities, because private companies involved in smart city projects have conducted most of the previous research, while the academic world has conducted little research of its own on this area [Table 2]. These academic studies have focused on technologies and their applications to subjects such as smart-technologies solutions, levels of smart cities measuring energy savings, and sustainability. There is a need for research regarding smart cities that involve different dimensions and factors such as social issues.

Table 2: Smart city definitions (academia and private sector)

	Authors	Definition	Key concepts
ACADEMIA	Giffinger & Gudrun, 2007	The city well performing in a forward-looking in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self - decisive, independent and aware citizens.	Self – decisive, aware citizens
	Hall, 2000	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 optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens.	Monitor security, maximizing services, citizens
	Rios, 2008	A city where the ICT strengthen the freedom of speech and the accessibility to public information services.	Accessibility
PRIVATE SECTOR	Harrison and Abbott, 2011	It is time to develop a solid theoretical foundation for Smart Cities and to develop understanding of how these technical methods can help to achieve the pressing goals of existing and new cities.	Innovation, knowledge, urban capacity, collaborative, urban systems
	Juan, Y-K., Wang, L., Wang, J., Leckie, J. O. and Li, K.-M., 2011	A smart city should be able to develop capabilities for many self-management autonomic technologies and optimize actions for mutually exclusive systems.	Decision-support system, Self-managing automatic systems, instrumentation, interconnection, intelligence
	Washburn, Sindhu, Balaouras, Dines, Hayes and Nelson, 2010	The use of smart computing technologies to make the 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.	Smart computing technologies, infrastructures, services, interconnected, efficient

Source: Information collected from different sources (2012).

I defined the smart city as a city knowledge-based, efficient, and effective, able to be competitive, cohesive, and environmentally sustainable, supported by the use of information and

communication technologies (ICTs), which promote interaction and collaboration between citizens and decision-makers to improve living conditions and society.

Cases of smart cities

Asia and the Middle East are regional leaders in developing new smart cities, while the United States and the European Union countries are engaged in initiatives to make existing cities “smarter.” Asian initiatives have focused on information and communication technology applications, ubiquitous technologies and the financial hub concept, while Middle Eastern efforts have focused on green technologies and a knowledge-based economy.

The United States has focused its attention on administrative and public services, and experimental cases of small and medium size cities such as Corpus Christi (Texas), Dubuque (Iowa), and Holyoke (Massachusetts). On a larger scale, cities such as Boston, Chicago, New York, and San Francisco are leading initiatives for smarter services and data management using open data platforms fostered by local governments. The European Union has focused on administrative services and community interactions. European Union countries are working on different urban scales (medium and large cities) in places like Amsterdam (The Netherlands), Helsinki (Finland), and Barcelona (Spain).

To define characteristics of smart cities, I select specific cases of smart cities in different countries. The criterion used to select these cases were that they be exceptional smart city projects and initiatives with variations in their outcomes. Each case has particular characteristics and scales, and each case illustrates a different approach to the smart city concept. These multiple case studies are divided into two groups: I) smart cities developed from scratch and II) smart cities initiatives.

- I) Smart cities developed from scratch: Masdar City (U.A.E.), New Songdo (South Korea), and PlanIT Valley (Portugal)
- II) Smarter cities: Dubuque (United States) and Barcelona (Spain)

Overview of projects

I. Smart cities developed from scratch

1) Masdar City (United Arab Emirates)

The Masdar City project is located 10.5 miles from Abu Dhabi in the United Arab Emirates. It has a 'unique equation' of green technologies, which reveal the high level of technologies and knowledge used to create this city in the desert. This project has not yet been completed, and the parts of the project that are operational reveal the dominance of the scientific and engineering perspective in the development of a scientific lab city based on green technologies.

2) New Songdo (South Korea)

The Songdo International Business District (IBD) is located 40 miles from Seoul in South Korea. It was designated as the Free Economic Zone. The purpose of the Songdo IBD was to become the commercial hub of Northeast Asia. New Songdo was conceived as the first ubiquitous city in the world designed to be an international business district, where emerging technologies could carry the city into a new age of efficiency and sustainability.

3) Plan IT Valley (Portugal)

PlanIT Valley is located 20 miles from Porto in Portugal. It is a prototype smart city that is designed to be a research-oriented city in which Living PlanIT and other companies will conduct research and develop operations intended to test new technologies and services for sustainable urban development. The city was designed to be the world's first living laboratory of sustainability. This project will use an Urban Operating System (UOS) by collecting information from all urban systems (Alusi, Eccles, Edmondson & Zuzul, 2011).

II. Smarter cities

4) Dubuque (United States)

Dubuque is a city of 57,631 inhabitants located in northeast Iowa. In 2009 the city of Dubuque began an agreement with IBM in the context of the IBM's Smarter Planet Initiative.

This project is based on new technologies that can sense, analyze and integrate data regarding the monitoring of energy consumption. The first phase will enhance understanding of the energy consumption and water management of the city and its residents, and thereby seek to reduce costs and carbon footprints. IBM will build a Platform for ‘real-time integrated sustainability monitoring’ that will provide the city with an integrated view of its energy management, including the energy consumed by the electric grid, water system, and general city services (IBM & City of Dubuque, 2009).

5) Barcelona (Spain)

Barcelona is a city of 1,615,448 inhabitants located in the Autonomous Community of Catalonia. In 2009 the City of Barcelona presented the smart city strategic plan for transforming the city, which included urban policies and urban redevelopment from an industrial economy to a knowledge-based economy. For instance, the 22@bcn district has become a symbol of urban redevelopment because it switched from industrial 22a to knowledge-based 22@. The main assets of the Barcelona plan are human capital, infrastructure, and information. The Barcelona smart city model is considered one of the most holistic approaches to smarter current cities. In 2011 the City of Barcelona and Cisco put forth a global initiative to develop a ‘city protocol’ for addressing new changes in urban planning, and defining standards for smart cities to become more sustainable, innovative, and competitive through the application of new technologies (City of Barcelona, 2012).

Table 3: Data of smart city projects

Project	Masdar City	New Songdo	PlanIT Valley	Dubuque	Barcelona
Start date	2007	2001	2008	2009	2009
Country	United Arab Emirates	South Korea	Portugal	United States	Spain
Nearest mayor city (distance)	Abu Dhabi (10.5 miles)	Seoul (40 miles)	Porto (20 miles)	Dubuque, Iowa	Barcelona, Catalonia
Land size	1,730 acres	1,500 acres	1,670 acres	City	City
Project leader	Masdar	Gale International	Living PlanIT	City of Dubuque & IBM	City of Barcelona
Estimated cost	19 billion	35 billion	10 billion	N/A	N/A
Residents	40,000	430,000	150,000	57,631	1,615,488
Premise	Sustainable city	Ubiquitous city	Smart city (research/IT)	Smart sustainable city	Smart city strategy
Completion date & status	2025 (partial operational with residents and under construction)	2014 (under construction)	2015 (planning stage)	Under operation	Under operation

Source: Information collected from different sources.

These projects and initiatives have been developed by public-private partnerships, creating companies or consortiums (Masdar City and New Songdo); others have been developed by agreements between local governments and private companies (PlanIT Valley, Dubuque, and Barcelona). I organized table 4 to illustrate different sectors involved, such as private companies and public institutions.

Table 4: Sectors by project

	Public-private partnership	Public sector	Private sector
Masdar City	Mubadala Development Company	<ul style="list-style-type: none"> • Abu Dhabi Government • Abu Dhabi Urban Planning Council 	<ul style="list-style-type: none"> • Foster + Partners • CH2M HILL
New Songdo	New Songdo International City Development	<ul style="list-style-type: none"> • Korean Government 	<ul style="list-style-type: none"> • Gale International • HOK • Cisco
PlanIT Valley		Paredes government	<ul style="list-style-type: none"> • Living Plan IT • Cisco
Dubuque		City of Dubuque	<ul style="list-style-type: none"> • IBM
Barcelona		City of Barcelona	<ul style="list-style-type: none"> • Cisco

Key categories of projects

The literature review and these projects revealed characteristics of smart city projects. These characteristics are related to the purposes, outcomes, and specific features of each project. The smart cities projects have focused on these five key categories: 1) Economy, 2) environment, 3) infrastructure (physical and virtual), 4) governance, and 5) Community. Table 5 indicates if each category is present or not by project. Masdar City and PlanIT Valley have three similar categories, and New Songdo, Dubuque, and Barcelona include all categories.

Table 5: Categories by case

Categories	Masdar City	New Songdo	PlanIT Valley	Dubuque	Barcelona
1) Economy	✓	✓	✓	✓	✓
2) Environment	✓	✓	✓	✓	✓
3) Infrastructure	✓	✓	✓	✓	✓
4) Governance	∅	✓	∅	✓	✓
5) Community	∅	✓	∅	✓	✓

(✓= present, ∅ = absence).

I identified sub-categories and specific components of these five categories.

Table 6: Categories, sub-categories and components

Categories	Sub-categories	Specific Components
1) Economy	Knowledge-based economy Human Capital	Center of research, living labs, IT companies
2) Environment	Sustainable practices Green initiatives	Green building, renewable energy
3) Infrastructure	Physical infrastructure	Energy, transport system, telecommunication, connectivity
	Virtual infrastructure	Interoperability, standardization and real-time information, ubiquitous technologies
4) Governance	Transparency	Data management, services online, decision-support systems
5) Community	Participation	Open data, accessibility, collaborative environment

I identified areas that cities should consider when developing smart cities:

- 1) Digital infrastructure
- 2) E-governance
- 3) Civic technology community
- 4) Innovative economic development
- 5) Smart urban development

Table 7 shows that there is an evolution from the conventional city to the smart city. This evolution is generated by the impact of Information and Communication Technologies (TICs).

Table 7: Areas conventional city and smart city

Areas conventional city	Areas smart city
Infrastructure	1) Digital Infrastructure
Governance	2) E-governance
Community	3) Civic technology community
Economic development	4) Innovative economic development
Urban development	5) Smart urban development

I identified these five areas as essential for developing a smart city. The digital infrastructure refers to conditions that facilitate speed of access and the capacity of the digital infrastructure. Smart urban development can incorporate urban development, and can also provide support for urban solutions sought by members of civic technology communities that, according to my definition, are part of smart cities.

Cities, e-government, and e-governance

The Paper Reduction Act (1980), the Government Performance and Results Act (1993), the Clinger-Cohen Act (1996) and the Electronic Freedom of Information Act Amendments (1996) laid the foundations for information management policies, which were adopted by the United States. These laws increased the engagement of governments in the virtual world by means of technology adoption, and crossed the boundary between physical and virtual government management (Dawes, 2008; Garson, 2006). The impact of the expansion of Internet access as a result of infrastructure improvements during the late 1990s increased the adoption of ICTs by governments. This fostered the growth of e-government focused on back-office administrative procedures such as electronic communications, financial management, and other transactions; there were subsequently incorporated into online citizen services. E-government has been criticized for automating government practices and promoting the development of a bureaucracy centered on government agencies. However, e-governance is centered on networks themselves rather than government agencies, and these networks may in fact reduce the separation among different actors (Garson, 2006).

The increasing dependence on the Internet and ICTs created a new formulation of governance, raising awareness of the e-governance concept. The governance concept refers to a process of governing, the manner by which the society is governed, and the ability of government to create appropriate conditions for engaging with networks (Rhodes, 1996; Stoker, 1998). This definition emphasizes governments' capacity to steer organizations and companies, which act as autonomous entities operating within a network built by different actors (Jessop, 1997; Mistri, 1999). Scholars have attributed to e-governance the rise of a new form of governance disruptive of the power relations among different actors; this has led some to see this

as the demise of modernist conceptions of governance (Loader, 1997). However, some studies have criticized this approach to e-governance, because by themselves ICTs cannot generate power relation changes, and they may actually reinforce existing power relations by virtue of reproducing unequal social patterns (Dawes, 2008).

E-governance focuses on the government's ability to engage with other institutions and within networks supported by ICTs, which may be useful tools for policy goals. Previous research has identified different dimensions of e-governance and these dimensions focus on content, access and infrastructure. E-governance development has been accentuated by local and global dimensions of human interaction (Loader, 1997). However, e-governance development can be influenced by different contexts, public interests and political issues.

E-governance at the local level has resulted in different approaches to local e-governance, which emphasizes dimensions of content, access, or infrastructure. However, the network's engagement occurs in each dimension and has the potential to be extended by facilitating social cohesion between the public sector, the private sector, organizations, and citizens, which is certainly relevant for cities' policies.

2.3. Cities in Cyberspace and Open Data

Cities in cyberspace

Researchers such as Wiener (1948) and Beer (1975) studied Cybernetics and its relationship between "human and machine." During the 1960s, planners conceived of cities as "cybernetic systems," where urban environments can be optimized with machines (Swanson & Johnson, 1964). However, the relationship between "human and machine" characterizing Cybernetics has changed since the information age (Castells, 1997). With the introduction of "cyberspace" this relationship grew to include "human, network and space" demanding a new notion of city and planning.

Technologies have played a crucial role in urban development, and have been integrated into urban life, while cities have become increasingly dependent on technologies. In particular,

information and communication technologies have impacted lifestyles and services (Corey and Wilson, 2006; Kim, Claus, Rank and Xiao, 2009). People currently live in networked societies, which involve interactions between “place-based” and “virtual-based” communities. Cities have physical and virtual structures, and the articulation of these interactions is defining features of “contemporary urbanism” (Mitchell, 1995).

Approach to Cyberenvironments

The National Center for Supercomputing Applications (NCSA) coined the term “Cyberenvironments,” used to describe systems supporting collaborative research. Cyberenvironments are an integrated set of technologies that provide an easy-to-use interface to local and shared information, models, and cooperative activities within a secure framework that support complex and collaborative projects. Cyberenvironments consists of collections of computational resources, data, and visualization resources made available online that promote the integration of resources that are open for participatory use (Liu, McGrath, Myers and Futrelle, 2007; Myers and McGrath, 2009). They emphasize constant creation, dynamic integration, and shared resources. The capabilities of Cyberenvironments are rooted in the engineering domain, and can be extended to others domains like the urban domain, becoming “urban Cyberenvironments.” Previous research in planning contexts focused on cyberspace, a close analog Cyberenvironments. However, the Cyberenvironments bring the collaborative dimension in time and space that has not been analyzed in the planning context.

Open data

Public institutions, agencies, private companies, communities, and individual users are producing and sharing data and information using the Internet. The amount of data is increasing and will continuous to increase in the form of “big data.” In 2009, the United States launched the open data platform, and as result thirty-one states and thirteen cities are promoting the transparency, accountability and the dissemination of information in the form of “open data.” Open data involves web-based platform and is customizable by users. Nonetheless, it is not intrinsically transparent; in fact “big data” and “open data” can be black boxes as simple access does not necessarily guarantee the understanding of data.

In 2011, the State of Illinois launched an Open Data web site¹. In the same year, the City of Chicago began using open data, launching the Chicago Open Data Portal². Both have developed initiatives to provide open access to data and promote the use of data by citizens and developers. The City of Chicago is working to built transparency and community engagement by offering access to information using technologies through initiatives such as “Performance Metrics,” which make agency performance data available to the public. Another initiative is ‘Smart Chicago Collaborative,’ a partnership among different institutions; that seeks to promote access and training to unskilled citizens.

In 2012, Chicago joined the Code for America in the form of the “City of Chicago’s Code for America project.” The Code for America seeks to promote openness, participation, and efficiency in local government. During the past decade, large cities have implemented 311 systems to handle non-emergency service requests. What began as a phone-based system is now moving to a web-based technology. In September 2012, the Open311 standard in Chicago was launched and opened up access to dozens of web and mobile applications allowing citizens to report problems, track the status of those problems, and enable government officials to monitor requests and make better decisions (Code for America, 2012).

In October 2012, the Illinois Innovation Council launched The Illinois Open Technology Program. The purpose of this program is to help local governments expand the amount of data available to the public. It seeks to encourage developers to use open data offered by the State through the open data platform, promoting synergy and collaboration between local governments and local developers. The program began as a pilot in Belleville, Champaign, Rockford and Chicago’s south suburbs. Governor Quinn said “the Illinois Open Technology Challenge will not only increase transparency at the local level by giving the public access to government data, it will give entrepreneurs the chance to develop new, innovative applications for the data that will create jobs and make a positive impact” (IGNN, 2012). Open data can provide access to information, and promote the use of data and the conversion of data into knowledge. It is expected to bring economic development to cities, particularly cities like Chicago.

¹ State of Illinois Open Data web site [<https://data.illinois.gov>]

² Chicago Open Data Portal [<https://data.cityofchicago.org>]

In this context, where the amount of data is increasing and not necessarily accessible in term of understanding and privacy, questions emerge: How do we move from data to knowledge? How can open data help to improve transparency? As regards linking open data and urban planning, can open data help people understand the city's dynamics? How can open data engage communities in public interest concerns?

2.4 Public participation and engagement within planning

Public participation in planning has been seen as a complex part of planning, in which the public demand access to information because this information has remained in the hands of experts or planners. Thus, in this case, planners should be able to make information accessible to the public, seeking to engage the public in the planning process. It is not merely an informative way to deliver information by reports to the public audience, but rather it is necessary to provide adequate conditions to the public in order to achieve a level of involvement.

Sharing public information by virtual platforms, like web portals, can facilitate the access to information by the public, and can facilitate planning procedures by open access to information. For instance, online visualization and customizable maps can provide a feasible understanding of information and engage people in interactions with virtual platforms. However, there are some limitations to address because people need to be familiarized and trained to use virtual interactions; and still there are people not fully involved into the virtual environment. Thus, this can limit interactions.

Sharing data has increased transparency, accelerating access to information. The information is often updated and given in real-time. So, this acceleration also implies that planning needs to consider both this way of sharing data by visualization and the production of information, by considering the potential by “co-production” with communities as a new form of engagement in the “e-participation.”

Public information by open data portals and new projects generated by using public data also provide resources that benefit planning. For instance, the development of a digital

application that collects data of neighborhood concerns in terms of green areas, crime, and abandoned buildings, among others. These data collections made by inhabitants facilitate engagement in the planning processes. Inhabitants can add to the initial data provided by planners or gathered from open data portals.

Another characteristic of open data, is its visualization which is useful to share with communities and to re-use when creating new contents.

Critiques of public participation in planning processes

The critiques about participation in planning processes are indeed related to representativity, legitimacy, and corresponsability. They are mainly related to access to information, not only to data, to finally build up knowledge it means shared-knowledge.

In public participation, the audience that often takes part in public meetings is not necessarily representative of the community involved, and they comprise a reduced group of interest; this practice discourages other individuals to participate through what appear to be designed to cover procedures requested by institutions. These aspects reduce the validity of consensus-building achieved during planning processes. In addition, planners have been criticized in the practice of public participation because they reproduce institutional power relations (Forester, 1990). There are critiques that consider that public participation in planning processes is often permeable to interests, strategies, and different expressions of power. It is important to emphasize that public participation is made up of citizens who are taxpayers and so in a few words, are both the direct beneficiaries and at the same time the supporters of policies.

The necessary feedback between civil society, planners, and policy-makers has some gaps. These gaps are related to debate and dialogue among these parties, as well as to a timeline issue, since the dialogue among the parties has to be in real time. For this reasons several cities (visited during my smart cities study trips), for example Tallinn (Estonia) and Helsinki (Finland), are “sensing” the city, meaning they collect data via a net of sensors. The aim of this net is to

provide feedback and build the process from data to information, in order to build shared knowledge. The local government collects data from the citizens and return to those tailor made services depending of the area where the data was generated.

So fostering public participation, as well as promoting concepts of neighborhood management and modern ideas of community, work as central tools in order to stimulate bottom up democratic values and engagement, participatory processes, and the revival of social planning up to most modern concepts, based on local cultural activities and especially, intercultural management.

Connecting people is a powerful tool for social inclusion, promoting an intercultural dialogue between different target groups of society, and fostering values such as communication, tolerance, social debate, and active work to combat isolation, exclusion and marginalization of individuals and all parts of society.

In few words, the critiques about public participation indeed are not related to the participation or to the quality of stakeholders, but rather to the efficiency and results of the participation process in a timeline, the evidence, and every year more and more, the acceleration of territory as an arena of the multivectorial institutional relationships.

When this public participation is integrated from the first day with a systematic approach, then it is possible to trace responsibilities, configure an accountability mechanism, and reinforce democracy.

Challenge for planners: governance of change

The challenge for planners is to contribute to a “governance of change,” meaning a change from traditional planning to innovative planning. A sine-qua-non condition for governance is “strategic planning”.

The aim of “good governance” is not only to regulate but also to catalyze “knowledge.” The traditional multilevel governance considers a top-down strategic approach aimed to the consensus. Instead the “governance of change” considers a multivectorial integrated system in real-time. This is the real challenge for planners, to move from a multisectorial programme and a timeline (one direction) to a multivectorial system in real-time (ubiquitous).

“Multilevel governance” considers one top-down institutional scenario (region-province-municipality) and it means to scale data for scaling solutions in terms of serving citizens. The Innovative Governance, or “governance of change,” is aimed instead to scale data, to share and decentralize the knowledge to finally propose scaled solutions and services to citizens. At the core of this debate is another innovative concept “social cohesion” via different instruments, technologically advanced and not. It is a matter of limitations and opportunities. It is a matter also of building solid and proactive partnerships among civil society, government and the private sector to achieve “knowledge for quality and competitiveness.” It means using shared-knowledge to foster quality of services delivered to the citizens and competitiveness among cities.

In other words, the aim is to foster local development via quality and competitiveness, promoting territorial cohesion among a multiplicity of actors and interests, as well as the involvement of private sector institutions and the direct participation of citizens 2.0 (organized as communities or nodes). It means fully active and connected in a scenario defined by a set of “data in progress” in real-time. These groups of citizens to the emergence of changes and so the aim of good governance is to decentralize the process of transformation and acceleration of cities via knowledge.

Technology, decentralized networks, and ubiquitous information help public engagement and feedback

Since the advent of the web browser Mosaic and the Internet in 1993, the accelerated use of information and communication technologies (ICTs) has created changes in human interaction that can facilitate public engagement. The main changes in term of public interaction created by the ICTs have been “interactive feedbacks” between community members and decision makers.

By using ICTs, they can engage in discussions, getting instant feedback from the public and from the decision makers. This way of interacting has decentralized traditional networks of power.

The access to information by ICTs also has experienced changes, and now it is in the form of “ubiquitous information.” This change provides potential access and aggregation of information in anywhere, anytime, and with different devices. It is expected that the way ubiquitous geographic information (UBGI) is produced and delivered information could increase the access to information and social opportunities (Kim, 2008; Townsend, 2005).

Cities using ubiquitous technologies require appropriate infrastructure, affordable ICTs services, support, and training. These are essential in order to achieve the level of public engagement and feedback required. People involved in “interactive feedbacks” need fast answers to their concerns, to be able to submit requests and interact. They need access to well-visualized information and feedback information monitored in real-time. This real-time condition may allow people to interact with decision makers and potentially with planners. Thus, planning will be required to be open and prepared to deal with these new interactions, networks, and the decentralization of information that can reduce the control of information by experts that have been centralized by top-down approach, and should move to decentralized bottom-up approach. Change introduced by ubiquitous information presents challenges such as the management of the amount of data which will imply standardization and interoperability of data.

CHAPTER 3

RESEARCH DESIGN

3.1. Research methods

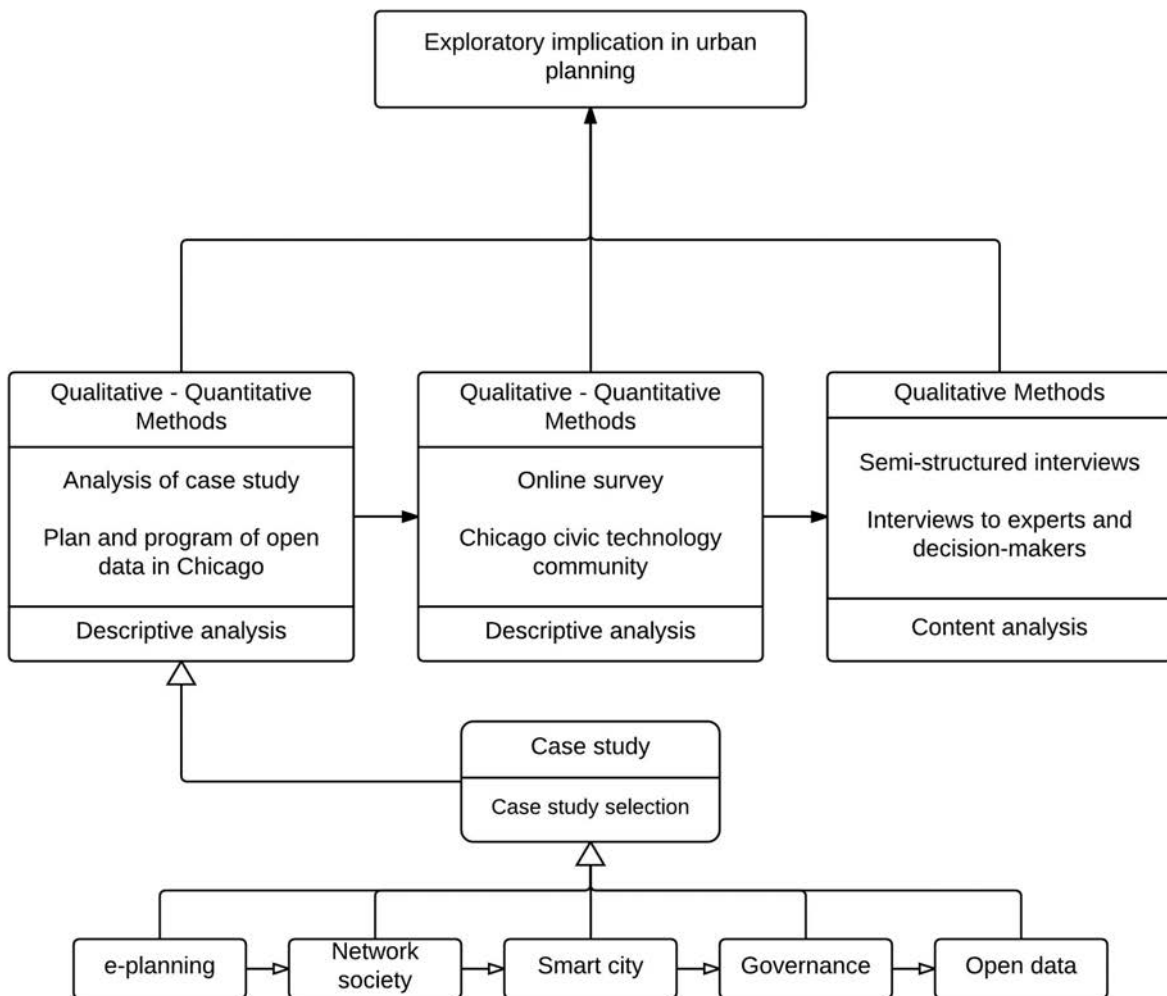
I chose Chicago as a case study for this exploratory research. The case selection was made because Chicago has developed programs and initiatives that support its efforts to become a smart city and an innovative space based on the use of open data. Chicago has become a remarkable and representative case of the use of open data on the local level. This research is significant because it studies the use of open data by analyzing collaborative environments involving citizens and the local government agencies. It considers their potential uses in the planning context for efficient urban e-governance and community participation that involves taking advantage of technologies. The research involves analyzing programs implemented in Chicago for the purpose of promoting transparency and accountability by offering public access to information by open data.

This exploratory research seeks to explore and analyze the case of Chicago using different approaches and it combines the strength of quantitative and qualitative research approaches, while maintaining the integrity of a single study (Yin, 2009). I employed these research methods for data collection and data analysis because previous approaches to the open data and smart cities have been highly dominated by quantitative methods that lacked the qualitative view. Thus, in this exploratory research qualitative and quantitative methods are integrated by analyzing a single case study (Yin, 2009). This research seeks to capture the uniqueness of a case study in order to obtain an in-depth understanding of “how” and “why” its particularities make possible its uniqueness.

Figure 2 details my dissertation process model. It follows a sequence which divides the case study into three main levels. The first level begins with a foundational literature review, and defines the research using a single case study. In the second level, I decided to develop the data collection and data analysis of the case study through qualitative and quantitative methods. The first part of the data collection revealed missing data regarding the community identified during

the research process. Thus, I included an online survey in order to provide a more detailed characterization of this community. I then conducted semi-structured interviews of experts and decision makers from different institutions involved with initiatives, plans and projects regarding of open data and smart cities in Chicago. Finally, I discussed exploratory potentialities for urban planning in theories and practices implications in community participation, e-governance and data management.

Figure 2: Dissertation process model



3.2. Data collection

This research considers quantitative and qualitative data in order to understand open data management in the collaborative scenario for the purpose of defining potential applications in the planning context. Data collection includes information such as the Chicago Technology plan. In the case of the civic technology community, insufficient data exist. Thus, I conducted an online survey and semi-structured face-to-face interviews, which provided data regarding the civic technology community and the perspectives of experts and decision-makers involved in open data and smart city initiatives. The online survey and interviews covered two different sets of questions; these are available in Appendix A and Appendix B.

Data collection focuses on information related to three main parts: 1) infrastructure, 2) governance and 3) civic technology community participation.

1) Infrastructure data:

- 2011 Chicago Survey
- MRI Consumer Survey (2008-2012)
- Broadband Illinois eStrategy Report 2013
- Current Population Survey
- U.S. Census Bureau

2) Governance data:

- The City of Chicago Technology Plan 2013
- Interviews and online questionnaire 2013
- Smart Communities Program, City of Chicago

3) Civic technology community participation:

- Chicago civic technology community online survey 2013
- Interviews and online questionnaire 2013

In this research I used online procedures: a web-based survey, digital audio recordings, and diverse devices and software were used to gather and analyze the collected data.

Internet Research

Scholars using Internet research as a method of data collection in social research. Internet research methods have strengths and weaknesses because not all participants have access to the Internet or sufficient skills to use it. These limitations can impact the validity and reliability of research. Thus, Internet research methods cannot simply mirror traditional methods and procedures, using the web or mobile platforms. Rather, Internet research procedures require revisions, variations, and the eventual creation of unique instruments that can be applied in an online setting. In addition, online procedures require paying attention to other factors that need not be considered when conducting paper-based and telephone-based surveys. For instance, in online surveys, the most relevant issues are the structural design, logical design, and visual design of the questionnaire, and the virtual interface used in accessing and navigating the online survey.

Online Survey

Traditional survey methods have experienced an evolution due to information technologies; indeed online surveys constitute a new and widely-used assessment format (Sue & Ritter, 2007). Online surveys have strengths and limitations, including a need for survey designs that use web platforms and requiring participant access to the Internet. Participants may also have concerns about privacy when participating in online surveys. Thus, during the process of inviting participants, it is necessary to provide a clear explanation of survey privacy and security issues according to the approved protocol. It is also crucial to consider questions of access, including whether or not participants are able to answer an online survey using mobile or other devices (Kalantari, Kalantari & Maleki, 2011).

I chose to conduct surveys for the purpose of obtaining data for characterizing the civic technology community identified in this research. To gather information from the community members and community behavior, I decided to use an online survey because I assumed that

potential participants have high levels of Internet access, the ability to use the Internet, and can participate using different devices.

The Chicago civic technology community online survey

To investigate the impact of open data in Chicago, I focused specifically on its effects on governance and community participation. I examined the civic technology community, also known as the civic innovation community, which arose in Chicago as result of the re-use of open data. I identified this community as being critical for innovation, because it goes beyond raw data, transforming existing data into new content and products that focus on urban concerns. As there was insufficient data available, initially, to develop a clear picture of the civic technology community of Chicago, understanding this vibrant community was one of the main purposes of this research. I initially identified a number of questions I wanted to answer via data collection:

- Who are the members of this community?
- What are their characteristics in terms of demographic information, level of education and types of skills?
- How they participate in this community?
- How they use open data?
- Do they work with planners and neighborhood communities?

I developed my final questionnaire based on these initial questions, and conducted an online survey in Chicago for the purpose of answering these questions and characterizing the community in question.

Sample

The sample considered in this survey included participants in the Open Government Chicago (-land) (Open Gov Chicago)³ and the Open Government Hack Night (Open Gov Hack Night)⁴ groups. These two groups were chosen because they constitute the core of the civic technology community of Chicago. I considered a “sample selection” of these two groups in the civic technology community.

The Open Gov Chicago group represents an open civic group organized and promoted by the Smart Chicago Collaborative⁵, an organization supported by the Chicago Community Trust, John D. and Catherine T. MacArthur Foundation and the City of Chicago. This organization plays a key role in terms of community engagement and participation in technology. The first public meeting of Open Gov Chicago was held in 2009. The group holds monthly meetings, and the members use multi-web platforms to communicate and disseminate information regarding activities and projects. The web platforms are Meetup.com and Google group. They stream meetings using Google Hangout and publish them online at Youtube.com. I physically attended four public meetings of Open Gov Chicago, which took place at the Chicago Community Trust. Each meeting had a specific topic, and involved presentations of programs and plans under implementation in Chicago. During these meetings the participants shared ideas, perspectives and opinions about the topics that were presented, and continued their discussions online using web platforms.

Around fifty people participate regularly in each monthly meeting. However, the number of participants sometimes increases. For instance, when the Technology plan was presented in October 2013, the number of participants doubled. To participate in these meetings, members of the Open Gov Chicago accepted email invitations sent by the coordinator, and around one hundred people accepted Meetup invitations. However, the regular number of people that attend to these meetings is around fifty and many follow meetings via a live stream.

³ <http://www.meetup.com/OpenGovChicago/>

⁴ <http://opengovhacknight.org>

⁵ <http://www.smartchicagocollaborative.org>

In 2013, I attended the following meetings of the Open Gov Chicago group:

- Meeting 1: Methods for Resident Engagement in the Civic Innovation Process (May 23, 2013)
- Meeting 2: Brett Goldstein of Chicago's Department of Innovation & Technology (June 13, 2013)
- Meeting 3: City of Chicago Tech Diversity Council Discussion (August 15, 2013)
- Meeting 4: City Technology Plan (October 30, 2013)

Many professionals make presentations during these meetings. These professionals came from the local government, private companies, universities and non-profit organizations. All of them work on initiatives that involve the management, visualization and the development of new content using open data. The audiences for these meetings came from the public, the private, and the non-profit sectors, and included independent professionals, community members of communities and graduate students.

The other group observed is Open Gov Hack Night. This group holds weekly meetings, and meet every Tuesday at the 1871, a start-up tech hub located in Chicago. Group members present new initiatives and projects that are under development. After the main meeting, coordinators invite to participants to discuss their projects by specific topic; participants are then divided into sub-groups based on their particular interests. When I attended their meetings, I counted approximately twenty regular participants. However, the number of participants increases when there are special presentations.

Open Gov Hack Night is based on sharing knowledge among participants. Some mentors also coordinate group activities. Open Gov Hack Night seeks to create new solutions to specific urban concerns and attempts to consolidate their activities over the long term through the creation of start-ups and new companies. Open Gov Hack Night uses web platforms to communicate and share projects and codes for developers. They have an index of projects⁶ and by November 2013, 109 projects registered. Conveniently, this index makes it possible to track

⁶ <http://opengovhacknight.org/projects.html>

the number of people involved in projects, including people who do not necessarily attend the weekly meetings.

I attended two meetings of the Open Gov Hack Night:

- Meeting 1: Bike Index and open source (October 22, 2013)
- Meeting 2: Chicago Data Dictionary by the City of Chicago (October 29, 2013)

Questionnaire design of online survey

I chose to conduct an online survey because I considered it the best way to administer a survey to potential participants. These participants are highly familiar with using web-based and mobile interfaces. I designed a structured online questionnaire for this survey. I divided the questionnaire into four main parts: I) participation, II) expertise and data use, III) urban issues and community, and IV) background. These four parts included questions regarding to their roles, expertise, skills, education levels, occupations, age range, sex, and race, among other variables [Table 8]. All of these variables contribute to providing a sample of the community members who are involved in the civic technology community of Chicago.

Table 8: Parts of the questionnaire

Part	Question	Section	Description
Part I	Questions: 1-3	Participation	Participation in civic technology groups
Part II	Questions: 4-9	Expertise and open data use	Skills and data management
Part III	Questions: 10-14	Urban issues and community	Urban interests and relationships with planners, different stakeholders and communities
Part IV	Questions: 15-22	Background	Demographic information, level of education and occupational sectors

I designed an online adaptive questionnaire for this survey. By filtering the questions that are displayed on the screen, the questionnaire changes depending on the answers provided by

participants. This adaptive characteristic of the questionnaire facilitates the process of answering questions because participants do not need skip questions that do not apply to them. This adaptive characteristic is designed to help reduce the number of participants who abandon the online survey before completion.

I conducted a testing period in order to evaluate the online survey software, and the hosting and application service providers (ASPs). I reasoned that the online data collection would benefit the survey process in term of procedure, reduce the time required for data collection, and facilitate data analysis. The evaluation and selection involved testing online questionnaires, the number of questions, number of responders, web-based interface, accessibility, survey distribution, format of export data, data analysis, security, and reports (Sue & Ritter, 2007). After a period of testing online surveys using different types of software and providers, I selected *SurveyGizmo.com*, which offers multi-platform interfaces for use on desktops, laptops, tablets and smartphones. In addition to facilitating participant access to the online survey, it includes an ample variety of question types, and aids in the reporting of results using different types of software.

Procedure of online survey

I contacted the coordinators of the Open Gov Chicago and Open Gov Hack Night groups for the purposes of conducting this survey. I requested their collaboration by distributing this survey to their group members. The Smart Chicago Collaborative organization was willing to collaborate by helping contact coordinators and disseminate invitations to participate in the survey. The survey invitation was disseminated to group members using the Google Group website and the Meetup site that they use to communicate.

The web post invitations detailed the conditions of participation, such as its voluntary nature and its anonymity and included a link to access the online survey. Before participants could respond to the survey, they first had to acknowledge their consent by clicking on a consent button on the first page of the online survey. This online consent form included all of the elements of traditional paper-based consent forms, and explained the terms of participation

according to the protocol previously approved by the Institutional Review Board of the University of Illinois at Urbana-Champaign.

The survey was conducted during a five-week period. I launched the online survey on October 16th 2013, and concluded it on November 20th, 2013. During these five weeks, I sent two reminders to both groups. Surveys completed were hosted by *SurveyGizmo.com*, the service provider of the online survey. For security reasons, the data collected was held in cloud storage on *Box.com* and *Dropbox.com*.

Interviews

This research identified actors from different sectors who play key roles in seeking to help Chicago become a smart city. Thus, I decided to include interviews with different stakeholders. Interview participants were experts and decision makers in public and private sector institutions, and included organizations involved in smart city initiatives and open data in Chicago. Interviewees were chosen due to their knowledge of the topics covered by the interview questions and were invited to participate by e-mail. Most participated by means of face-to-face interviews conducted in Chicago. Those who were unavailable for face-to-face interviews had the option of participating by responding to an online structured questionnaire. Table 9 presents the sectors and institutions of participants.

Table 9: Sectors of participants

Sector	Participants	Institution
Public sector	Open Data expert Urban Planner	City of Chicago, Department of Innovation and Technology The Chicago Metropolitan Agency for Planning
Private sector	Smart city expert Urban Planner	IBM Parsons Brinckerhoff
Organizations	Civic technology community coordinators	Smart Chicago Collaborative Urban Collaborative Systems Code for America

Procedure of Interviews

The participants who consented to face-to-face interviews were recorded in audio format. These audio recordings did not include personal information about the participants, and only included their answers to questions. The audio data records were saved in MP3 format and uploaded to cloud storage folders hosted on Box.com and Dropbox.com. Participants who used the online questionnaire received a script by e-mail that included a link for accessing the online questionnaire. Data was gathered using a web-based interface and hosted by the same provider used for the online survey (SurveyGizmo.com).

I contacted each participant via e-mail and invited them to participate in this study by means of face-to-face interviews. If the participant was willing to participate in this study, I then sent a follow-up email to set up a face-to-face interview. The duration of each interview was one hour, and each interview was conducted during a single meeting. I explained the paper-based consent form to participants before beginning the interview, and asked them to sign it. This consent form explained the conditions of participation, such as the fact that participation was voluntary and did not include personal information. This form also asked them whether they consented to the audio recordings of their answers. For those unavailable for face-to-face meetings, I also sent emails including instructions and information about how to access the online questionnaire. The online questionnaire included a request to provide consent.

The total number of participants invited to participate in the interviews did not exceed a total of seven people. This study provided confidentiality to participants in the face-to-face interviews and online questionnaires. Thus, the individual names of participants were not displayed, according to the protocol approved by the Institutional Review Board. I began conducting these interviews on October 22, 2013 and I concluded conducting interviews on November 22, 2013. I also conducted the structured online questionnaires during this period of time.

3.3. Data analysis

In this research, the data collected will be analyzed into three main phases:

Phase 1: Assessment of open data, policies and implementation

This phase takes into account the analysis of open data policies in the United States, their implementation, and their current use in Chicago. This analysis includes open data inputs and outputs expected from the initial purpose of transparency.

Phase 2: Data management in collaborative scenario and civic technology community

This research analyzes the collaborative scenario of data production and data visualization. Specific aspects to be considered in this analysis include elements, applications, services, and open data portals. It includes open data portal analysis in terms of sets of data available, categories, view types, interfaces, use by public, and frequency of use. It also examines how the local government and agencies share data. This phase explores the collaborative scenario in which occurs in the civic technology community, and analyzes how knowledge data creation occurs among actors involved. Thus, this phase identifies non-governmental actors involves such as civic developers and citizens that play a crucial role to add value to open data processing and dissemination.

Phase 3: Transference into planning context

Data production and access to information have experienced changes. However, planners have not yet fully integrated emerging technologies and this new collaborative dimension of open data into the planning context. This phase explores the potentialities of open data in collaborative scenarios that can be transferred into the planning context. This research purposes the collaborative dimension through Cyberenvironments in planning.

Analysis strategy

This exploratory research involves quantitative and qualitative analysis. The survey analysis has a quantitative approach that uses a descriptive analysis of results. The interviews are followed by a qualitative approach employing a content analysis of the results. The analysis approach uses a combination of data sources gathered by using different procedures such as document, surveying, and interviewing. Data and combinations of data provide strength and validity to findings, and each of them contributes to the case study (Patton, 1990 & Yin, 2009).

The online survey was analyzed using a descriptive analysis, identifying relationships between variables in order to characterize the chosen sample. The survey data gathered include nominal data, ordinal data and numerical data categorized by interval scales, which were analyzed according to data type. The preliminary process of survey data analysis began with a review of respondents who completed the questionnaire; most of the respondents answered all of the questions, while a few of the respondents omitted a few specific questions. Subsequently, I created an initial summary table that includes a collection of frequency distribution tables for each question. The summary table provided the first picture of the data gathered. This data analysis involved descriptive and inferential statistics, performing statistical tests, and testing relationships and clusters among variables—all analyses presented in chapter five. The survey results were analyzed using statistical and geographic information systems software including SPSS, R, RStudio and ArcGIS.

The survey results were downloaded from the hosting service provider (SurveyGizmo.com), and stored online at Dropbox.com. I conducted a data cleaning before analysis, which was required in order to facilitate the data analysis. This data cleaning process was comprised of three-stages: screening, diagnosing, and editing data (Van den Broeck, Argeseanu Cunningham, Eeckels and Herbst, 2005). This process allowed me to identify missing values, organize variable names, and recode a few variables.

In the case of the interview analyses, all audio files of interviews were transcribed using Transcriptions software, which allowed me to listen and type using a single interface. I identified each participant by number instead of name. After transcriptions, I composed a list of the initial

main codes, and during the process of coding I increased the initial list of codes as the need emerged with each interview. When I completed the coding process for all of the interviews, I did a review of all of the codes. As I found associations between some of the codes, I decided to come up with a new list of codes.

The Computer Assisted Qualitative Data Analysis (CAQDAS) has been considered to facilitate an accurate qualitative analysis process (Welsh, 2002). Thus, before beginning the process of coding transcripts, I conducted a testing period of different CAQDAS software, such as ATLAS.ti, Nvivo and Dedoose. Following this period of software testing and web application, I chose the Nvivo software to develop my coding process, as the software facilitates the analysis process after coding is completed. After completing the coding processes, I began to write memos for each code, which allowed me to identify concepts, topics, and links among codes. These links among codes allowed me to develop overarching categories and led me to develop my discussion. The interviews were analyzed using content analysis. I drew connections from the perspectives of the participants and built a discourse that led to a discussion that involves developing theories as well as implications for urban planning.

Expected Outcomes

This exploratory research provides an analysis of open data programs and policies implemented in Chicago in order to promote transparency and public participation. These programs and policies use open data visualization, supported by information and communication technologies. This research seeks to provide an assessment of open data and to define its potential uses in the planning context by focusing on urban governance and community participation. The approach to planning is based on planning in Cyberenvironments and takes collaborative planning into consideration.

CHAPTER 4

OPEN DATA IN CHICAGO

4.1. Open Data, policies and implementation

Open data from transparency to policy

The “Memorandum of Transparency and Open Government”⁷ (January, 2009) established an innovative approach to policy-making founded upon principles of transparency, participation, and collaboration. These principles were reinforced by the Memorandum “Building a 21st Century Digital Government”⁸ (May, 2012), which proposed the development and implementation of a comprehensive strategy for delivering digital services to the public. These memoranda reinforced the management of information by open data. One consequence has been that thirty-one states and thirteen cities are promoting transparency, accountability, and the dissemination of information in the form of open data. The United States recently announced the Memorandum of “Open Data Policy-Managing Information as an Asset”⁹ (May, 2013), which states that “open data” can be defined as structured data which is available and can be used and restructured by users into new contents. Open data should include the following principles: it should be public, accessible, described, reusable, timely, and well-managed, post-release.

Open data is increasingly becoming crucial for governments—particularly local governments which use open data to enhance transparency, disseminate information, create visible datasets, and apply user-centric practices. Moreover, others impacts produced by open data initiatives have emerged, which go beyond transparency and public access to information. These impacts can be catalyzed by an entrepreneurial government and involve governance and

⁷ Memorandum of Transparency and Open Government (January 21, 2009).
[http://www.whitehouse.gov/sites/default/files/omb/assets/memoranda_fy2009/m09-12.pdf]

⁸ Memorandum of Building a 21st Century Digital Government (May 23, 2012).
[http://www.whitehouse.gov/sites/default/files/uploads/2012digital_mem_rel.pdf]

⁹ Memorandum of Open Data Policy - Managing Information as an Asset (May 9, 2013).
[<http://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-13.pdf>]

human capital (Dawes, 2008), leading to new forms of governance. This has been transformed into so-called “e-governance” through the adoption of technologies that support public policies, government operations, and the engagement of citizens. With respect to civic engagement, e-governance is reshaping governance by enhancing interaction between government agencies and civic technology communities.

The civic technology community’s human capital shows how highly skilled citizens can take advantage of open data, add value to raw data, transform data into knowledge, and make visible data to facilitate the understanding of city dynamics. These impacts bring up unsolved issues concerning access to information and inclusion. Even though ICTs have improved and increased access to information available from the Internet and mobile devices, that does not mean that simple access implies understanding. Indeed most highly skilled citizens can take advantage of the openness of government through open data to develop new content using open data and create new businesses through new entrepreneurial networks. However, this dynamic may increase the gap between highly skilled citizens and less skilled citizens, reinforcing existing patterns of exclusion.

Open Data context

New York, Boston, San Francisco, and Chicago are home to leading open data initiatives in the United States. San Francisco was the first city to follow the federal open government portal¹⁰, launching the San Francisco Open Data Portal¹¹ in 2009. New York and Chicago joined this movement by developing open data legislation at the local level.

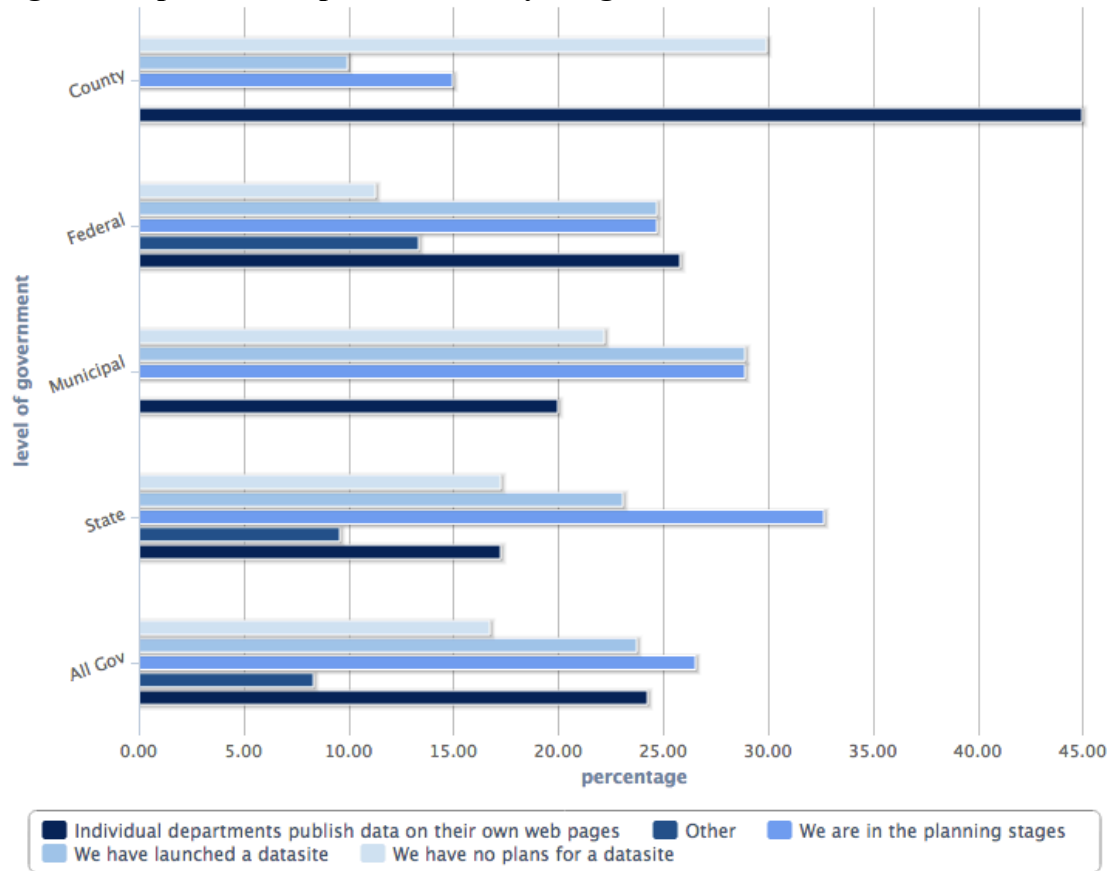
The Open Government Data Benchmark Study provides a big picture of the open data initiatives at the program and policy level in the United States (Socrata, 2010). The study examined government organizations (federal, state, county, and municipal), and found that 55.6 percent of government organizations had a mandate to publish data, 48.1 percent had published data, 23.8 percent had launched a centralized open data platform, and 28.9 percent of local governments had launched an open data platform [Figure 3]. This study also examined citizens’

¹⁰ Federal Open Government Portal [<http://www.data.gov>]

¹¹ San Francisco Open Data Portal [<https://data.sfgov.org>]

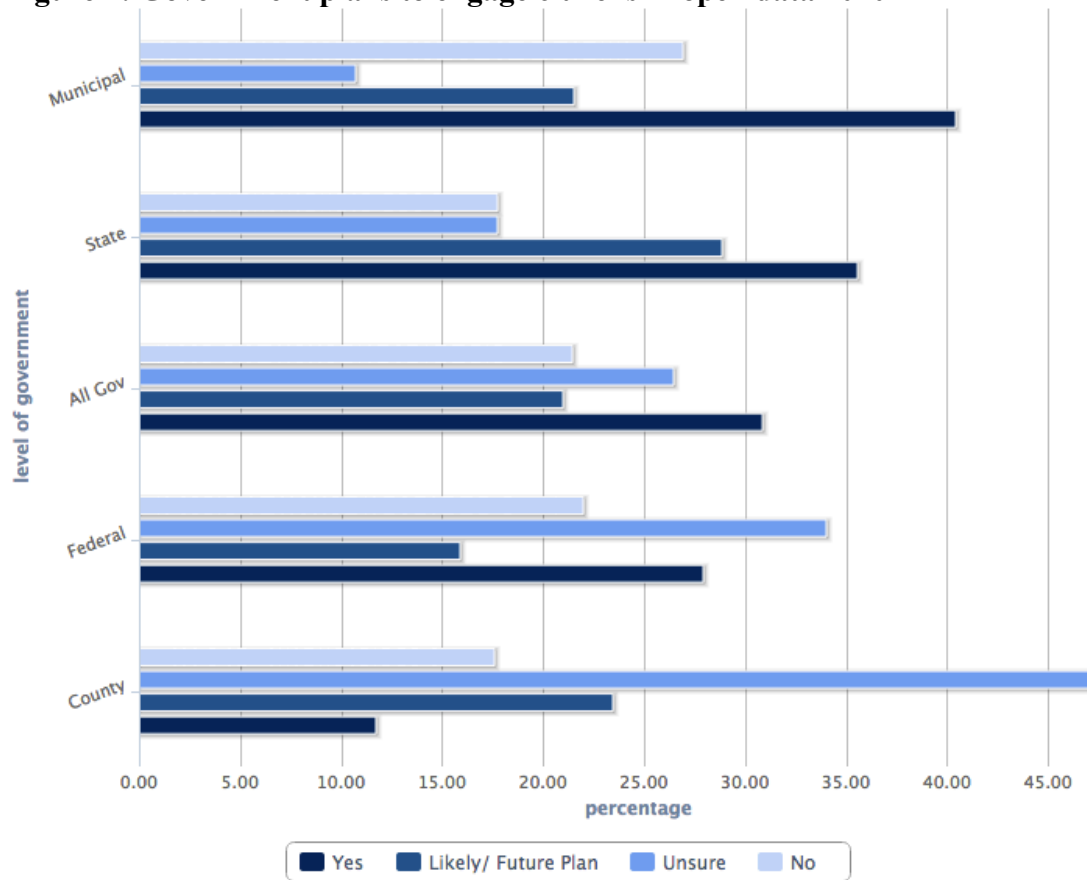
and developers' levels of engagement with, and interest in, open data initiatives and assessed their experiences using these open data platforms [Figures 4 and 5].

Figure 3: Open data implementation by the government 2010



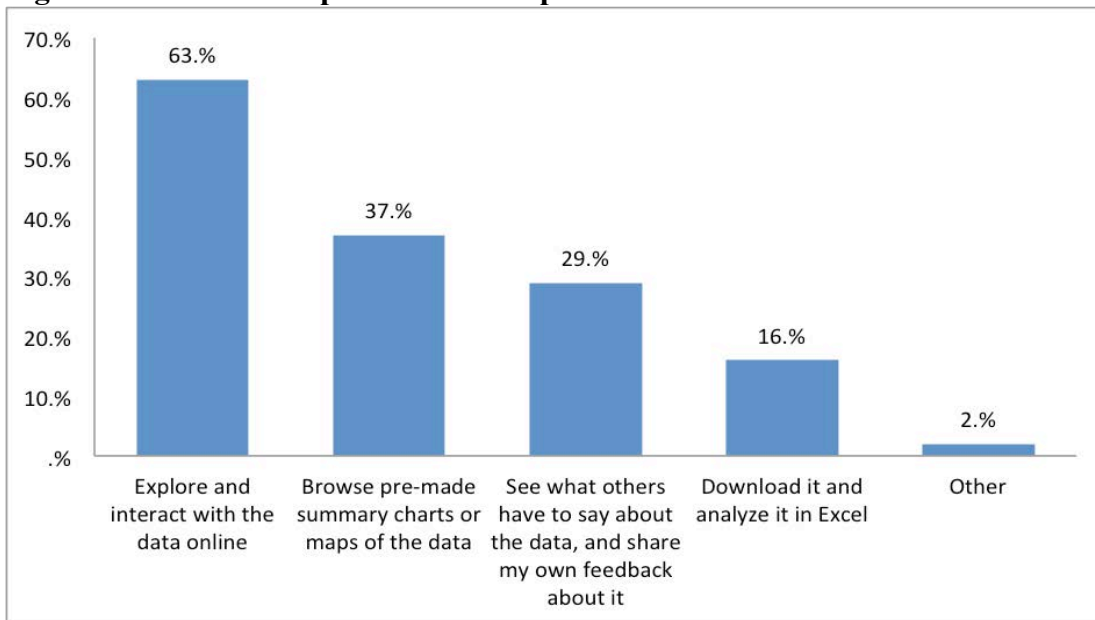
Source: Information collected from 2010 Open Government Data Benchmark Study.

Figure 4: Government plans to engage citizens in open data 2010



Source: Information collected from 2010 Open Government Data Benchmark Study.

Figure 5: How citizens prefer to access public data 2010



Source: Information collected from 2010 Open Government Data Benchmark Study.

Open data in Chicago

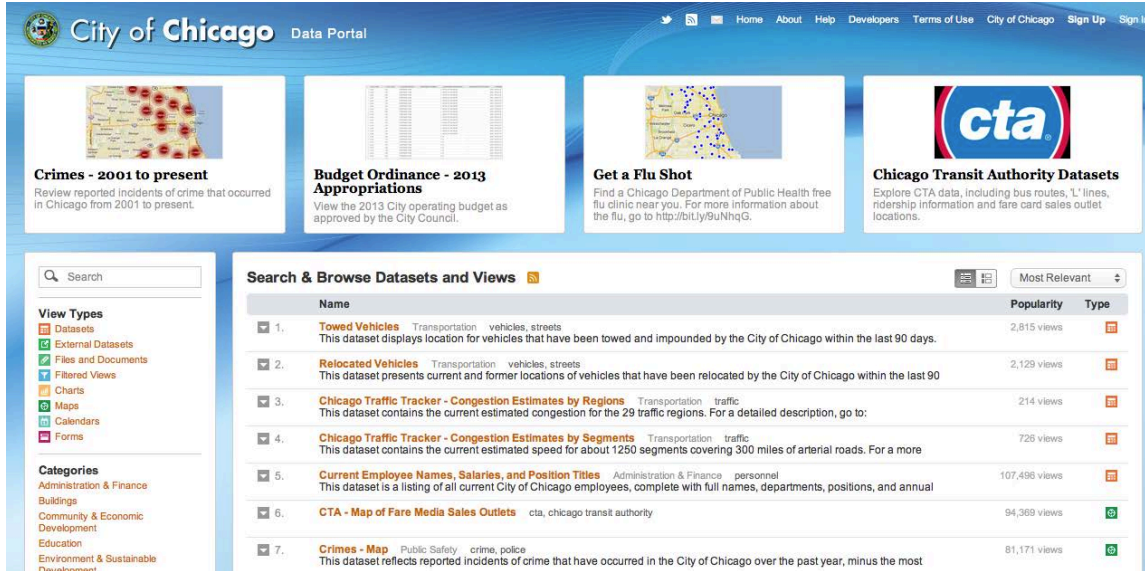
Open data initiatives have been implemented in Chicago as a result of the adoption of the Memorandum of Transparency and Open Government (2009). The development of efficient governance was included in the comprehensive regional plan GO TO 2040, developed by the Chicago Metropolitan Agency for Planning (CMAP). Chicago has encouraged a dynamic open data movement which goes beyond efficient data management on the part of the local government. The City of Chicago is playing the role of an “entrepreneurial local government,” and is encouraging the development of an emerging economic arena for producing material and non-material technologies. The different actors involved come from different sectors: public and private, entrepreneurs and civic society.

An active civic technology community shares data and knowledge for the purpose of collaborative production, co-production and co-creation. Members of this community are civic developers who represent the emerging, active, human-capital, knowledge-based society in Chicago. Regional and local government agencies and non-profit organizations also promote the use of civic technology to encourage the inclusion of less skilled and low-income community members. Projects and applications created by the civic technology community seek to provide solutions to urban problems, but the link to planning practices remains non-existent.

Chicago Open Data Portal

The open data platform enables citizens and developers to create content by means of visualization or interfaces using Application Programming Interfaces (APIs). The applications are based on open data, and can be created using the Socrata Open Data API (SODA), which allows access to data that is hosted on Socrata data sites.

Figure 6: City of Chicago Open Data Portal



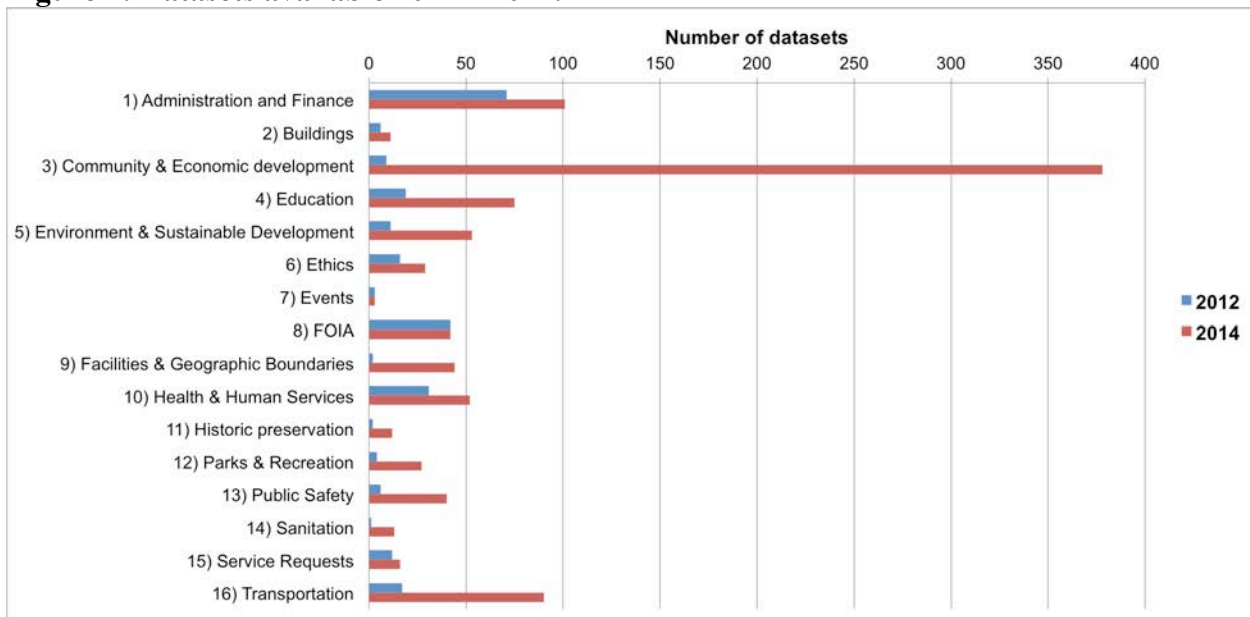
Source: [https://data.cityofchicago.org]

The Open Data portal is organized into three main sections: I) view types, II) categories and III) topics.

I. View types: 1) datasets, 2) external datasets, 3) files and documents, 4) charts, 5) maps, 6) calendars, and 7) forms.

II. Categories of Datasets

Figure 7: Datasets available 2012 – 2014.



Source: Information collected from the Chicago open data portal 2012 and 2014

Figure 8: 10 most accessed datasets 2014

Name	Popularity	Type
1. Current Employee Names, Salaries, and Position Titles Administration & Finance personnel This dataset is a listing of all current City of Chicago employees, complete with full names, departments, positions, and annual salaries. Fo	349,487 views	📄
2. Affordable Rental Housing Developments Community & Economic Development housing The affordable rental housing developments listed below are supported by the City of Chicago to maintain affordability standards. For infor	135,753 views	📄
3. Building Permits Buildings permits Permits issued by the Department of Buildings in the City of Chicago from 2006 to the present. The dataset for each year contains more th	176,924 views	📄
4. Potholes Patched - Last Seven Days Service Requests streets, pot holes This map shows potholes patched in the last seven days, based on the corresponding 311 service requests at https://data.cityofchicago.or	65,107 views	🗺️
5. Business Licenses - Current Active Community & Economic Development business, licenses, current This dataset contains all current and active business licenses issued by the Department of Business Affairs and Consumer Protection. Thi	88,379 views	📄
6. Crimes - 2001 to present Public Safety crime, police This dataset reflects reported incidents of crime (with the exception of murders where data exists for each victim) that occurred in the City	100,036 views	📄
7. Police Stations Public Safety facilities, gis Chicago Police district station locations and contact information.	124,606 views	📄
8. Food Inspections Health & Human Services food, inspections This information is derived from inspections of restaurants and other food establishments in Chicago from January 1, 2010 to the present.	101,570 views	📄
9. Chicago Street Names Transportation streets, gis List of all Chicago streets with suffixes and minimum and maximum address numbers.	80,819 views	📄
10. CTA - Map of Fare Media Sales Outlets (deprecated August 2014) Transportation cta, chicago transit authority, deprecated Map shows physical locations where CTA fare media, such as Transit Cards, CTA Passes and Chicago Cards were sold through approxim	182,359 views	🗺️

Table 10: Number of datasets by category.

Categories	February 2012	February 2013	February 2014
	<i>n</i>	<i>n</i>	<i>n</i>
1) Administration and Finance	71	80	101
2) Buildings	6	8	11
3) Community & Economic development	9	183	378
4) Education	19	42	75
5) Environment & Sustainable Development	11	29	53
6) Ethics	16	20	29
7) Events	3	3	3
8) FOIA	42	42	42
9) Facilities & Geographic Boundaries	2	16	44
10) Health & Human Services	31	44	52
11) Historic preservation	2	6	12
12) Parks & Recreation	4	10	27
13) Public Safety	6	18	40
14) Sanitation	1	7	13
15) Service Requests	12	14	16
16) Transportation	17	32	90
TOTAL	252	554	986

Source: Information collected from the Chicago open data portal 2012 and 2014

These categories are related to services that the City of Chicago either provides or manages. Data from these categories are re-used to develop new forms of data visualization using mobile devices or the web. Categories for which large data sets are available are not necessarily used more frequently. For example transportation, public safety, community, buildings, and environment have been used most frequently to develop applications for mobile devices or web-based data visualization [Table 11].

Table 11: Characteristics of digital applications developed using open data

Area	Name Apps	Real-time	Problem identification	Problem solution	Feedback/ opinions
1) Transportation	What's driving costing you?			X	
	CTA apps	X		X	
	allSchedules			X	
	Was My Car Towed or Relocated?			X	
	Chicago Winter parking	X		X	
	SpotHero			X	
	FastParkchicago	X		X	
	Taxi Share Chicago	X		X	
	Offline Bike Map			X	
2) Public safety	Crime App		X		
3) Community engagement	SeeClickFix		X		X
	Fixit		X		X
4) Environment	Metro Chicago Farmer's Market			X	X
5) Building	Vacant and abandoned building finder		X		

Source: Information collected from different sources. Civic Apps from Chicago Digital (December, 2012). [<http://digital.cityofchicago.org/index.php/open-data-applications/>]

Most applications seek to provide solutions to urban issues, particularly transportation. Examples include parking, driving costs, and the schedules for public transportation. Applications allow people to report and track urban problems in real-time. Users can include both information about specific locations and a few details about the problem, such as infrastructure issues or crime incidents, in order to foster awareness and collaboration when solving problems.

The Chicago Technology Plan

The Chicago technology plan was launched in September 2013. In 2012, the open data executive order established that city agencies were required to provide public data and update information using the open data portal. This was done under the supervision of the Department of Innovation and Technology. In September 2011, the City of Chicago published crime datasets from 2001 to 2011 through the open data portal. In April 2010, the open data portal began operations with 24 datasets. Chicago has experienced a continuous evolution of open data offerings from 2010 to 2014 [Table 12]. This evolution is not limited to increases in number of datasets available online, and was supported by the Chicago Technology Plan, which provides a framework for recent, current, and future actions in adopting technologies.

Table 12: The Chicago open data from 2010 to 2014

2010	2011	2012	2013	2014
Open data portal (April, 2010)	Open data portal (June, 2011) Crime datasets (Sept., 2011)	Open data executive order (December, 2012)	Technology Plan (September, 2013)	First annual open data report (February, 2014)

Source: Own production collected from different sources.

This technology plan brings the vision, strategies, and initiatives that Chicago needs to support, its future technological development. In this context, the Mayor of the City of Chicago emphasized the following:

Technology is critical for both job creation and improving the quality of life for our residents. Both of these areas are top priorities in the city of Chicago and this framework will help us realize our collective potential. I see the development of technology in Chicago as a key area of focus for the future (Emanuel, R, September 2013).

This plan also has been seen as a tool for promoting resident engagement using technologies. In following this vision, the Chicago Department of Innovation and Technology (DoIT) Commissioner and CIO stated:

The Tech Plan is a tool of engagement between the residents of the City and their government as we work together to solve the problems facing our communities and embrace technology as an innovative solution to those problems (Berman, B., September 2013).

The development of technology in Chicago has been seen as an engine that has the potential to drive economic development. Key to this are developing a skilled workforce and attracting the technology sector investments, turning Chicago into a technology-based city. The Chicago Technology Plan has defined the following key objectives:

- 1) to continue to release more data to the public as a part of creating a more efficient government,
- 2) to expand the use of social and digital media to communicate with the public, and
- 3) to consolidate local IT services to improve efficiency and quality of delivery.

This technology plan has twenty-eight initiatives within five foundational strategies. The foundational strategies are: A) A next generation infrastructure, B) Every community a smart community, C) Efficient, effective, and open government, D) Civic innovation, and E) Technology sector growth [Table 13]. The plan reinforces the idea of Chicago becoming a city where technology can catalyze new opportunities based on innovation, inclusion and engagement. The twenty-eight initiatives include both current and future initiatives.

Table 13: Foundational strategies and initiatives

Strategies	Initiatives
<p>A. A next generation infrastructure</p> <p>Establish next-generation infrastructure that enables residents and businesses to become more digitally-engaged.</p> <p>High-speed Internet is becoming increasingly essential for both residents and businesses. Chicago is committed to making this resource available by engaging private companies, universities, and other organizations to build a world-class broadband infrastructure, increase options for broadband service in underserved areas, and provide free Wi-Fi access in public spaces across the city.</p> <p>Achieving these goals will support public and private technology initiatives citywide and will help residents and businesses become more digitally-connected and technologically-savvy.</p>	<ol style="list-style-type: none"> 1) Work with partners to increase speed and availability of broadband in Chicago 2) Enable a digital public way 3) Implement policies and infrastructure to allow for urban technology experimentation
<p>B. Every community a smart community</p> <p>Bridge the digital divide to ensure the full participation of all Chicago residents and businesses in the digital economy through training and engagement programs that make technology relevant, useful, and productive.</p> <p>The City strives to make every community a “smart community” in which everyone is able to fully participate in the digital economy. Increasing the number of digitally-connected and technologically-savvy residents and businesses yields increased job placement, broadband market demand, and business growth opportunities. Through school- and community-based efforts, the City will help make technology relevant to residents’ and businesses’ needs and interests. The City will partner with community leaders, nonprofits, and businesses to develop best practices from local research and pilot programs.</p>	<ol style="list-style-type: none"> 4) Establish a smart community benchmark and toolkit for broadband access and use 5) Scale up smart communities 6) Make free Wi-Fi available in public places 7) Increase options for low-cost broadband 8) Educate and engage young people in technology 9) Offer digital training and hands-on technology expertise 10) Promote digital excellence activities 11) Provide public computer access and support 12) Make educational and creative resources available to residents

Table 13 (continued)

Strategies	Initiatives
<p>C. Efficient, effective, and open government</p> <p>Leverage data and new technology to make government more efficient, effective, and open.</p> <p>The City of Chicago is working to become more efficient and effective across its departments by leveraging new technology, gathering, analyzing, and publishing data, and utilizing these tools and information to improve government processes and services.</p> <p>Data-driven decision-making is helping the City reduce costs and offer services better tailored to public needs. Chicago is utilizing new technologies, such as mobile and social media technology, to increase its connection to its residents and provide quality services in a complete and timely manner.</p>	<p>13) Utilize data drive efficiency and effectiveness</p> <p>14) Increase and improve city data</p> <p>15) Leverage technology to improve communications</p> <p>16) Focus on expertise implementation of technology</p> <p>17) Consolidate local government data centers</p> <p>18) Focus resources on innovative technology solutions</p>
<p>D. Civic innovation</p> <p>Work with civic technology innovators to develop creative solutions to city challenges.</p> <p>Civic innovation occurs when individuals work with government to improve the quality of life in urban areas. To encourage civic innovation, Chicago offers a range of tools and initiatives that give Chicagoans a stronger voice in government decisions and empowers them to develop creative solutions to city challenges.</p> <p>The City also harnesses the power of civic innovation to anticipate and identify residents’ concerns, allocate the best resources to address these concerns, and respond more effectively when problems arise. Chicago’s visionary civic leaders, robust entrepreneurial community, and world-class research universities are using technology to transform civic collaboration and reimagine the relationship between government and its residents.</p>	<p>19) Research data-driven solutions to major urban challenges</p> <p>20) Bolster transparency and support civic hackers</p>

Table 13 (continued)

Strategies	Initiatives
<p>E. Technology sector growth</p> <p>Encourage the vibrancy of Chicago’s Technology Sector by attracting and retaining in Science, Technology, Engineering and Mathematics (STEM) professionals and supporting the creation and expansion of technology companies.</p> <p>Chicago is driving economic growth and job creation by encouraging the vibrancy of Chicago’s Technology Sector, especially in the areas of Web/Mobile, CleanTech, and Biosciences. With Chicago’s mature business sector and world-class universities as a starting point, the City is focusing on attracting and retaining talented STEM-trained professionals and technology firms to Chicago, encouraging existing companies to expand, and supporting the creation of start-up companies.</p>	<ul style="list-style-type: none"> 20) Expand the number of physical incubator and co-working spaces in the city 21) Expand the number of successful networks that exist to connect entrepreneurs with costumers, venture capital, and membership opportunities 22) Attract and retain a talented, diverse STEM workforce 23) Showcase ‘Why Chicago’ is a destination technology city through consistent messaging and events 24) Encourage technology firms to promote their ties to Chicago 25) Strengthen connections with world-renowned academic research institutions 26) Foster a business-friendly environment 27) Promote ways to increase venture capital and other funding available to start-ups

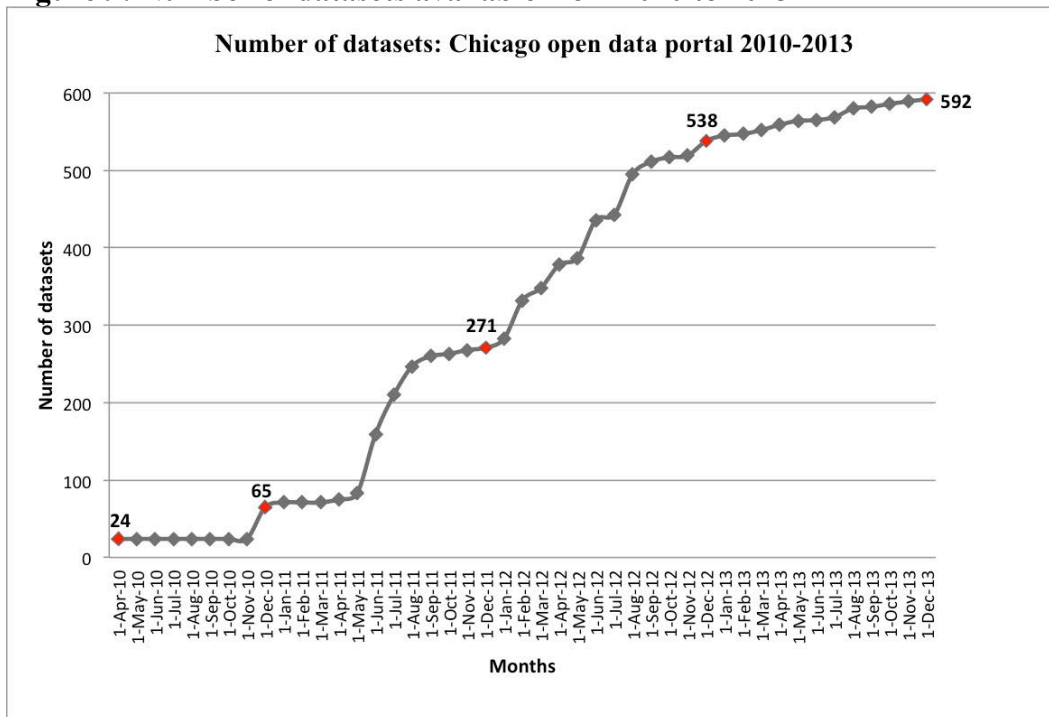
Source: Data gathered from the Chicago technology plan (City of Chicago, 2013)

The technology plan defines that these twenty-eight initiatives will seek to drive benefits in seven areas of impact: 1) savings, 2) services, 3) engagement, 4) access, 5) skills, 6) jobs and 7) training in Science, Technology, Engineering and Mathematics (STEM). The plan considers these areas to be sample indicators. In February 2014, the first annual report did not include an evaluation based on these indicators.

The first annual report shows that the number of datasets made available by the Chicago open data portal increased from 2010 to 2013. The open data portal had 24 datasets in April

2010, 65 datasets available in December 2010, 271 datasets available in December 2011, 538 datasets available in December 2012, and 592 datasets available in December 2013 [Figure 9]. The City of Chicago has announced that it will continue to increase the number of datasets available through the open data portal.

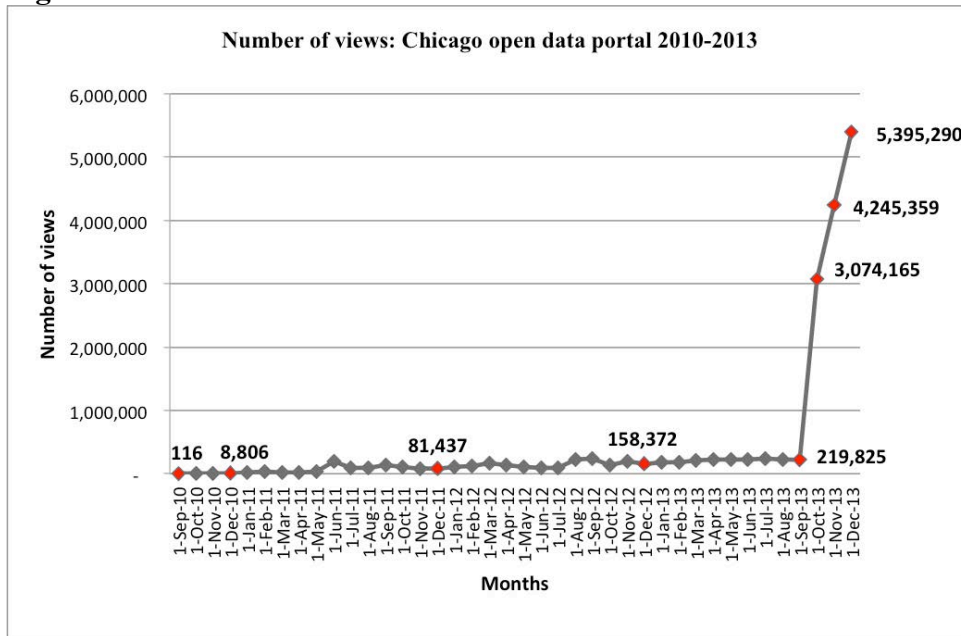
Figure 9: Number of datasets available from 2010 to 2013



Source: Data gathered from the Open data annual report 2014 (City of Chicago, February 2014)

The number and type of datasets available and the number of views have all increased. In December 2010 there were 8,806 views. Exactly, one year later, the open data portal was re-launched, at which time there were 81,437 views. In December 2012, when the open data executive order was announced, there were 158,372 views, and the number of views has only continued to increase. In October 2013, there were 3,074,165 views, and in December 2013, the number reached 5,395,290 [Figure 10].

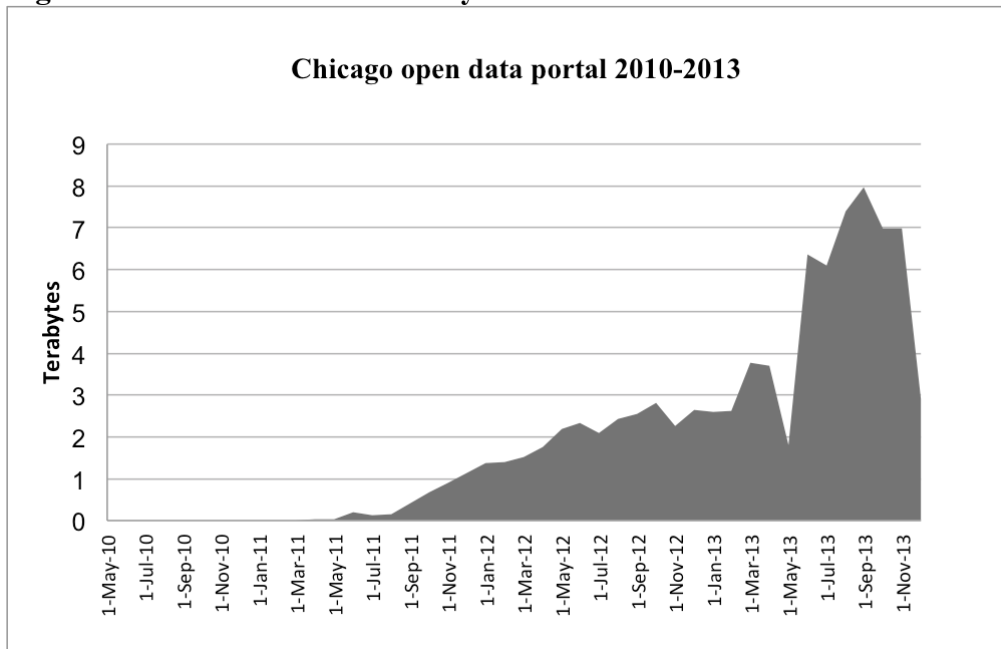
Figure 10: Number of views from 2010 to 2013



Source: Data gathered from the Open data annual report 2014 (City of Chicago, February 2014)

Figure 11 presents the evolution of data accessed in terms of terabytes from 2010 to 2013. This reflects an increase from 0.42 terabytes in September 2011, to 2.6 terabytes in September 2012 and the largest amount of data accessed was 8 terabytes in September 2013. Table 14 shows data downloaded from Chicago open data portal.

Figure 11: Data accessed in terabytes 2010-2013



Source: Data collected from the Open data annual report 2014 (City of Chicago, February 2014)

Table 14: Chicago open data downloaded from 2010 to 2013

	November 2010	November 2011	November 2012	November 2013
Terabytes	0.0033	0.9035	2.2548	6.9933

Source: Data collected from GitHub Chicago [<https://github.com/Chicago>]

This technology plan provides a framework for the implementation of initiatives and projects by the City of Chicago, and between the City of Chicago with other non-profit organizations. The Chicago Technology Plan incorporated the strategy of “civic innovation,” that increased the civic innovation space as a result of the open data portal. Even though developers and citizens were using data before the open data portal existed, they were not working together as a community. Citizens who are active in the civic innovation scenario have a collaborative approach to civic concerns and they attempt to provide urban solutions that will improve the daily lives of residents in the Chicago metropolitan area. The level of engagement that has developed between this community and the local government reflects a change in local governance. The Chicago technology plan takes a direction that other cities might take into account.

4.2. Digital Infrastructure

Digital infrastructure requires openness and interoperability, and is critical for developing a smart city. When cities lack appropriated conditions such as networks, fast speed connections, access to the Internet, and skills, it is impossible to expect that stakeholders, community members, and government agencies will be able to take advantage the Internet’s potential. Networks and connection speed are among the challenges that the digital infrastructure needs to improve, and Internet access has been another challenge of the digital age since the 1990s. However, Internet access has increased since that time, and the ways in which the Internet can be accessed have become more diverse. Previously, Internet access was available only by computer. Internet access is now available through a variety of devices such as smartphones, tablets, and

consoles to name a few. In addition, social programs seek to provide access in public libraries and other locations in neighborhoods; these can help reduce the digital access gap.

Digital access is not only a simple connection. It requires a digital infrastructure similar to physical infrastructures such as water, energy, sewage, and transportation—infrastructures that have themselves become increasingly dependent on information and communication technologies (Kim, 2008). The dependence of the digital infrastructure is gaining attention in the form of programs and initiatives in the United States. These programs and initiatives seek to improve and renew the digital infrastructure by extending broadband and the implementation of high-speed Internet. Nonetheless, a considerable gap in the availability of this infrastructure remains, differs within cities and among cities (Van der Meer & Van Winden, 2003).

I consider *access*, *skills* and the *speed* to be the three main disparities regarding technology infrastructures. These are relevant because limits to access, skills, and speed lead to exclusion by virtue of generating social inequalities. People with access at home can obtain and provide information. The manner in which people use their access depends on the level of skill they possess, and they can use their access in an informative or a transformative manner. For instance, if they have sufficient skills, people can telecommute but these opportunities depend on the speed of connection for data transmission.

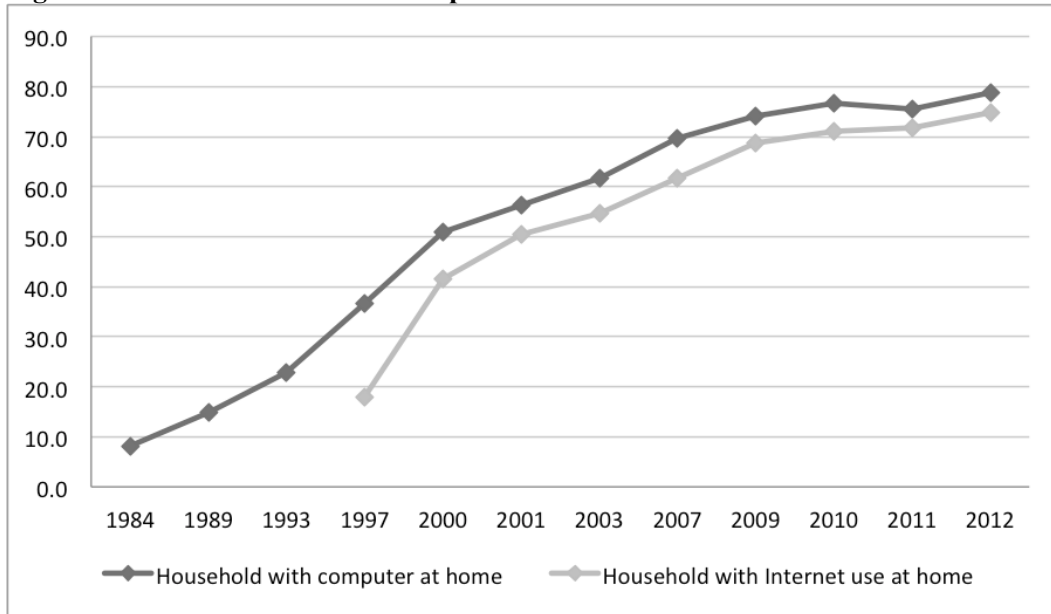
There are certainly disparities in Internet access speed. For instance, broadband is not available in all urban and rural areas. Another consideration is the cost of speed connections. However, the rapid development of technologies has improved both access and speed. The Pew Internet & American Life Project Surveys collected information from 2000 to 2013, asking adults aged 18 and older how they access the Internet at home. The results show that in 2000, 34% used dial-up connections and 3% used broadband; by 2013 3% were using dial-up and 70% were using broadband.

During the 1990s, the focus was on the lack of “Internet access,” which was known as the digital divide. In the 2010s the focus is on increasing “Internet speed,” the new principal digital divide. Therefore, the broadband extension and other forms of improvement are current

initiatives designed to reduce the speed gap. Thus, as technology changes rapidly, the digital divide also takes on different forms.

Figure 12 illustrates the evolution of households with a computer at home and Internet at home from 1994 to 2012 in the United States. In 2001, households with a computer at home and households with Internet at home constituted over 50 % of all households; this increased to over 70 % in 2010. In the case of the household with Internet at home, there were not questions regarding to the Internet before 1997. In 2009 there was a deceleration of households with Internet at home, as well as of households with a computer at home. This deceleration continued through 2011.

Figure 12: Households With a Computer and Internet Use in the United States: from 1984 to 2012



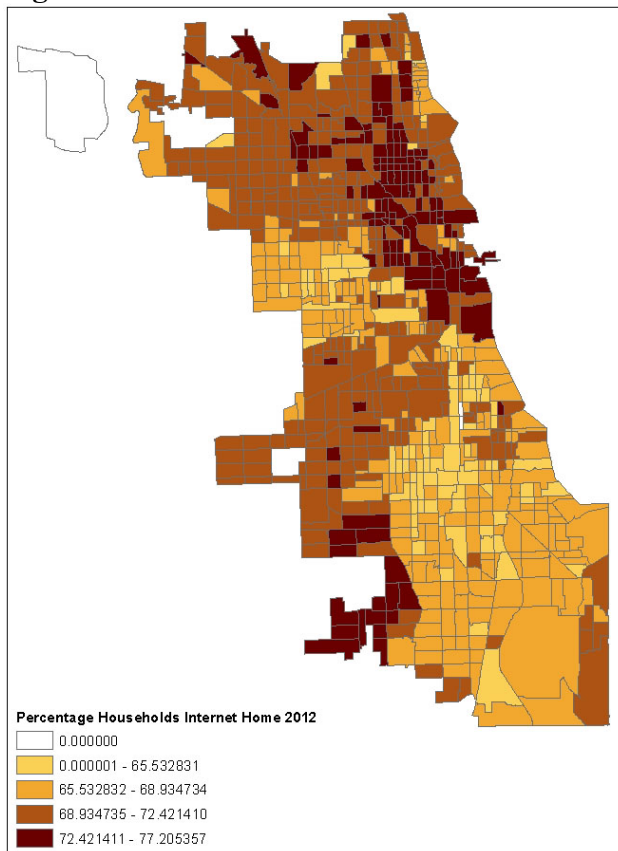
Source: U.S. Census Bureau, Current Population Survey.

Digital Infrastructure in Chicago

Improvements in digital infrastructure in Chicago are critical for fostering a smart city. There are initiatives for improving access, reducing the digital divide in specific community areas and neighborhoods, and for creating high tech districts and innovation hubs. However, all of these initiatives require improvements in digital infrastructure in terms of physical networks and the speed of connections. Digital infrastructure needs to be affordable for all people. Figure 12 illustrates that community areas characterized by limited incomes do not often use the Internet at home. Cost and the skills needed to use the Internet are barriers that need to be reduced.

Figure 13 shows households that used Internet at home in 2012. In the North East side of Chicago, from 72 percent to 77 percent of households used the Internet at home.

Figure 13: Households Internet at home in Chicago 2012



Source: U.S. Census Bureau and MRI Consumer Survey (2008-2012)

Broadband and smartphone connection by spatial use in Chicago

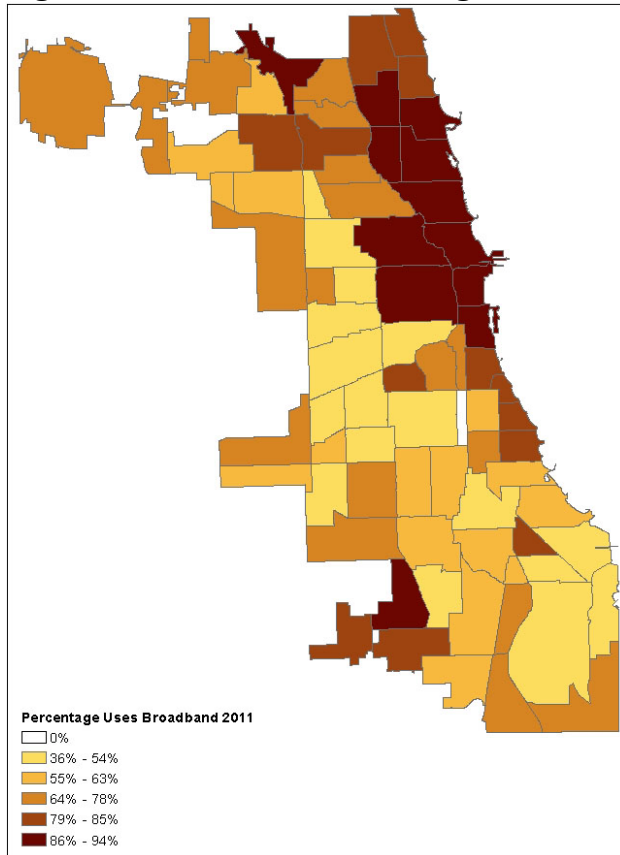
Broadband can provide connection by medium using different platforms such as DSL, cable, and fiber-optic. In 2008 the Federal Communications Commission (FCC) considered basic broadband speed to be 768 kbps to 1.5 mbps. This basic broadband speed is expected to soon become outdated. The City of Chicago is considering requiring a minimum speed of 45 mbps downstream and 15 mbps upstream in order to be competitive.

One goal of the City of Chicago is broadband infrastructure expansion. The City of Chicago seeking to have a gigabit or near gigabit speed broadband in seven innovation zones in order to provide robust access to research centers and industrial and commercial areas. The purpose of this initiative is to stimulate economic growth by fostering innovation and job creation. The expansion of broadband adoption has also been promoted at the neighborhood level. The Broadband Technology Opportunities Program (BTOP) began in 2010, and this program seeks to increase broadband adoption and provide financial support for local programs. Chicago has the Smart Communities Program supported by the LISC Chicago, City of Chicago and financially supported by the BTOP.

To explore broadband adoption on the local scale, I considered data from the 2011 Chicago Survey. That survey was conducted by telephone and had a sample size of 2,905 residents. The survey provided information about how people access the Internet by using broadband and using smartphones only (Mossberger & Tobert, 2002). The spatial distribution involved 77 community areas in Chicago.

Figure 14 illustrates the broadband spatial distribution in community areas. Eleven community areas on the North East side and one community on the South West side of Chicago show concentrations of over 86 percent using broadband to connect to the Internet. By contrast, there are seventeen areas, most of which are located on the South side of Chicago, where only 36 percent use broadband to connect to the Internet.

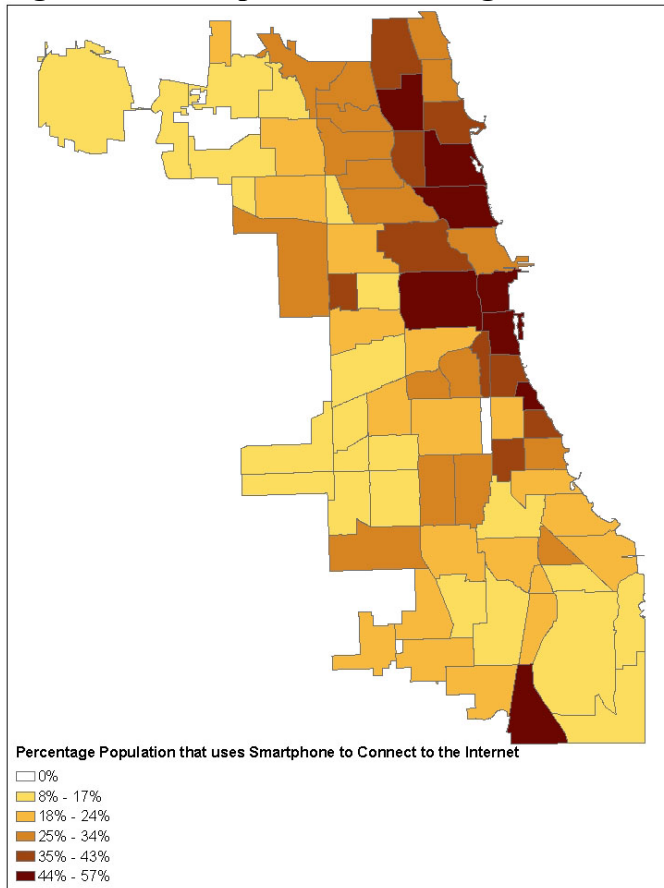
Figure 14: Broadband Use Chicago 2011



Source: Information gathered from the 2011 Chicago Survey

The type of access by broadband and mobile devices (smartphones) can be critical for activities and content on the Internet. Broadband can facilitate the amount of data which can be accessed by the speed used to upload, download and develop new contents. In the case of smartphones, these can facilitate access by instant communication, and feedback can add real-time information by digital applications. Thus, the limited availability of broadband and mobile devices can create gaps or reinforce existing inequalities related to access to information, communication and knowledge.

Figure 15: Smartphone Uses Chicago 2011



Source: Information gathered from the 2011 Chicago Survey

Smartphones are used to connect to the Internet, and smartphone use exhibits a pattern that is similar to broadband use. However, smartphones are used to connect to the Internet less frequently [Figure 15]. This map illustrates that only eight community areas have achieved the range of 44 percent to 57 percent. Most of these community areas are located on the North East side of Chicago, and only one community area is located on the South side.

The case of open data in Chicago showed us that data aggregation and open data did not increase simply as a consequence of Memorandum of Transparency and Open Government. Rather, the key factor was the “hyperlocal” condition of Chicago with communities interested in social and public issues. This has distinguished Chicago from other cities and metropolitan areas in the United States, where the impact of open data has not developed beyond simple data aggregation. Leadership is another key factor present in Chicago, and leadership present at different levels, not only from government agencies. Thus, when all these stakeholders (government agencies, non-government organizations, researchers, citizens, entrepreneurs) come together, working together with a shared interest, they underscore that open data is not only a technological issue, but a social and cultural issue as well.

Today the main topic of debate about innovation on planning and policy making concerns urban areas versus cities. This debate is focused on a multifarious approach to "territory" and subsequently to "space". For several decades, cities were the main core of the debate that involved the public and private sector on different institutional arenas; the most representative example of this are the multilevel scenario of national, sub-national and local governments. Metropolitan Chicago is a magnificent example of the multilevel governance scenario, and as a case to analyze related to the “societal processes” necessary to achieve and improve the collective creation of value, knowledge and the engagement of civil society in public issues.

Open data suggests a new arena in which terms like “real-time,” “data transfer,” and “dissemination” are emerging as key aspects to consider alongside traditional civic terms like democracy, governance, social cohesion and sustainability. In some senses the societal processes is unpredictable (but not stochastic) since it responds to a continuous acceleration of the anthropized territory embedded in technology and embarked upon in a collaborative and innovative approach to improving and increasing knowledge—specifically public and collective knowledge.

Today, cities have to innovate and create knowledge constrained by current circumstances and reduced budgets, all while constantly debating with new stakeholders in a democratic fashion. Thus, it is time to rethink the cities and consider a better policy making process, and to widely foster and increase competitiveness about energy efficiency, logistics, connectivity, and accountability. All these achievements have to be transferred and sustained on a variety of scales from the urban to the metropolitan, from the local to the regional, and from the territorial to the spatial on a continual (real-time) basis and via a participatory and collaborative open data platform. Such as qualities make shared knowledge more effective and render possible the collective building of the "perfect momentum," and Chicago is on this track.

Nonetheless, digital infrastructure in Chicago still reproduces inequalities, as access to the Internet, and the "speed" of such access represent the new digital divide that affects and limits access to knowledge, the possibility of knowledge creation, and the development of collaborative environment knowledge sharing. Thus, this is a big challenge that Metropolitan Chicago needs to address. It is not enough to only generate special innovative zones; it is necessary to also reduce the gap created by who have and those who do not have appropriate "internet speeds" that facilitate knowledge creation to all communities.

CHAPTER 5

SURVEY AND INTERVIEWS RESULTS AND ANALYSIS

5.1. Survey results and analysis

This chapter presents the results of the data collected using the online survey. The online survey provided information about the Chicago technology community by collecting information gathered from participants in the Open Gov Chicago group and the Open Gov Hack Night group. Both groups are active members of the current civic technology ecosystem in Chicago. This analysis seeks to provide a characterization of the Chicago civic technology community.

An exploratory and descriptive approach was used to analyze the survey; most of the results take the form of categorical and ordinal data. I used mixed methods to test associations, relationships, clustering, independence and homogeneity among the variables. I also used several types of descriptive statistics such as chi-square tests and frequencies, cross-tabulations, and exploratory hierarchical cluster analysis.

The online survey was conducted during a five-week period beginning on October 16th 2013, and concluding on November 20th 2013. I attended several meetings of these two groups to explain the online survey and to invite them to participate. In addition, I invited participants via the online groups they use to share information about their activities, meetings, and projects. The online survey consisted of 22 questions asking them about their participation, their expertise in data use, urban issues, community interests, and their backgrounds, including variables such as: race, age, sex, and education level, among other variables.

The survey was answered by a total of 65 participants. Of the respondents 24 are members of the Open Gov Chicago, 10 are members of the Open Gov Hack Night, and 31 participate in both groups [Table 15].

Table 15: Distribution of members by group

Groups	<i>n</i>	%
1 Open Gov Chicago	24	36.9
2 Open Gov Hack Night	10	15.4
3 Open Gov Chicago and Open Gov Hack Night	31	47.7
Total	65	100.0

As can be seen in Table 15, almost half of the survey participants are members of both groups (47.7 percent), with 36.9 percent being members of group 1 (Open Gov Chicago) and 15.4 percent being members of group 2 (Open Gov Hack Night).

This sample size is similar to the observed number of people attending the regular meetings of these two groups. I observed that Open Gov Chicago had about fifty participants during its regular meetings while Open Gov Hack Night meetings typically had twenty participants. In both cases, when meetings were held on exceptional topics, such as those meetings including special guests, the number of participants increased to about double the average. Thus, this sample size fits the attendance at the regular meetings, which is an appropriated number of participants in this analysis. It is important to notice that some of the participants who attend these meetings are not frequent participants and may only attend to a single meeting.

Most of the participants (49.2 percent) became members of these groups during 2013. In 2012, 30.8 percent joined these groups, while 7.7 percent joined in 2011. Open Gov Chicago was the first group to be created (2009), and 6.6 percent of participants joined in that year. Thus, the number of participants increased significantly in 2012. It is important to notice that the open data portal was re-launched in June 2011. In December 2011, there were 271 datasets available, in contrast with 65 datasets being available in December 2010. By December 2012, there were 538 datasets available. Thus, I consider this to be an impact of the open data portal which was re-launched in 2011, increasing the number of people taking part in these groups.

I was interested to know the ways in which members of these groups participate. Question 3 asked about the ways of participation, and respondents had the option of answering

by selecting all that apply. These included attending meetings, making presentations, being a mentor or leader, developing projects, and networking, among others. In addition to attending meetings, networking ($N=47$) and developing projects ($N=36$) constituted the most common ways of participation [Table 16].

Table 16: Ways of participation by group

Participation	Groups			Total
	1 Open Gov Chicago	2 Open Gov Hack Night	3 Both Open Gov Chicago and Open Gov Hack Night	
Attending meetings	24	9	30	63
Making presentations	11	3	10	24
Mentor and leader	1	1	9	11
Developing projects	11	6	19	36
Networking	16	7	24	47
Other ways	1	1	7	9

Table 16 shows that there are 11 people who have taken on mentor and leader roles. Most of them are in the group 3, which has 9 mentors and leaders, and they fill the same role as in groups 1 and 2. Thus, 17 percent of this sample participates as mentors and leaders.

I used the chi-square to test the association between different ways of participation and groups. Table 17 shows the p -value for each chi-square test.

Table 17: Test of association using Chi-square test

Association	Groups & Attending Meeting	Groups & Making presentations	Groups & Mentor or leader	Groups & Developing projects	Groups & Networking	Groups & Other ways
Pearson Chi-square test						
p -value	0.306	0.519	0.042	0.494	0.666	0.136

As can be seen the p -value for association between groups and mentor or leader has a p value $.042$ smaller than the p value $.05$, which means that they have a strong relationship less than the 5%.

Question 4 asked about the main area of expertise of the participants. Respondents were offered nine options from which to select, with the possibility of adding another area of expertise. The results show the following main areas of expertise distribution: 26.2 percent

selected programming as their main area of expertise, 18.5 percent chose web development, 15.4 percent chose other expertise, and 10.8 percent chose community development. The lowest percentages were in digital design (3.1 percent), media communications (3.1 percent), urban planning (4.6) and 6.2 percent in both mobile development and entrepreneurship [Table 18]. Thus, the distribution of areas of expertise in Table 18 reveal that there is not a significant concentration in any single area of expertise. However, when these specific areas of expertise are clustered by related sector we can see changes.

Table 18: Main area expertise distribution

	<i>Expertise</i>	<i>n</i>	<i>%</i>
Valid	1 Web Development	12	18.5
	2 Mobile Development	4	6.2
	3 Programming	17	26.2
	4 Digital Design	2	3.1
	5 Entrepreneurship	4	6.2
	6 Urban Planning	3	4.6
	7 Geographic Information Systems	4	6.2
	8 Community Development	7	10.8
	9 Media communications	2	3.1
	10 Other	10	15.4
	Total	65	100.0

To make the differences in term of areas of expertise visible, I clustered areas of expertise into six sectors: 1) technological, 2) spatial, 3) social, 4) entrepreneurial, 5) research and 6) manufacturing.

Table 19: Expertise by cluster of sectors

	<i>Sectors</i>	<i>n</i>	<i>%</i>
Valid	1 Technological	39	60.0
	2 Spatial	7	10.7
	3 Social	10	15.3
	4 Entrepreneurial	4	6.1
	5 Research	4	6.1
	6 Manufacturing	1	1.5
	Total	65	100.0

When areas of expertise are clustered by sector, they show a significant concentration of expertise in the technological sector, with 60 percent reported. This value decreases to 15.3

percent in the social sector, 10.7 percent in the spatial sector, 6.1 percent in the entrepreneurial and research, and 1.5 percent in the manufacturing sector [Table 19].

Participants were also asked to rate the “skills and qualities” that they bring to meetings and activities. This is not necessarily linked to their main area of expertise. They had nine options to select and were allowed to rate their self-perceived abilities according to a scale from 1 to 5: 1) a lot, 2) very, 3) moderate, 4) a little and 5) not at all. Figure 16 shows that “shared knowledge” and “networking” rated at over 50 %, revealing their status as both relevant qualities and skills for these groups. Other skills and qualities considered to be important were communication, collaboration and creativity, all of which were reported at over 40 percent.

Figure 16: Qualities and skills

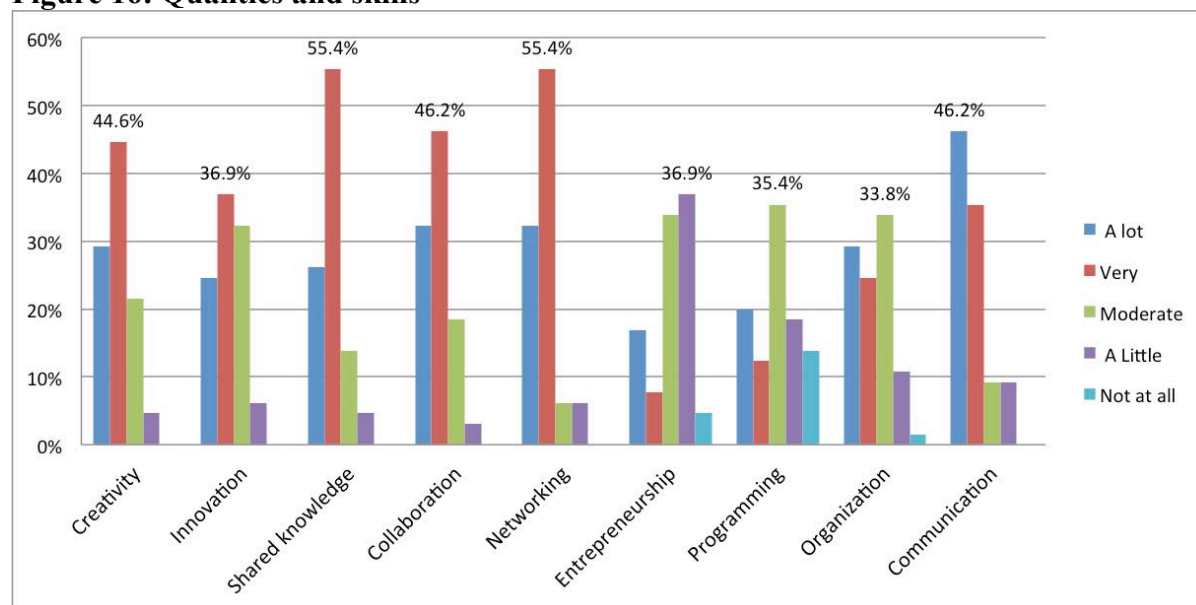


Table 20: Distribution of qualities and skills

	1 A lot	2 Very	3 Moderate	4 A Little	5 Not at all	Total
1 Creativity	29.2	44.6	21.5	4.6	0.0	100.0
2 Innovation	24.6	36.9	32.3	6.2	0.0	100.0
3 Shared knowledge	26.2	55.4	13.8	4.6	0.0	100.0
4 Collaboration	32.3	46.2	18.5	3.1	0.0	100.0
5 Networking	32.3	55.4	6.2	6.2	0.0	100.0
6 Entrepreneurship	16.9	7.7	33.8	36.9	4.6	100.0
7 Programming	20.0	12.3	35.4	18.5	13.8	100.0
8 Organization	29.2	24.6	33.8	10.8	1.5	100.0
9 Communication	46.2	35.4	9.2	9.2	0.0	100.0

Table 20 presents the distribution of participant “qualities and skills” which included, among others, shared knowledge, networking, creativity, and communication. The results shows that “shared knowledge” and “networking” stood out as concentrated qualities and skills of participants, with both categories reporting 55.4 percent rated in “2”, or “very.” Another significant concentration within distribution is “communication,” with a 46.2 percent rated “1.” Also significant were “collaboration” (46.2 percent) and “creativity” (44.6 percent), both of exhibited high “2” ratings.

The concentrations of participants in level 3 and level 4 were in programming, entrepreneurship and organization. ‘Programming’ was rated as level 3 (moderate) by 35.4 percent of participants. This suggests that skills are not necessarily linked to the participants’ main areas of expertise. In the case of expertise [Table 18], the highest percent was programming (26.2 percent).

In case of the “entrepreneurship,” 36.9 percent of participants rated their skills “4” with 33.8 percent reporting “3.” “Organization” had 33.8 percent reporting “3,” but also had a distribution of preferences at “1” and “2.” “Innovation” was concentrated around 1, 2 and 3, with 36.9 percent rating it “2.”

In question 7, I asked to participants about how are they were using open data; and question 8 asked which open data portals they used to obtain data. Table 21 shows that 66.2 percent use open data portals for project development, 30.8 percent use them only for visualizing data, and 3.1 percent have never used open data portals. This shows that a significant number of participants are using open data not only in an “informative way”—that is, perusing available datasets—but that they are also using open data to develop projects. I consider this to be an evolution from an “informative way” to a “transformative use.”

Table 21: Use of open data portal

		<i>N</i>	%
Valid	1 I have used data from open data portals to visualize data and for project development	43	66.2
	2 I have used open data portals only to visualize data	20	30.8
	3 I have never used open data portals	2	3.1
	Total	65	100.0

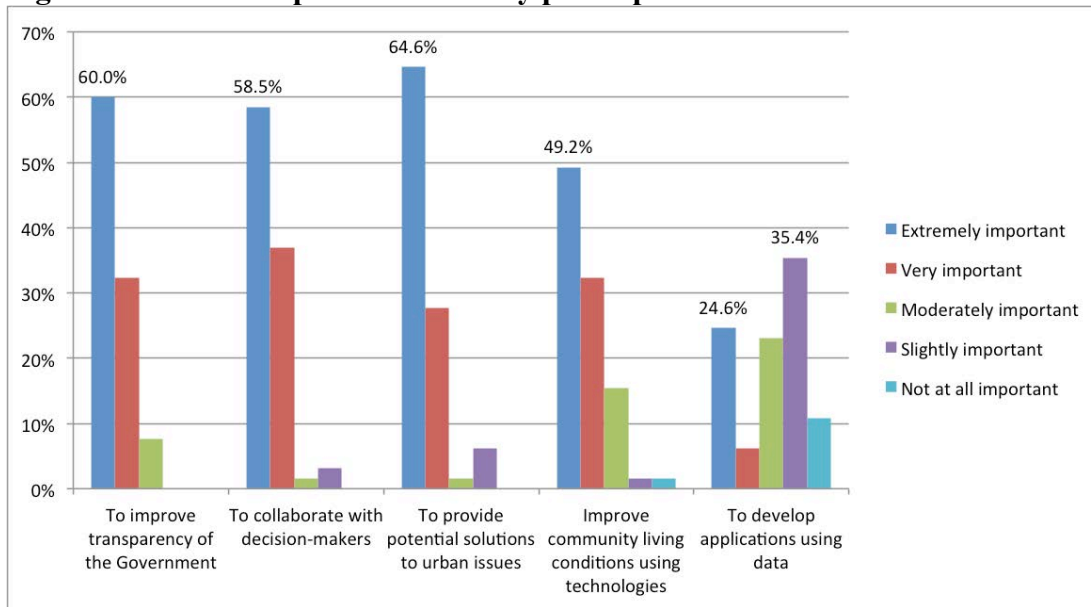
Question 8 asked participants which open data portals they usually use to obtain data. They had the option of selecting all of the portals that apply (federal, state, county, local, and other). The open data portals of local government were used by 35.8 percent of the participants—the highest rate of use. County and State portals both reported a 20.6 percent rate of use by participants. The Federal portal use was 17 percent, and other open data portals had a 6.1 percent rate of use [Table 22].

Table 22: Open data portals

<i>Open data portals</i>		<i>Responses</i>		<i>% of Cases</i>
		<i>n</i>	<i>%</i>	
odportals	1 Federal open data portal	28	17.0	44.4
	2 State open data portal	34	20.6	54.0
	3 County open data portal	34	20.6	54.0
	4 Local government open data portal	59	35.8	93.7
	5 Other open data portals	10	6.1	15.9
Total		165	100.0	261.9

With respect to open data, 64.6 percent of participants considered the most important goal to be “to provide solutions to urban issues.” 60 percent considered the second most important goal to be “to improve transparency of the government,” 58.5 percent selected “to collaborate with decision-makers;” and 49.2 percent chose “to improve community living conditions using technologies.” 24.6 percent considered “to develop application using data” to be the most relevant goal, and most of the participants (34.5 percent) considered this goal to be “slightly important” [Figure 17].

Figure 17: Goals of open data rated by participants



The results of the goals of open data revealed that there had been an evolution from “transparency of the government” to “solutions to urban issues,” and also from “transparency of the government” to “collaborate with decision-makers.” In 2009, transparency was the main goal of open data, but this changed rapidly as a consequence of the use of open data. Participants in this online survey considered the main goal of open data to be “solutions to urban issues” and “to collaborate with decision-makers.” This shows the evolution of community participation into groups interested in collaboration, working with decision-makers, and being better prepared to take part on a different level of participation. Participation was previously confined to an “informative level” in which community members were not able to engage in advanced dialogues, and flow of feedback between decision-makers and community members. New adaptations in governance are thus required, since participation is increasingly more interactive and dynamic. Communities are now using data to develop content and they have a collective interest in developing and providing solutions to urban concerns in neighborhoods and on the metropolitan scale.

I asked the participants how diverse their teams were in terms of expertise when they use open data. Participants reported their teams to be somewhat diverse (52.3 percent), very diverse (32.3 percent), not very diverse (9.2 percent), and not at all diverse (3.1 percent). Although teams

that work on projects have a significant degree of diversity, this is not enough, and there is a need to increase the diversity of expertise in order to bring a holistic approach to projects and the development of potential solutions.

Question 11 asked participants about areas in which they are currently working or developing projects that address urban issues. This question includes the following nine areas: 1) transportation, 2) environment, 3) economic development, 4) public safety, 5) transparency of public services, 6) health and human services, 7) education, 8) housing and buildings, and 9) public space. These areas were defined using the categories of the datasets in the Chicago open data portal. Participants in this survey were allowed to select all of the areas in which they were working at that moment.

In a preliminary analysis of the results [Table 23], and considering the frequencies of the variables, I identified 4 groups among these variables (nine areas). These are organized into the following groups: Group I—transparency; group II—Education, Health, Housing and Safety; group III—transportation and economic development; and group IV—public space and environment.

Table 23: Areas of projects

	<i>Responses</i>		<i>% of Cases</i>
	<i>N</i>	<i>%</i>	
1 Transportation	25	10.7	39.1
2 Environment	8	3.4	12.5
3 Economic development	18	7.7	28.1
4 Public safety	29	12.4	45.3
5 Transparency of public services	45	19.3	70.3
6 Health and human services	31	13.3	48.4
7 Education	35	15.0	54.7
8 Housing and buildings	30	12.9	46.9
9 Public space	12	5.2	18.8
Total	233	100.0	364.1

I considered transparency to be a group by itself, because 70.3 percent of survey respondents were working on projects related to transparency when they answered the question. Many participants were working on both transparency and another area simultaneously. The

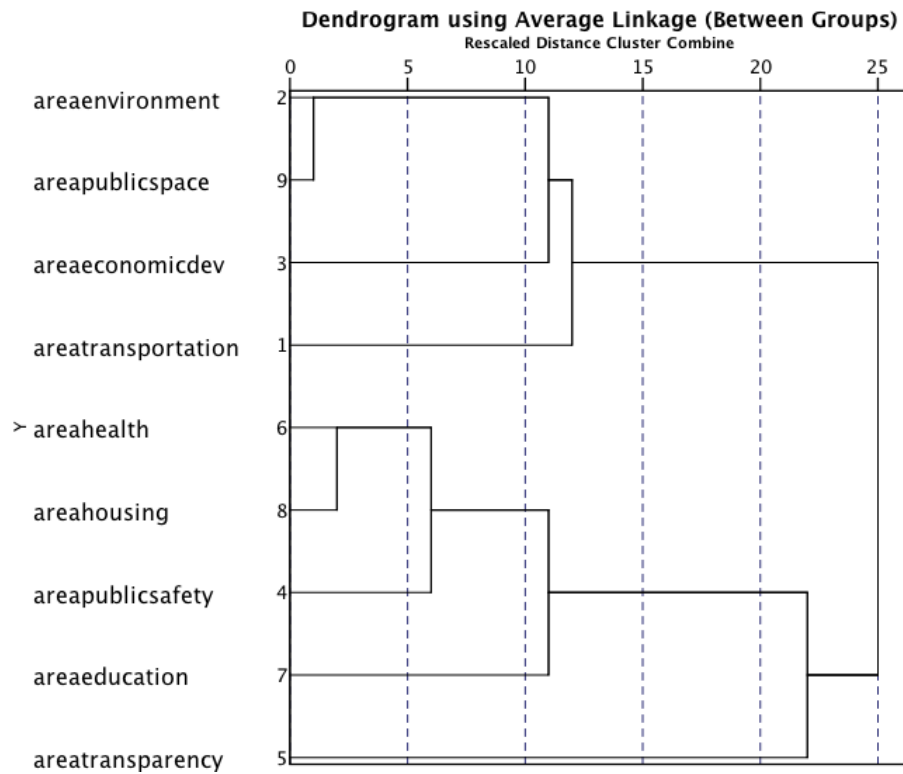
second group ranged from 54.7 to 45.3 percent. The third group ranged from 39.1 to 28.1 percent and the fourth group ranged from 18.8 to 12.5 percent.

I considered that the first and second groups indicate significant areas in which participants are developing projects. I did a hierarchical cluster analysis in order to clarify the number of clusters in these nine areas. This analysis involves “agglomerative clustering,” and the dendrogram illustrates the process of agglomerations, and partitions produced during each stage [Figure 18]. The agglomeration schedule defined three clusters using the average linkage between groups method [Table 24].

Table 24: Agglomeration schedule

<i>Stage</i>	<i>Cluster Combined</i>		<i>Coefficients</i>	<i>Stage Cluster First Appears</i>		<i>Next Stage</i>
	<i>Cluster 1</i>	<i>Cluster 2</i>		<i>Cluster 1</i>	<i>Cluster 2</i>	
1	2	9	14.000	0	0	5
2	6	8	15.000	0	0	3
3	4	6	17.500	0	2	4
4	4	7	21.000	3	0	7
5	2	3	21.000	1	0	6
6	1	2	21.667	0	5	8
7	4	5	27.750	4	0	8
8	1	4	30.150	6	7	0

Figure 18: Dendrogram based on agglomerative cluster analysis



I analyzed cluster membership using cluster k means, which provides detailed group structure following classification [Table 25]. The analysis of memberships shows that areas are organized into three clusters:

Cluster 1: education, public safety, housing and health;

Cluster 2: transportation, economic development, public space and environment; and

Cluster 3: transparency.

Table 25: Cluster membership defined by cluster k means analysis

<i>Case Number</i>	<i>Areas</i>	<i>Cluster</i>	<i>Distance</i>
1	Area transportation	2	2.915
2	Area environment	2	2.550
3	Area economic development	2	2.915
4	Area public safety	1	2.773
5	Area transparency	3	0.000
6	Area health	1	2.385
7	Area education	1	2.947
8	Area housing	1	2.487
9	Area public space	2	2.550

In cluster 2, areas such as “environment” and “public space” are not garnering enough interest from the developers of projects. Both areas are closely related, so in this case there is a gap, and there is a need to increase the use of data in these two areas. However there is also a need to increase the number and quality of available datasets, a lack of which can reduce interest in developing projects using open data.

The number of datasets related to these areas has increased since 2012. For instance, on the Chicago open data portal, the category “environment and sustainable development” had 11 datasets available in February 2012; by February 2014 the number of datasets available had increased to 53. Therefore, the number of datasets increased, but not as much as in other areas [Figure 7]. Even though transparency is the principal area, areas in cluster 1 (health, education, housing and public safety) show a significant number of activities involving development projects. Based on these results, I expect the area of economic development to increase considerably; in 2012 there were 9 datasets available, while in February 2014 there were 378 datasets available, a significant increase.

In question 12, I asked survey participants whether or not they were working with urban planners (UP) to develop their projects and ideas. They had four alternatives to select, as shown in Table 26.

Table 26: Variables working with urban planners

<i>Questions</i>	<i>Variable</i>
I am now working with urban planners and I have worked with urban planners	1 UP
I am now working with urban planners	2 UP
I have worked with urban planners	3 UP
I have never worked with urban planners	4 UP

At the time of the survey the results show that 6.2 percent are working and have worked with UP before, while 15.4 percent are working with UP for the first time. A cumulative 21.6 percent are working with urban planners; 23.1 percent have worked with UP before; and a significant number (55.4 percent) have never worked with UP.

These results show that although participants in this survey had identified the main goal of open data as being “solutions to urban issues,” urban planning has not become fully involved in project development. The reason might be that solutions sought by the civic technology community are short-term and real-time, but that planning practices are confined to long-term solutions, without involving either the short-term or a real-time dimensions. Thus, if planning practice were to incorporate the short-term and the real-time dimensions, doing so could facilitate dialogues and activities within the civic technology community.

I asked participants whether or not they were working with neighborhood communities (NC). A 7.7 percent are working and have worked with NC, while 20 percent are working with NC and they did not work with NC before, a cumulative 27.7 percent are working with NC. 30.8 percent have worked with NC before and 41.5 percent have never worked with NC at all.

Table 27: Variables working with neighborhood communities

<i>Questions</i>	<i>Variable</i>
I am now working with neighborhood communities and I have worked with neighborhood communities	1 NC
I am now working with neighborhood communities	2 NC
I have worked with neighborhood communities	3 NC
I have never worked with neighborhood communities	4 NC

It is significant that 41.5 percent have never worked with neighborhood communities. This shows that projects are focused on the urban and metropolitan scales rather than on a neighborhood scale.

I was interested to know whether there is a relationship between working with urban planners (UP) and working with neighborhood communities (NC). Given that I use nominal variables, I conducted a cross-tabulation and chi-square test to analyze this relationship [Table 28].

Table 28: Cross-tabulation working with UP and working with NC

			<i>workplanners</i>				<i>Total</i>	
			<i>1 UP</i>	<i>2 UP</i>	<i>3 UP</i>	<i>4 UP</i>		
Workcommunities	1 NC	Count	1	2	0	2	5	
		% within workplanners	25.0	20.0	0.0	5.6	7.7	
	2 NC	Count	2	5	5	1	13	
		% within workplanners	50.0	50.0	33.3	2.8	20.0	
	3 NC	Count	1	3	6	10	20	
		% within workplanners	25.0	30.0	40.0	27.8	30.8	
	4 NC	Count	0	0	4	23	27	
		% within workplanners	0.0	0.0	26.7	63.9	41.5	
	Total		Count	4	10	15	36	65
			% within workplanners	100.0	100.0	100.0	100.0	100.0

*Variables UP and NC [Table 26 and Table 27].

Table 28 shows the cross-tabulation between 4 UP and 4 NC and shows that 63.9 percent have “never worked with planners” and have “never worked with neighborhood communities.” In the case of 2 UP and 2 NC who are “now working with planners” and are “now working with neighborhood communities” they achieved 50 percent. Thus, working with planners appears to lead to an increase in working with neighborhood communities. Thus, not working with planners seems to also affect working with neighborhood communities.

Table 29: Chi-square test

	<i>Value</i>	<i>df</i>	<i>Asymp. Sig. (2-sided)</i>
Pearson Chi-Square	29.375 ^a	9	.001
Likelihood Ratio	35.660	9	.000
Linear-by-Linear Association	21.579	1	.000
N of Valid Cases	65		

a. 12 cells (75.0%) have expected count less than 5. The minimum expected count is .31.

The chi-square test results in Table 29 show that there is a relationship between working with urban planners (workplanners) and working with neighborhood communities (workcommunities).

There is an opportunity for more urban planners participating in the civic technology community to promote neighborhood community participation with developers. Increasing this is crucial for developing new content and digital applications that seek to provide urban solutions. These solutions should be closely related to the critical urban concerns of communities, in this case the needs of neighborhood communities. This will bring projects to a different territorial scale, such as neighborhoods.

The last part of the survey includes a set of questions about the backgrounds of participants. This part has questions regarding to demographic information, educational level, current occupation and sectors in which they are employed.

Table 30 illustrates the results, which are presented in terms of race or ethnicity, age, and sex. Regarding race and ethnicity, 69.2 percent are White, 10.8 percent report being of Other Hispanic, Latino or Spanish origin, 7.7 percent are Black or African American, 4.6 percent are Other Asian, 3.1 percent are Other Indian and 3.1 percent are Other (mixed race). Thus, the race or ethnicity distribution in this sample is not homogenously distributed, and there is a significant concentration in a single race. For instance, these results noticeably different than the race distribution in the 2010 Census, which shows Chicago to be 32 percent White, 32 percent Black or African American, 29 percent Latino and 5 percent Asian.

It is a crucial social goal to reduce this difference in terms of race and ethnicity and become more diverse, because diversity this will bring a better approach and understanding about people’s needs and city dynamics.

In case of the age distribution in this sample, I divided age into six ranges. Data shows a clear main range of ages (25-34) with 46.2 percent, and the second range of ages (35-44) was 33.8 percent.

Table 30: Demographic characteristic of participants

<i>Characteristic</i>	<i>n</i>	<i>%</i>
Race or Ethnic		
White	45	69.2
Black or African American	5	7.7
Asian Indian	2	3.1
Other Asian	3	4.6
Other Hispanic, Latino, or Spanish origin	7	10.8
Other (mixed)	2	3.1
Total	64	98.5
Missing System	1	1.5
Total	65	100.0
Age		
18 – 24	2	3.1
25 – 34	30	46.2
35 – 44	22	33.8
45 – 54	7	10.8
55 – 64	4	6.2
65+	0	0.0
Total	65	100.0
Sex		
Male	37	56.9
Female	22	33.8
Total	59	90.8
Missing System	6	9.2
Total	65	100.0

The sex distribution is 56.9 percent male and 33.8 percent female. Although male respondents constituted the highest percentage, female participation appears to be increasing. In 2011, the number of women began to increase; by 2013, the number of women taking part in

these groups had reduced the female participation gap in the civic technology community. Figure 19 illustrates this shift.

Figure 19: Sex distribution from 2009 to 2013

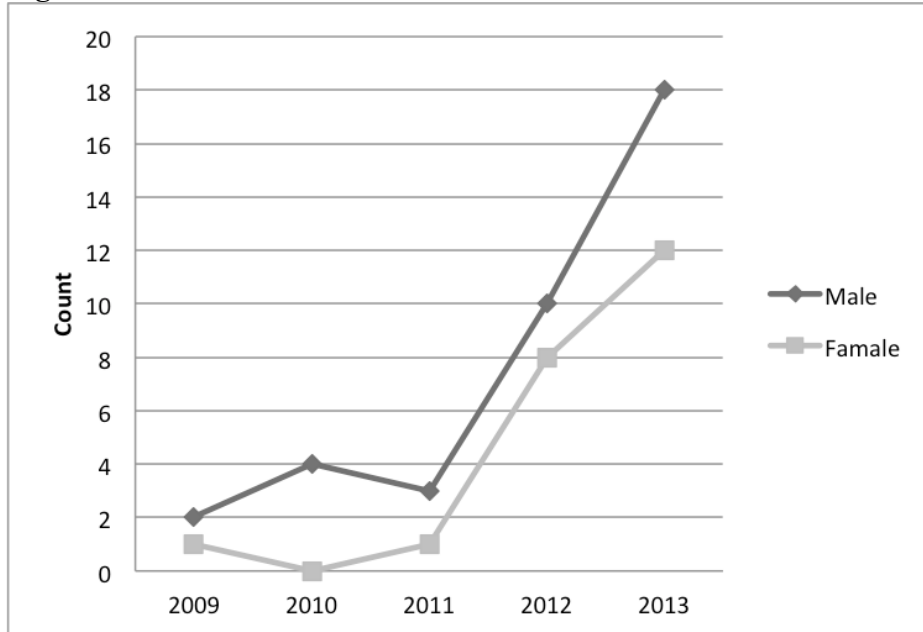


Table 31: Cross-tabulation by year and sex of participants

		2009	2010	2011	2012	2013	Total
1 Male	Count	2	4	3	10	18	37
	% within year	66.7%	100.0%	75.0%	55.6%	60.0%	62.7%
2 Female	Count	1	0	1	8	12	22
	% within year	33.3%	0.0%	25.0%	44.4%	40.0%	37.3%
Total	Count	3	4	4	18	30	59
	% within year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 32 presents the education levels of participants. This shows that 47.7 percent of participants had a master’s degree, 32.3 percent of them had a bachelor’s degree, 10.8 percent had a doctoral degree, and 4.6 percent had some college. Thus, a cumulative 58.5 percent had pursued post-graduate degrees.

Table 32: Education level of participants

<i>Characteristic</i>	<i>n</i>	<i>%</i>
Education Level		
Some College	3	4.6
Bachelor's Degree	21	32.3
Master's Degree	31	47.7
Doctoral Degree	7	10.8
Total	62	95.4
Missing System	3	4.6
Total	65	100.0

As the data reveals 58.5 percent of participants hold post-graduate degrees. This explains how this level of education is representative of the concentration of knowledge that facilitates interactions in this community.

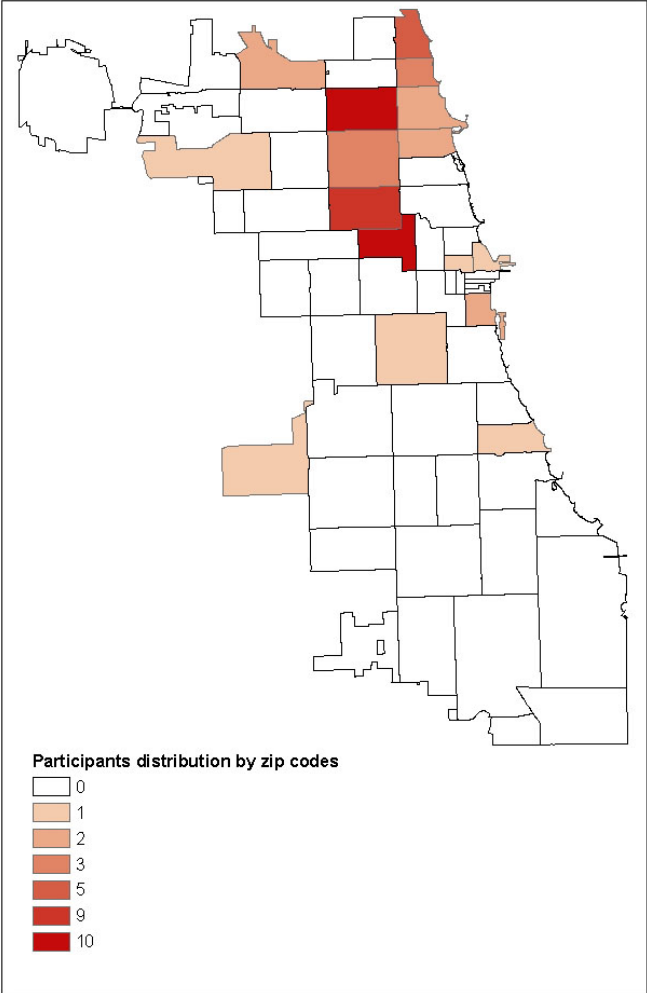
I asked the participants about their current occupations; and the results show that 49.2 percent of them are currently in management, professional, and technical positions. A cumulative 35.3 percent are employed or students at the university level (faculty, staff, graduate students and undergraduate students); 38.5 percent were in occupations in the private-not-for profit, tax-exempt, or charitable organizations; and 30.8 percent were in private-for-profit, company, business or individual, for wages, salary or commissions [Table 33].

Table 33: Characteristic of employment

<i>Characteristic</i>	<i>n</i>	<i>%</i>
Current occupation		
Management, Professional and Technical	32	49.2
Self-employed	4	6.2
University and College faculty or administrator	11	16.9
University and College staff	1	1.5
Undergraduate student	1	1.5
Graduate student	10	15.4
Other	3	4.6
Total	62	95.4
Missing System	3	4.6
Total	65	100.0
Sector		
Private-For-Profit, company, business or individual, for wages, salary or commissions	20	30.8
Private-Not-For-Profit, tax-exempt, or charitable organization	25	38.5
Local Government employee (city and county, etc.)	3	4.6
Federal Government employee	1	1.5
Self-Employed in Own Not Incorporated business, professional practice, or farm	3	4.6
Not-Apply	10	15.4
Total	62	95.4
Missing System	3	4.6
Total	65	100.0

Figure 20 illustrates the distribution of participants by zip code. The numbers show that most respondents are concentrated on the North East side of Chicago, with three zip codes having the highest concentrations of participants. These zip codes are 60622 and 60625, both of which have 10 participants, and zip code 60647, which had 9 participants. There are missing zip codes because some participants did not provide this information.

Figure 20: Map of number of participants by zip code



The online survey reveals that the Chicago civic technology community is relatively homogenous in terms of education level, age and occupation. In terms of sex, more women beginning to take part.

The survey shows that the focus of open data is not necessarily on government transparency as participants display a high degree of interest in “urban solutions” and “collaboration with decision-makers.” This points out another level of participation. This is not a static, receptive or top-down type of participation managed by government agencies nor is it a vertical type of participation; here the roles of community members and representatives of government agencies are in different positions. They are more open to developing dialogues, and dialogues embedded in knowledge because members of this community are not only informed about available datasets but are also using data to create new contents. When they participate in this community their purposes are “shared knowledge” and “networking”; in addition they bring communication, collaboration and creativity.

Nonetheless, there are some gaps in terms of the diversity of members. The community should strive to promote a greater degree of inclusion of different races and ethnicities, women, and participants of different ages. There are other types of knowledge that not necessarily linked to education level. These include work experience and local know-how, and might offer the possibility of knowledge-expansion in this community.

The participants are developing web-based and digital application projects to provide filtered information gathered from open datasets. In addition, they are able to implement these projects in a rapid manner. Projects were once largely focused on transparency, but the emphasis is now on urban solutions to people’s needs on the Chicago metropolitan scale.

First and second order of open data

I suggest in my analysis this changeover from transparency to urban solutions to be a “second order” or “second wave” of open data use achieved in Chicago [Table 34].

Table 34: Open data level

Open data level	Outcome of open data
First order	<ul style="list-style-type: none"> • Transparency of government
Second order	<ul style="list-style-type: none"> • Collaboration with decision-makers • Urban solutions

This second order of open data will be important for extending gains to different territorial scales. The second order of open data appears the focus on ‘urban solutions’ that should consider specific urban zones, and neighborhoods. Thus, this second order of open data urban planning should take part in, and contribute to, the creation of linkages with neighborhood communities, and help to define and foster the development of innovation and creative urban zones.

5.2. Interviews results and analysis

The interviews participants are experts, decision-makers, and members of different stakeholders. Each is currently working on projects, programs, or initiatives related to smart cities, and each brings diverse types of expertise and perspectives. The purpose for conducting these interviews was to build a vision of the impacts of open data in Chicago and to reveal precisely how Chicago is using open data in seeking to become a smart city.

I conducted five interviews: four face-to-face interviews and one by means of an online questionnaire. I transcribed all of the interview audio files and then coded each interview. I used an initial list of codes, but this list increased in size during the coding process for each transcript. Thus, after concluding the coding process, I developed a revised list of codes, which I then reduced after clustering interconnected codes. The processes of transcribing and coding were crucial for interview analysis because they allowed me to analyze each participant's perspective, discourses and reflections about topics that were covered during each interview. I classified the data by codes and I wrote primary memos in order to summarize the data. I then wrote analytical memos, which were valuable for reflecting upon codes and defining categories, themes, and concepts from data (Saldaña, 2009). This allowed me to identify and clarify connections within the data, and to organize ideas that I ordered and reordered using diagrams and schemes. During my analytical memo process, I found codes and categories that I inserted into memos, and I also found cluster of codes. Thus, it was feasible to identify codes that are embedded inside analytical memos (Corbin & Strauss, 2008).

The interviews were guided by a structured questionnaire (Appendix B). The questionnaire included fourteen questions about plans and projects involving open data, digital applications, community participation, urban issues and access to information among other topics. Each participant received a paper copy of this questionnaire guide. However, during the interview processes, new questions emerged that were different in each case, depending on the topic and expertise and interest of each participant. Most of interviews were conducted within one hour.

List of codes

The final list of codes helped me to classify topics covered during interviews.

Table 35: List of codes

Initial list	Final list of main codes
<ul style="list-style-type: none">▪ Transparency of data▪ Transparency facilitates interactions	Transparency
<ul style="list-style-type: none">▪ Impacts of open data (expected and unexpected)▪ Benefits for cities using open data▪ Data driven▪ Data reuse▪ Dialogues about data	Impacts and uses of the open data
<ul style="list-style-type: none">▪ Challenge of becoming smart▪ Changes in local government▪ Infrastructure▪ City efficient and effective▪ Hyperlocal▪ City analytics	Key factors of Chicago
<ul style="list-style-type: none">▪ Role of the civic technology community▪ Community inclusion	Civic technology community
<ul style="list-style-type: none">▪ Technology and urban development▪ Impact of technologies in future cities▪ Smart city	Impact of technologies
<ul style="list-style-type: none">▪ City digital apps▪ Apps helping the quality of life▪ Apps engage community	Digital applications (apps)

The interviewees provided different perspectives on questions and topics related to the impacts of open data in Chicago. Each interviewee emphasized different angles of the same prism and all of the interviewees agreed upon the values added by the civic community to the use

of open data of Chicago. They emphasized the sense of community and collaboration among the members of this community and the local government.

Figure 21: Relationship of codes

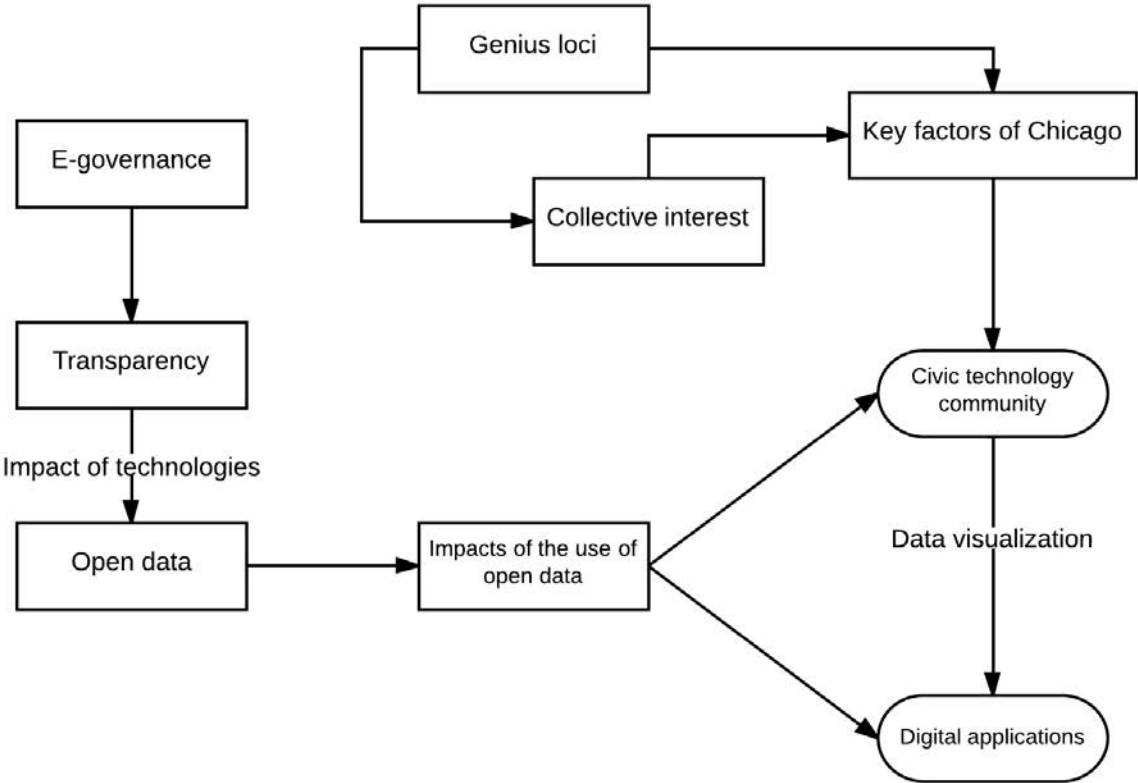


Figure 21 illustrates the relationship of codes identified and this figure shows hierarchical linkages.

Transparency

The interviewees understood the transparency of government data as having the purpose of assessing the performance of the city in the areas of open government. Transparency was the initial impetus for open data portals, because the portals of government agencies make public data visible. Participants believed that transparency acts as a catalyzer that can foster interactions between experts and non-experts.

Participant 1: Well actually I think you have come back to this idea of transparency and government because the more transparent the government is, at all levels, the accessible data is available...I think that's what creates the interactions between people in society to change things to better things, because everything is compartmentalized, regulated and systematized that really takes away the innovation that everyone has, and it's not just technicians that can solve the problem, it can be university students, elementary school students, employees at hospital, can be anybody.

Impacts and uses of the open data

One direct effect of open data has been to help the public understand how the government functions by providing a level of detail not previously made public. Another direct effect is the improvement of decision-making by enhancing the visibility of the process and by data analysis. Using open data does pose the potential risk of rendering cities mere “data generation systems,” thereby underestimating the reality of cities as complex social environments in which people interact.

The public demand for data was one unexpected impact of open data, and the local government has been required to be very responsive to consumers of data as indicated participant 1.

Participant 1: The indirect effects that we did not expect that... I think that is serving to make us, or maybe you can say if is direct or indirect, I am not sure if we excepted it, it's serving to make us more responsive to the consumers of our data.

In case of the City of Chicago, the IT department did not have public visibility before the advent of open data. As a result, the IT department became both an internal service provider and an external service provider of data engaging in direct dialogues with citizens. The volunteer civic developer community was another unexpected impact of open data, and one of the biggest impacts of open data. When open data portals began operations the initial purpose was transparency. However, the development of a civic developer community using open datasets was an unanticipated benefit, and this community turned out to be crucial for supporting and extending the open data movement.

Cities collect and use data in a variety of ways, and these data are a sort of “natural resources” produced by cities daily. They can be used internally to improve the efficiency of city government services, and they can also be used externally through the use of open data portals that transmit the content of datasets to the public. However, participants agreed that the potential benefits for cities that embrace open data have yet to be fully imagined as we are still in the early stages of the technology. At present, open data is a resource that needs to be refined and processed, just like other natural resources, and this requires tools and capacities. Participants noted that simply possessing data is insufficient, because using data requires skills and the knowledge needed to transform raw data into new content and products.

Using open data

Interviewees indicated that open data can be used to inform the public and other government agencies, institutions, and companies. Indeed public and private benefits become apparent when using open data. There are volunteers, developers, and non-necessary experts who use open data, and they figure out how to visualize and use it in different ways. Prior to open data, the access to data was limited to trained experts trained in data encryption. Open data changed this by fostering dialogues previously inaccessible to citizens with limited access to information, and hence sub-optimally positioned to discuss and reply to experts. This change can facilitate dialogues founded upon public participation in various arenas.

Open accessibility has increased since 2009, supported by executive orders that require government agencies to implement transparency by means of open data portals. This has impacted how government agencies use data and how people use and take advantage of data. For instance, citizens now can come to meetings better informed, with better understanding of the context. Open data has thus increased and improved dialogues between citizens and the government. These dialogues can take the form of both face-to-face meetings and virtual interactions via e-mail, Twitter, or through codes using GitHub. Communication by codes between citizens and members of local government has become a new channel of communication, one that improves data and engagement with the public. Another major impact of the use of open data has been the development of digital applications (apps). These digital applications can be customized to meet even individual user needs. The developers of apps make data useful to people by offering very specific services that can be regional or metropolitan in scale.

Key factors of Chicago

The main factor of the open data movement in Chicago is the “synergy” found in communities involved in technology and innovation. Interviewees from different institutions agreed on this point. The level of community participation achieved had been neither expected nor planned. There are two associated factors that make possible this level of community development: human capital, and traditional and mature collective interests.

Participant 3: I think it's a combination of things, Chicago always been a center of innovation in terms of many things, like architecture, urban design, but it is been a long movement of people involved in, in social problems or issues in Chicago all the issues of the city of Chicago through time, and Jane Addams Hull House....so there is a whole list of people that have focused on the population of Chicago, and how the population can adapt to change whatever the current conditions.

Leadership is another key factor. Leadership is not limited to the political arena because it occurs on different levels and involves technical members of the local government and members of organizations who are willing to collaborate by making data available. I consider having social and cultural factors linked to open data as making the difference in Chicago. It is feasible to achieve a high level of engagement and interaction when open data is not only embedded in technologies but also involves social and cultural issues.

Interviewees believed that fostering efficiency and competitiveness requires the improvement of infrastructure. This will provide favorable conditions for digital startups, information technology companies and centers of research. Interviewees stated that commitment and leadership can help provide improvements in infrastructure (speed of access and broadband extension). Chicago needs to address these challenges in a short period of time and these challenges have been included in the Technology plan.

Civic technology community

One of the most important key factors in the success of open data is the synergy of communities in Chicago which use it. Participants gave different names to this community, such as the “civic developer community,” the “tech community,” “civic mind developers,” and “urban geeks groups.” This community plays an important role in the open data movement. One in particular is accountability, which helps improve the quality of work produced by the local government and other institutions. Members of the community demand continuous improvements in the quality of data, and the amount of datasets available.

Participant 1: I think open data and civic development community, they serve...they play off each, because open data gives the civic development community fuel to work off that. So, I mean there certainly were developers that cared about civic issues before it was open data, but those civic mind developers were asking for that data.

The community provides appropriate criticisms, suggests improvements and collaborates in this process by sending suggestions regarding missing and incomplete data.

This community has the support of the Smart Chicago Collaborative non-profit organization. This organization provides support for developers, digital hosting, and funds for promoting the creation of civic apps and encouraging the development of new startups. Different informal networks and thematic groups have helped build this civic technology community using the logic of “cross pollination,” which suggests that people from different backgrounds think in different ways. This diversity of expertise and skills have been positive and this lead to debates about topics and projects. This type of community has opened space to skilled individuals who take the opportunity to play active rather than passive roles.

Interviewees who have participated in this community since the beginning, and who continue to participate, pointed out that the community was initially insufficiently diverse in terms of sex and race. This has been changing, and there has been an increase in the number of women who take part in this community. In seeking to change this tendency, the community invited women from the academic sector, who have themselves encouraged additional women to become involved. A racial gap persists, as the majority of members are white. Thus, one important challenge for this community is reducing their homogeneity by increasing the community’s diversity. They are taking actions to increase diversity by civic events known as “hackathons,” public workshops where people receive training and work together on specific topics using codes to create digital applications. These have become an opportunity to recruit new participants to the civic technology community.

Impacts of technologies

Interviewees emphasized how people are making use of information and communication technologies. Citizens obtain information through channels of communication and send information to other community members and to decision-makers. Faster access to data, information, and communication has facilitated the development of web and mobile applications (apps). These apps provide instant communication and real-time information, which is improved by users who themselves contribute new data. “Hyperlocal” data for Chicago (metropolitan) is the characteristic of information processed by developers. Digital developers often have created local applications (apps) for city services. Interviewees considered that apps provide consumable information which has already been processed by developers and is ready for use. However, web

and mobile apps are only one potential uses of open data.

Other aspects discussed by the interviewees included the potential risks involved when technicians assume that technologies are intrinsically disconnected from social values. Achieving advanced levels of technological usage will depend on the society in which technologies are used, and both society and technologies are continuously evolving.

Participant 5: I am not sure that I would claim that technology of any kind is "crucial". In an historical perspective, societies invent technologies, and then technologies re-invent societies. New technologies are - with a few exceptions - first applied in cities and are applied to address problems that the citizens may not have realized were "crucial". "We do it because we can!" Information processing is still a very immature technology, but it has already demonstrated significant power than can be applied to urban problems.

Digital applications

The development of digital applications using open datasets have increased, including for data visualization purposes which facilitate access to information through the web and mobile devices. Digital developers are interested in civic issues and seek to provide data visualization in order to render visible the city's dynamics and urban concerns. The interviewees did not reach a consensus on digital applications development, because digital applications tend to depend on local uses and interactions. Thus, each local environment is crucial for use of digital applications.

Another factor that can impact digital application development in whether local open datasets are accurate and up-to-date. Thus, the development of digital applications depends upon the availability and quality of data, as well as on the engagement of the local community. In Chicago, digital applications have been the point of origin for innovative ideas. Digital developers have created startup businesses based on applications (apps) that use the data generated by the city government. Innovation and entrepreneurship in the form of digital applications is thus another type of impact of open data emerging from the city's open data initiative.

CHAPTER 6

DISCUSSION

6.1. Impacts of Open Data

The open data movement has evolved beyond the initial purpose of transparency. It has brought changes to governance by introducing the concept of ‘e-governance.’ At the same time, it has broadened conventional community participation into a civic technology community. Open data became a federal policy in the United States in May 2013, and the City of Chicago launched their Technology plan in September of that year. Nonetheless, how prepared are government agencies to incorporate these types of changes?

Government agencies and local governments have historically been rooted in bureaucratic practices where decisions are made in a top-down manner. Open data implementation requires an institutional transition of government agencies and local governments toward becoming part of the “civic innovation space.” A local government cannot be a key mediator of change and promote innovation if its own practices are embedded in traditional bureaucratic practices. Open data requires the renewal of traditional government practices as well a relationship with the civic community. This new development involves technical, political and social factors that impact governance. These changes will also require variations in communication in order to facilitate interactions among institutions and communities.

The open data movement is spreading to many cities and is growing in the United States and abroad. Nonetheless, it is in the early stages of development; many of its policies, plans, and initiatives are just beginning to be adopted or implemented and open data still does not exist in many cities and countries. However, open data is not limited to the availability of online datasets; it requires the development of a dynamic civic innovation space, crucial for countries and cities to take advantage of it. Cities with highly skilled human capital will be in a better position to take advantage of the impacts created by the open data movement. These include

knowledge creation, innovation, the shared economy, and entrepreneurship. Cities thus need policies directed at strengthening human capital and reducing the gap between highly skilled and low-skilled citizens. Boston, Chicago, New York and San Francisco are leaders of the open data movement; these cities have large concentrations of highly-skilled citizens influenced by leading universities located in their home states. Although, these cities have agglomerations of highly skilled citizens, we cannot assume that they are exempt from the need to reduce the gap between highly skilled and less-skilled citizens. Indeed, the civic technology community in these cities currently remains limited to a small number of active members.

The survey conducted shows that members of Open Gov groups take advantage of open data because they enjoy high levels of education (58.5 percent have postgraduate degrees), and are well-networked with experts and decision-makers who are informed about initiatives and projects of the City of Chicago, other government agencies, universities, institutions and organizations. They have developed an active environment for sharing knowledge and interactions.

The scenario generated by the open data movement comprises active community participation and skilled community members becoming involved in the civic technology community. In addition, this scenario requires skilled members at the government level, because as members of the civic technology community they can advocate for “civic innovation space,” where ideas and knowledge can be shared while seeking solutions to urban concerns.

Figure 22: E-governance and civic participation

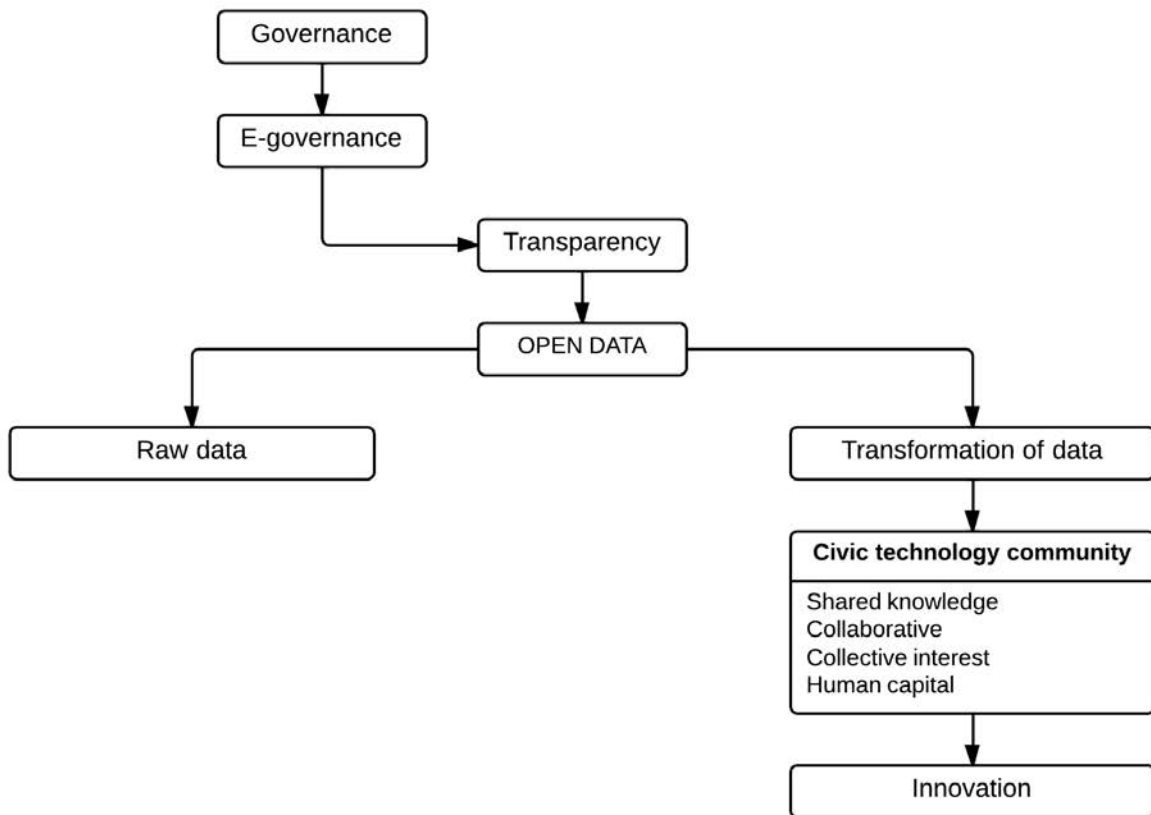


Figure 22 shows the linkages between e-governance and civic participation in a smart city. This process has different parts. The first part indicates the linkage between governance and transparency, which switches to e-governance and open data, and datasets can be considered to be “raw data” or “raw material.” This can be transformed into new contents and products, but this will happen only if there is a transformation of raw materials by means of innovation. Data innovation can be made possible by the capacity to transfer data into information, and this is directly related to the capacity of human capital involved in the data transformation process. This process occurs in the context of collaboration, which initially involves sharing data, and is followed by the sharing of knowledge. The collaborative dimension based on the “sharing society,” which produces these interactions. This is feasible for a community, and in the case of smart cities will be a “civic technology community.”

Overview of cases in Chicago

Civic Users Testing Group (CUTGroup)

The Civic Users Testing Group (CUTGroup) is an initiative of the Smart Chicago Collaborative. This organization is helping developers to improve the accuracy of their projects in order to increase the quality of life in Chicago. The CUTGroup involves three areas promoted by the Smart Chicago Collaborative: access, skills and data. Many testers access using public centers of connectivity; they receive skills to be able to test, and data are used by developers creating digital apps. The Smart Chicago Collaborative is a link between developers and CUTGroup, and supports them working together.

Members of the CUTGroup are residents of Chicago; those who were willing to participate filled out a profile as a CUTGroup member. They are paid to test out civic digital applications (apps) and websites that can be used in Chicago. The payment is a five dollar Visa gift card to be a tester, and a twenty dollars gift card is given when a tester has been chosen to test a civic app. The first gift card (five dollars) is used as a way to validate information provided by the tester.

The developers of these apps and websites need to test their projects. They use open data to develop their projects and they then need feedback on technology from testers to improve their ideas, concepts, pilot apps, and mature apps. Feedback is useful in each of these stages. The testers meet in public computer centers, most of them libraries. Testers receive an initial training that provides them skills. Participants as testers come from diverse areas of the Chicago metropolitan area, with different backgrounds and socio-economic situations. However, each of them engages in the testing group, actively participating as part of a single group. According to Smart Chicago Collaborative, there are many reasons testers are willing to participate, including gift cards, working with civic developers, engaging with a civic innovative community, or due to particular interest in technology. In the case of developers, they participate in different groups of the “Chicago civic technology community,” such as Open Gov Hack Nights, the co-working space 1871, and other groups and activities, which are part of this civic technology community.

They consider this CUTGroup an appropriate way to get feedback from the community, and from different target populations, depending on the target required by each specific project. Another issue is the frequency of feedback; some developers prefer access to feedback during the process of developing ideas and projects, others developers agree to receive feedback only when the project has been finished.

CUTGroup has tested the following digital applications and websites:

- **Go to School!** user application test, this app gives information in four steps give as way-finding tool with school start times and contact information.
- **Chicago Health Atlas**, this website provides data based on citywide information and people can get details about health trends near the user.
- **EatSafe.co**, provides food inspection locations based on user position. This kind of application makes visible information that people were not able to access in any other easy way.
- **Everyblock iPhone App**, this is a new version of a previous website of neighborhoods launched in 2007 that was relaunched in January 2014. Everyblock seeks to create a web and mobile virtual platform of neighborhood interaction, sharing residents' concerns and needs.

There is an evolution of participation about testers because members of CUTGroup began playing that role, however this is just the initial stage of participation, some of them are very interested on more depth level of participation working with civic developers and sharing their ideas about new projects. It was not the main purpose of CUTGroup rise a community and achieve such as level of development and engagement, however this has become part of the nature of the CUTGroup.

Figure 23: Testers and developer working together



Source: CUTGroup book (2014) [<http://www.cutgroupbook.org>]

Developers and CUTGroup have been accelerating the uses of open data by website and digital applications projects, and they have been strengthen the Chicago civic technology community, increasing the community activities and extending this to a broader diversity of participants.

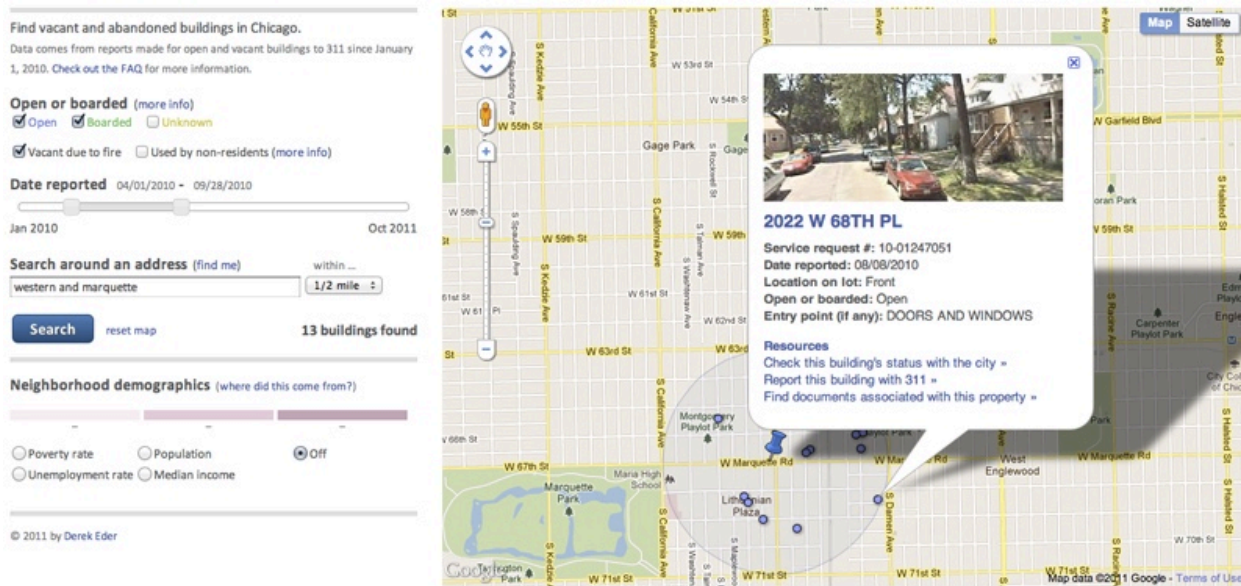
Vacant and Abandoned Building Finder Chicago (Chicagobuildings.org)

Chicagobuildings.org is a web application created in 2011. This web application provides a finder of vacant and abandoned building. It was developed as a tool for people and organizations to help them find buildings not in use, and to facilitate the identification of the areas surrounding these abandoned buildings and the neighborhoods in which they are located, because they constitute potential hazardous zones.

This website was created using updated open data that come from the 311 reporting service of the City of Chicago. Demographic data come from the Greater Chicago Food Depository (since September 2011). According to the information gathered from the Chicagobuilding.org website dating back to 2010, a total of 18,949 vacant buildings have been reported by 311, and it is estimated by the website that around 19 vacant buildings are reported

every day. About data used by this website, the raw data used require some cleaning since there are some blank data fields, so it is require improvement in data available.

Figure 24: Information displayed of vacant and abandoned buildings



Source: Chicagobuildings.org

The information can be displayed on the website visually as a map. This map provides the specific location, date on which this building was reported, and also a picture of the building. These data also include demographic information by neighborhood, population, poverty and unemployment rate, and median income.

The website provides a visualization of neighborhoods with a concentration of vacant and abandon buildings, which is useful to identify urban areas under risk since concentration of vacant building and abandon buildings may increase crime rates. Thus, this initiative is useful to communities, organizations and individuals that may express their concerns about a neighborhood with a high concentration of vacant and abandon buildings concentration.

This website seeks to make visible urban and community concerns about vacant and abandon buildings. So, in this case there is a public interest about urban and social concerns and a manner to promote change in making visible these urban concerns.

Two projects in progress in Chicago

Array of Things and Plenar.io are new projects in progress in Chicago. Array of Things launched in June 2014. This is about real-time data collection by sensors. Plenar.io launched in September 2014, and has a linked way to use open data. I consider that these two projects because both are linked to this research topic and show us how initiatives related to open data are in constant evolution.

Array of Things

The Array of Things project was launched in June 2014. This project will distribute sensors across the city of Chicago, and the purpose of these sensors is to measure different aspects such as: temperature, humidity, light, sound, motion, infrared, and other data related to air quality. These sensors will upload data to the open data portal of the City of Chicago; this information will upload every thirty seconds. The City of Chicago will input this data into the predictive analytics platform created by the city. This project is led by a joint initiative of the Urban Center for Computation and Data of the University of Chicago, Argonne National Laboratory, and the School of the Art Institute of Chicago.

This is an experimental project that will provide data almost in the form of real-time information, and will be available through the Chicago open data portal. It is expected that a distribution of 30 nodes will be deployed in the loop area; this amount may increase to 500 nodes and could continue to increase. Even though the amount of nodes is still reduced, the value of this project lies in its “urban sensing in real-time” concept, making this information available through an open platform.

Figure 25: Sensor Array of Things



Source: Array of Things Twitter.

In this project, there are concerns about the privacy of the data collected by sensors, and this will be a challenging issue to address because this can be sensitive. It could produce a negative perception, leading to resistance from the community to this project and to other initiatives that involve data collection-using sensors.

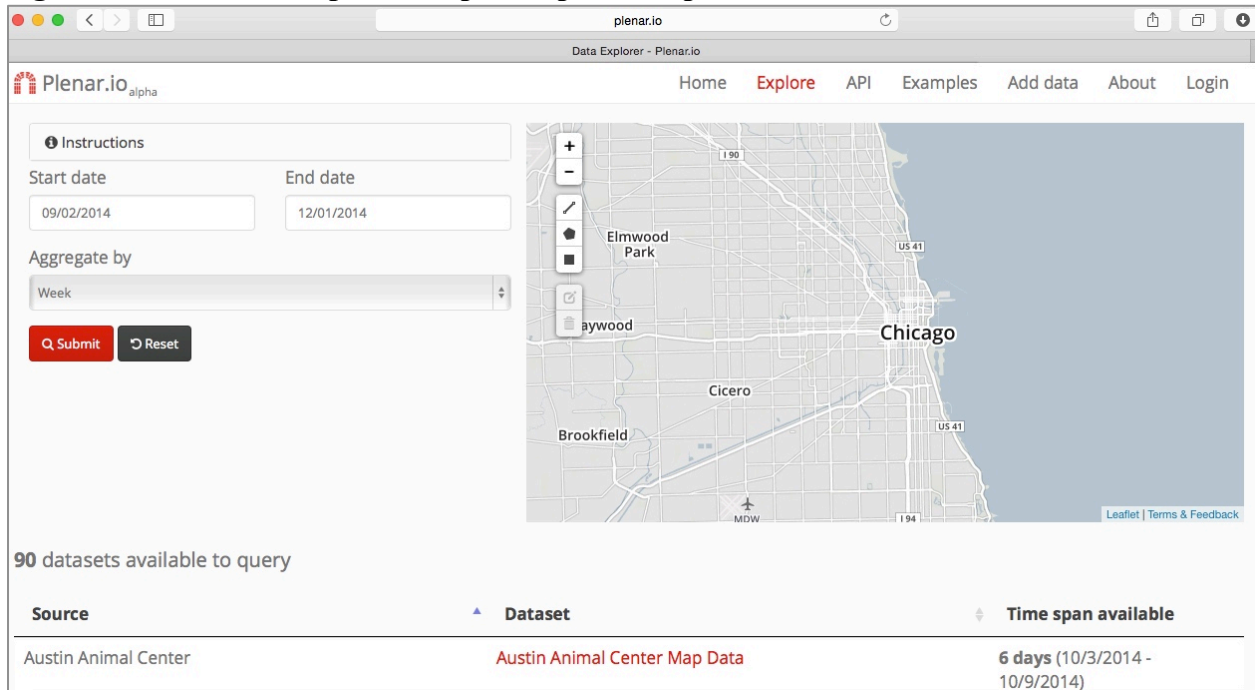
Plenar.io

Plenar.io was launched in September 2014. It is considered a new stage of open data, and its website emphasizes that “Plenar.io is rethinking the way in which open data are used.” Another issue is how fast new changes are introduced; open data management is in constant evolution, almost a real-time evolution.

It is important to take into account that many cities in the United States still do not have open data portals available, others cities are implementing these portals. Chicago relaunched the open data portal in June 2011. The City of Chicago has another level of acceleration in terms of open data. Based on how I classified levels of open data (first order and second order), Chicago is not at the “first order of open data,” it is situated on the “second order of open data.” I consider Plenar.io to be an example of a different level of use of open data that fixes the second order of open data. We can see open data will be in constant evolution particularly in Chicago.

The Plenar.io platform allows for the formulation of specific questions to all datasets, instead of conducting a search in a single and unconnected dataset, which many times have a kind of restrictive access since data are in the form of spreadsheets. Using Plenar.io makes it possible for all datasets to be linked, and it is possible to obtain a better answer to our questions. This manner of using open data allows us to download data from multiple sources and it is possible to analyze data in a spatio-temporal mode because the index has spatial and temporal attributes. It is also feasible to find relationships between datasets. Users can import data from different resources, for instance, they can import data from open data portals that run using Socrata or CKAN. The source code is on GitHub, and the Plenar.io Application Program Interface (API) can be used from web and mobile apps and ESRI. This platform is based on WindyGrid, which organizes data by space and time, making possible multi-dimensional and real-time information that was implemented by the City of Chicago. It is expected that Plenar.io will increase features allowing complex data aggregation and analysis of unstructured data.

Figure 26: Plenar.io, a spatio-temporal open data platform



Source: plenar.io/

Plenar.io is an accelerator of open data based on collaborative interaction, that is, an innovation in access to open data, which supports the Chicago civic technology community that requires this kind of platform to do robust analysis and also new projects seeking solutions to urban issues.

6.2. From the genius loci to the innovative milieu of Chicago

The interviews included discussions of key factors that can help Chicago become a smart city. Interviewees attempted to find particularities of Chicago that would facilitate an understanding of the dynamics of the open data movement in Chicago. Although the emergence of a civic technology community was not on the initial list of expected results, this community has attracted a lot of interest as a potential model that could be replicated in other cities. Questions remain about “why” and “how” this open data movement achieved this level of civic participation in Chicago. I argue that Chicago’s long tradition of collective interests and a sense of community fueled the rise of the civic technology community; hence, its dynamic level of

participation should not be unexpected. In addition, the presence of human capital developed by Illinois universities has produced a dynamic form of local synergy. Thus, the Chicago civic technology community reflects the “genius loci” of Chicago.

The concept of “genius loci” has been interpreted as meaning a “sense of place,” the “atmosphere of place,” and “qualities of place” (Jiven and Larkham, 2003). Norberg-Schulz (1980) defined it as “the sum of physical as well as symbolic values in nature and the human environment, as expressions of society’s cultural interpretation of place.” Thus, the concept is multilayered and can be interpreted as the “uniqueness of place” built by the local environment, values, and interactions of people living there; those contributing to the unique and identifiable character of a place.

When the “genius loci” and the “innovation” converge, the “innovative milieu” emerges. I consider the “innovative milieu” to be a key factor in Chicago, and one that can help us understand how the dynamic civic involvement in Chicago occurs. The innovative milieu (or the milieu innovateur) concept was developed during the 1980s by GREMI: Groupe de Recherche Européen sur les Milieux Innovateurs (Aydalot, 1986; Aydalot & Keeble, 1988 and Camagni, 1995). The concept emphasizes the local synergy as an essential component of innovation, in which interactions and collective “learning and labor” become the core of local synergies. The innovative milieu concept takes into consideration the social structures that constitute the point of origin of innovative behaviors in which “knowledge,” “interactions,” and “frictions” among members in this environment are essential components of the innovative milieu in which “frictions” are embedded in cultural interactions and encounters (Tsing, 2005).

Thus, in this synergy the “hyperlocal” innovative capacity is crucial, working together through activities linked to the use of the open data. The open data movement in Chicago has been useful linking diverse private interests into collective interests. The “collective process” evolved into the “collaborative process,” which involves voluntarism, entrepreneurship, and the energies of people from different groups and sectors developing their ideas into projects by working in a collaborative manner. They are not simply sharing data and tools; most important they are “sharing knowledge” and helping to transform data into new types of contents and

making data understandable and thus consumable by larger audiences. This civic technology community has taken responsibility and has gained the trust of citizens, institutions, organizations and companies. In addition, the type of relationship that exists between the City of Chicago and the Chicago civic technology community is an innovative practice between the local government and the local community. This is not merely an informative, bidirectional, and top-down relationship; it is instead a collaborative relationship among members of the civic technology community and the local government.

Technologies have often been seen merely as tools to facilitate living conditions. However, the use of technologies in conjunction with collective and collaborative values can discourage disaggregation of interests, and the aggregation of interest and knowledge can reinforce communities. Here I am referring to knowledge-based collaborative environments where knowledge is the relational linkage within dynamic frictions that can produce transformations (Latour, 1997 and Tsing, 2005). During the 1990s, the “information age” was discussed as a society connected by networks (Castells, 1997). During the 2010s, there was a paradigm shift from the “information age” to the “knowledge age,” in which environments were embedded into knowledge. Thus the concept of Cyberenvironments where there are not only individual but collaborate actors, and in which networks have experienced a transformation into “cloud.”

6.3. Implications for urban planning

Since its inception urban planning has undergone a continuous evolution. This evolution has involved adaptations of theoretical and procedural perspectives on planning that include: rational planning, collaborative planning and e-planning, among others. Scholars have sought to answers questions including “what is the limit of the territorial unit?” “Who should be involved as actors, and how could they have connections among the actors involved? (Forester, 1974; Healey, 1992; and Nunes, 2010). In rational planning, the spatial definition was understood to be a “concentric unity” confined to its limits and defined by the urban or the regional conditions that determined the limits of the territorial unit. The rational planning perspective conceived of this concentric unity as a system based on Cybernetics. In the case of collaborative planning, scholars

considered that this concentric unity include actors inside the territorial unity such as groups and stakeholders. Thus, collaborative planning focused on who should participate in the planning process. E-planning, focuses on the question of how actors make connections among themselves; it was influenced by the digital age or information age (Castells, 1997, 2000) where connections are made by the networks among the actors involved.

Figure 27: Planning evolution

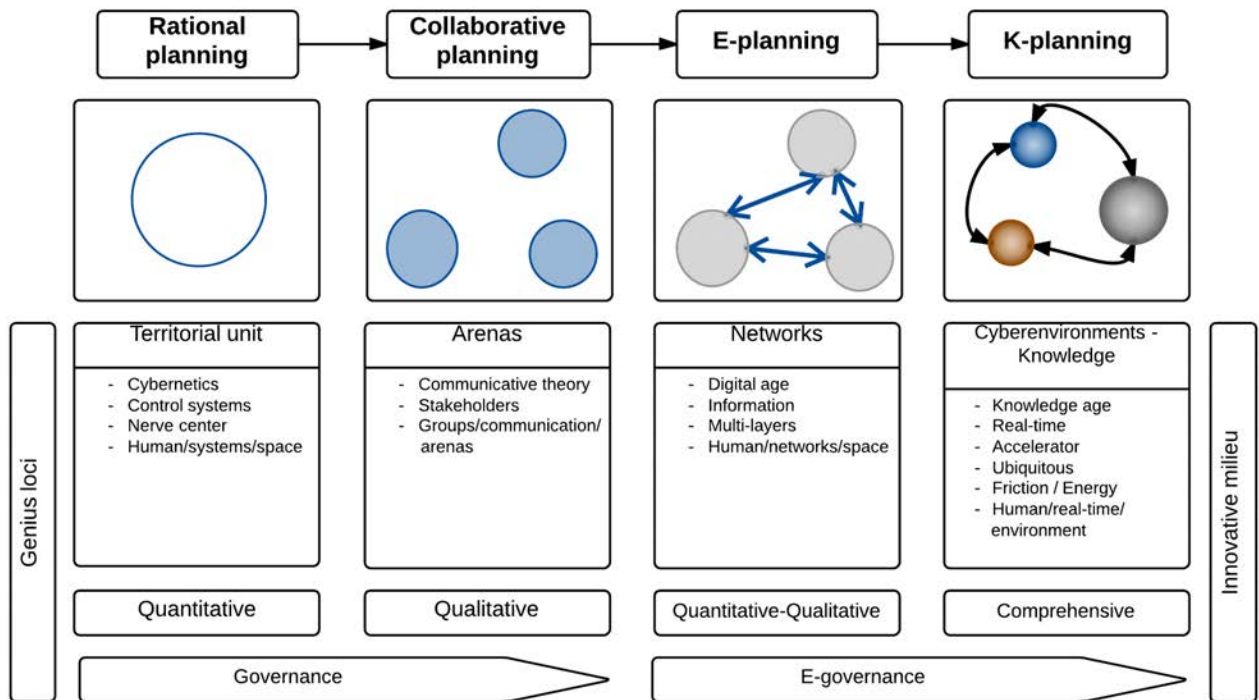


Figure 27 illustrates the evolution in planning, where planning experienced transformations with variations in the outcomes. Rational planning defines the limits of the territorial unit; collaborative planning identifies arenas and groups of participants; e-planning is focused on networks of these groups; and k-planning is focused on Cyberenvironments which are based on knowledge. I illustrate these Cyberenvironments by spheres in movement, friction, and generating energy.

6.4. Planning in Cyberenvironments

The shift of paradigm from the “information age” to the “knowledge age” has implications in the planning context: the main one being the evolution from “e-planning” based on networks and information to “k-planning” based on Cyberenvironments and knowledge. This occurs through the process of transforming information into knowledge where knowledge is built by dynamic synergies, interactions, and frictions of “cloud environments.” Networks have also experienced a process of transformation into complex collaborative ecosystems, which take form in Cyberenvironments, and these forms exist in real-time.

Planning has been seen as being confined to the physical limitations of space and place. However, the new paradigm of space extends beyond its physical limitations and also extends beyond the traditional constructions of power relationships. This occurs when the impact of technologies become linked to knowledge production, at which point power relationships experience changes. In this understanding of space, external and internal space matter; space thus takes the form of a complex environment in a different time relationship due the impact of technologies, which I identified as Cyberenvironments.

Knowledge planning (k-planning) can provide the basis for developing future smart cities by considering the “re-concentration of knowledge” as being the core of the k-planning. The “smart city” has usually been conceived of as being a city highly rationalized and embedded in technological operations by the information and control of the city’s services for the purpose of improving efficiency. In this scenario, planning appears to be disconnected from the smart city concept. However, taking into account the case study analyzed in this research, there are key factors that make it possible to become a smart city. These factors are not simply the speed of the networks and technologies. In case of Chicago the civic technology community is a key factor, and is embedded in knowledge. In fact, participants in the survey chose “shared knowledge” as the principal quality and that they bring to the civic technology community. This community is an engine of the existing “innovative milieu of Chicago,” and has been built using significant human capital generated by the universities in Illinois. However, under different conditions k-

planning might be feasible for application to urban generation and urban re-generation in time. In both cases, the “acceleration of territorial development” is crucial for Cyberenvironments.

Planning in Cyberenvironments simultaneously implies urban space and time, and both work together to build the Cyberenvironments. This takes into consideration two dimensions of time: the long-term and the short-term. The long-term concerns origin and destiny, where the origin is in the genius loci and the destiny (outcome) is defined by the milieu innovator. The short-term in the real-time dimension is defined by the acceleration of the process of transformation of raw material data, and the level of acceleration is given by the knowledge [Table 36].

Table 36: Dimensions in time

Time	Dimensions in time and space	
Long-term	Origin	Destiny (outcome)
	Genius loci	Milieu innovator
Short-term (real-time)	Accelerator	Transformation process of
	Knowledge (k-planning)	raw data

K-planning for generation of urban development

The “k-planning for generation” in planning seeks to provide potential solutions for new urban development. This defines a main outcome, which is inspired in genius loci, but without previous existing genius loci. The outcome defined will be embedded into the “innovative milieu,” which this urban development seeks to achieve.

K-planning for re-generation of urban areas in existing cities

The regeneration will be accomplished through large-scale urban projects whose purpose is to accelerate the urban re-generation. The re-generation is conceived by taking into account the origin (genius loci) and defines its milieu innovator as an outcome. These large-scale projects will be located in strategic locations, which foster innovation and competitiveness.

In planning theory and practice, the focus traditionally has been on planning for the long-term, meaning ten, twenty, and fifty years. The short term has been thought of in terms of five-year periods. However, transformations introduced by the digital age and its network society (Castells, 1997) have changed access to data and information, and the manner of interaction of people by networks. As such, access to data has been accelerated due to the exponentially increasing amount of data available, and this amount increases every day, every minute, and every second. We are immersed in a “ubiquitous society” where public and private services can be delivered and received anywhere and anytime (Kim, 2008). Kim stated that the relationship between space and time is no longer the same; the relationship is different than it was twenty or fifty years ago. Thus, it appears crucial for planning to reflect upon these changes created by the impact of “real-time.” Planning needs to face these changes and include them by simultaneously reconsidering conceptions and understanding of space and time.

These changes in time anywhere and anytime have also impacted governance, where traditional dialogues among decision-makers and residents were conducted in formal meetings. This static procedure has changed to a dynamic process of e-governance in which dialogues are held in real-time by diverse platforms using instant communications such as Twitter and by means of codes using GitHub. Achieving this high level of e-governance requires a structural base that includes leadership of local government, the civic technology community, the digital infrastructure and open data as raw material. Data is a resource and its transformations can produce improvements in efficiency and the competitiveness of the city.

6.5. Role of planners

Urban planning has an opportunity to develop a role in the scenario of smart cities, and in the civic technology community, where planners appear as the missing actors. I identified two roles that planners can play. These are the external role and the internal role. A planner can play an “external role” by creating linkages between the civic technology community and neighborhood communities. These two communities have different types of knowledge that need to be shared among members of both groups in order to produce urban solutions that are more closely to local concerns. Neighborhood communities are in transition to become more involved

in the broader (local context) civic technology community because the gap between these two communities needs to be reduced, not just in terms of access to information, but also in terms of training and knowledge, to be better positioned to take advantage of open data and big data. The planner should have two positions here: be part of the civic technology community as a “collaborative member” and not just observe as an outsider, and bring the planning perspective to the discussions and actions of this community. Secondly, a planner may act as a “nexus” between these communities (civic technology community and neighborhood communities) by facilitating dialogues, interactions, sharing knowledge, and addressing urban concerns and potential sustainable urban solutions on a short-term and also real-time basis.

The “internal role” identified occurs in terms of data management. In planning practices data has been used “encrypted” rather than “open.” Thus, the form of open data and the increasing amount of data available in the form of big data have completely changed previous encrypted “data management.” The openness of data also implies an openness of processes and openness of practices. Data is no longer produced in a unidirectional manner, meaning in terms of the top-down logic or from the center to periphery. The aggregation of information, cloud storage, and the flow of information have expanded their limits. New forms of data production include civic community feedback; citizens are no longer simply the passive recipients of reports and encrypted results delivered by government agencies, decision-makers, and planners. In the case of Chicago, the civic technology community is helping to improve open datasets published on the open data portal. They are re-using public data for data visualization and in developing web and mobile applications. This is a high level of civic engagement based on the knowledge of a community that is highly skilled in technologies, and oriented toward the civic collective interest in improving living conditions in Chicago. Thus, planners face new challenges in this scenario. These challenges involve data management for open data and big data through planning in Cyberenvironments.’

6.6 Public participation and planning

Public participation is the core of planning and it is substantial for the legitimacy of the planning process, based the involvement of proper and valid stakeholders and subsequent related accountability procedures.

At this point, we could consider the different ways of participations: assembly, communities, networks, and finally “the cloud.” All of these are different expressions of the same subject, “participation,” and certainly every one of these forms of participation could define a different territorial unit, and even more, “the space.”

The soul of planning is the citizen, indeed the “new connected citizen.” Thus, the participation of this new citizen is not an “added value” of the planning process, but a “constitutive value” (meaning without it the planning process cannot be considered).

Today it is absolutely clear that public participation brings the “human dimension” to a planning scenario embedded in data flow and technology, making it evident now than before that all possible transformations related to planning and policy-making in the end depend on social cohesion and consensus building.

Planning, at the end, must be translated into services for the citizens, services like mobility, energy efficiency, health care, etc. All these services could be provided remotely and with a systematic approach. This approach requires a “well tempered” governance platform involving government and civil society nowadays in real-time.

These citizens, main actors of public participation, are different today, are more connected, involved, and demanding. These citizens 2.0 are actually a different territorial asset with different regulations and responsibilities. Considering for example a consensus-building for urban regeneration areas. In those cases, is quite clear that the community debate is not focused only on those residents who study, work, or live in the involved area, but also those who take part in the same on-line focus groups because in some way they also have an interest in the

area's development. So the territorial unit is complex. It is not direct, nor is it symmetrically (neighborhood) connected. Rather, most of the time it is really fuzzy but legitimate link between the "public."

So public participation is not only a one-way procedure necessary to legitimize processes, but is a constitutive value of the planning and transforming of the territory, and today even more that the territory means transforming a multivectorial space in real-time.

CHAPTER 7

CONCLUSIONS

This dissertation initially focused on the relationship between planning and information and communication technologies (ICTs). This is because ICTs have been increasingly used in the lives of people particularly in urban agglomerations and have had an increasing impact. Into this scenario many smart cities initiatives have been launched, such as experimental urban projects as “laboratory cities” and a move to transform existing cities into smart cities. Most of these projects and initiatives have been embedded in technologies where the focus is the city’s operational performance using smart technology solutions. In the case of laboratory cities, these projects recreate the urban environment and seek to attract concentrations of IT companies and human capital for the purpose of innovation. Such cities in the process of transformation seek to achieve efficiencies and competitiveness, provide infrastructure, optimize the conditions that foster an efficient city, and retain and attract companies, particularly IT companies. However, there is a tendency to develop these projects and initiatives by setting “the technology operation” as the main goal, and by understanding urban agglomerations as “data generation systems” rather than understanding them as being human-centered networks in which the actions and interactions of people provide the characteristics and the genius loci of a city. Because the human dimension builds the environments, which are integrated by citizens any full approach to the smart city should consider this.

I focused on revealing these environments through the impacts of open data in Chicago. However, I moved beyond the datasets themselves to focus on the social aspects of their impact in the ubiquitous society. This approach provides a contextualized understanding of the Chicago case study, where I found that the impacts centered upon community participation and governance, including implications for urban planning.

The analysis of the case study led to the finding that citizen participation is not confined to “traditional spaces of meetings” and “arenas” defined by the collaborative planning. These traditional spaces have experienced an evolution as citizens develop new modes of participation

which involve linkages between space and time (physical, virtual and real-time). These new modes of participation were created to achieve specific outcomes and interests related to skills and knowledge, which participants share when building communities. These types of communities have created and achieved positions to express and take action on urban concerns which are not limited to claiming and demanding solutions from authorities. They include suggesting and creating solutions and putting such solutions in action using new channels of communication based on the information and communication technologies (ICTs) to make their demands and solutions visible. Changes in communication have been exponentially augmented by the impact of the ICTs and have accelerated the visibility of demands and solutions which occur in real-time. This time acceleration has compressed cities in which many urban physical infrastructures are reported on in real-time through mobile applications; such information is increased by the citizen's voluntary reports about city dynamics. Citizens can also request answers faster than ever before from the local government and institutions involved in public services.

Another impact is the membership of community groups organized by government agencies. Citizens have created new ways of participations by groups that act as "living labs" in which there is no formal membership. Through these groups participants express concerns about collective interests and collective knowledge, and they are willing to share knowledge and build communities.

There has been a shift of paradigm from the "digital age" to the "knowledge age." During the digital age, the focus was on the "access" to the Internet, while during the knowledge age the focus is on the "speed" of the Internet. Speed can determine the type and size of content that is feasible for downloading and uploading. In terms of urban development, speed is critical for defining the "level of acceleration" that is defined by knowledge.

I identified this type of community in Chicago, and I defined it as the Chicago civic technology community (CCTC). The CCTC plays a key role in the open data movement and achieved a high level of participation in Chicago. The survey conducted included two groups in this community: the Open Gov Chicago, and the Open Gov Hack Night. This sample shows that

the synergy developed by the CCTC reveals changes in civic participation and changes in governance improving accountability. This dynamic shows that the evolution from governance to e-governance has been reinforced by instant communications, and this has led to the development of a vibrant flow of feedback on the local level between members of the CCTC and the local government. The CCTC offers an opportunity to bring together developers, members of organizations, and citizens who had previously been working individually using data, and the CCTC helped bring them together. The CCTC has acted as a catalyst to further innovation by reusing data, and transformed existing data into new content and shared the results with the local government and organizations.

This research considers the evolution of planning and takes rational planning, collaborative planning, and e-planning into consideration. In using this approach, I considered changes in focal points of rational planning that focus on the definition of the territorial unit (regional, metropolitan, urban) and understanding it as a whole system. In collaborative planning, there is a particular interest in finding out who are the members by groups of the territorial unit; e-planning focuses attention on networks of actors. In k-planning the focus is on Cyberenvironments.

I suggest k-planning (knowledge planning) as a new venue in planning. K-planning offers a comprehensive and contextualized understanding of “planning in Cyberenvironments.” The urban planning in Cyberenvironments is feasible by using k-planning that includes has the real-time dimension, and represents a space is built by dynamic synergies in the friction of environments, where all environments are in motion at the same time, thereby generating energies that are working together in collaboration and co-production. K-planning addresses the real-time dimension by utilizing the “acceleration” of space and time simultaneously as “the acceleration of territorial development.” This acceleration can reach different levels, and these levels will depend of the level of knowledge.

K-planning offers an alternative to the urban development of smart cities based on k-planning. This can be applied to the urban generation of smart cities and the urban regeneration for smarter existing cities. K-planning can be applied as the basis for smart cities that have been

developed mainly as experimental living laboratories or innovation zones without considering a community's synergies of existing human capital, particularly in the case of developing smart cities from scratch. K-planning involves the genius loci as the basis of any smart city, and this will depend of the local environment. Thus, the key components of a smart city are embedded in k-planning.

This research concludes that the impacts of open data extend beyond data collection and data management. There are also social implications which involve civic communities. The development of relationships involving the civic community and members of government agencies can reinforce urban governance, where governance takes the form of *e-governance*. Open data is helping cities and citizens understand the city's dynamics, how a city works, and how a city talks back to authorities and decision-makers using instant and real-time communication. This instant dynamic interaction between the city government and citizens has implications for changes in citizen participation and communities that should be included in planning practices. Planning should include the scenario of how having "instant multidimensional information" available involves changes in communities' interactions, which can facilitate planning processes. This also requires changes in the approaches that planners use and understanding the role played by civic technology communities. The roles that planners play can be diverse, such as the role of a mediator introducing the planning perspective to dialogues, and the role of a member of the civic technology community.

I consider future possibilities for research in the urban big data context. There is great interest in big data and applications of big data on the territorial scale. Big data has been increasing its connections to urban issues by using sensor data collection on buildings, sensors located in public spaces, sensors on transportation systems and sensors of environments. However, a question emerges: how can big data be applied on the urban scale and on a small scale, such as in neighborhoods or innovation zones? This will require emphasizing linkages between big data and different territorial scales. I consider k-planning to be a potential intersection between big data and planning on a different territorial scale. K-planning and big data are related by their approach to the short-term which involves using real-time dynamic dimensions.

APPENDIX A

ONLINE SURVEY PROTOCOL



Online Consent Form

Dear participant:

You are invited to participate in this survey because you are part of the Open Gov Chicago group or the Open Gov Hack Night group. This study is part of the dissertation of Claudia Vicentelo, a doctoral candidate at the University of Illinois at Urbana-Champaign under the supervision of Professor Tschangho John Kim, Department of Urban and Regional Planning at the University of Illinois at Urbana-Champaign.

This survey is part of the research 'Planning in Cyberenvironments: An Analysis of the Impacts of open data in Chicago.' The purpose of this research is to analyze the open data in Chicago, and potential impact in urban planning. This study focuses on community participation in planning process and changes introduced in terms of governance at the local level. Your responses to this online survey are very important and will help us to characterize the Chicago civic technology community.

This survey will take approximately 15 minutes of your time. You will be asked to complete an online survey about civic role of participation, expertise, skills, education and occupation. This survey also seeks demographic data such as age range, sex and race.

Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time without penalty. You may skip any questions you do not wish to answer. If you do not wish to complete this survey just close your browser. There are no risks to individuals participating in this survey beyond those that exist in daily life.

Your participation in this research will be completely anonymous. Possible outlets of dissemination may be co-investigator dissertation and aggregated results can be disseminated by means of journal articles, conference presentations and web portals. Although your participation in this research may not benefit you personally, it will help us understand a new type of community's participation.

If you have questions about this research, you may contact Claudia Vicentelo by phone 217-417-0077 and by email vicente1@illinois.edu or contact, Professor Tschangho John Kim at tjohnkim@illinois.edu or 217-649-1719.

If you have any questions about your rights as a participant in this study or any concerns or complaints, please contact the University of Illinois Institutional Review Board at 217-333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

Please print a copy of this consent form for your records, if you so desire.

I have read and understand the above consent form, I certify that I am 18 years old or older and, by clicking the I consent button to enter the survey, I indicate my willingness voluntarily take part in the study.

I Consent

0%

Chicago Civic Technology Community Survey

Part I: Participation *(This part will ask about your participation in Open Gov Chicago and/or Open Gov Hack Night)*

- 1. In which of the following groups (Open Gov Chicago and/or Open Gov Hack Night) have you participated in or are currently active? (please select one)**
 - Open Gov Chicago
 - Open Gov Hack Night
 - Both Open Gov Chicago and Open Gov Hack Night
- 2. In which year did you first take part in this group?**
 - 2009
 - 2010
 - 2011
 - 2012
 - 2013
- 3. In which ways do you participate in these groups? (Please select all that apply)**
 - Attending meetings
 - Making presentations
 - Being a mentor or leader
 - Developing projects
 - Networking
 - Other ways _____

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10%

Chicago Civic Technology Community Survey

Part II: Expertise and Data Use *(this part will ask you about expertise, skills and data management)*

- 4. What is your main area of expertise? (Please select one)**
 - Web Development
 - Mobile Development
 - Programming
 - Digital Design
 - Entrepreneurship
 - Urban Planning
 - Geographic Information Systems
 - Community Development
 - Media communications
 - Other: _____
- 5. Which qualities and skills do you bring to Open Gov Chicago and/or Open Gov Hack Night meetings and activities? (Please rate all)**

	A lot	Very	Moderate	A little	Not at all
Creativity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shared knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaboration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Networking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entrepreneurship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programming skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organization skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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20%

6. Are you currently working on, or have you ever worked on any of the following types of projects? (Please select all that apply)

- Mobile Apps
- Web-based
- Cloud-based
- I have never worked on mobile Apps, web-based or cloud-based projects

7. Have you used open data portals to visualize data and/or for project development?

- I have used data from open data portals to visualize data and for project development
- I have used open data portals only to visualize data
- I have never used open data portals



8. From which of the following open data portals do you usually obtain data from? (Please select all that apply)

- Federal open data portal
- State open data portal
- County open data portal
- Local government open data portal
- Other open data portals

9. When using open data how diverse are the areas of expertise of the team that your work with?

- Very diverse
- Somewhat diverse
- Not very diverse
- Not at all diverse



Chicago Civic Technology Community Survey

Part III: Urban Issues and Community (In this part you will find questions about urban issues, planners, community and stakeholders)

10. Please rate each of the following goals in terms of importance for you (Please rate all)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
To improve transparency of the Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To collaborate with decision-makers (local government and other government agencies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To provide potential solutions to urban issues (e.g. transportation, environment and urban security)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improve community living conditions using technologies (hardware and software)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To develop applications using data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. In which areas are you currently working or developing projects or ideas to address urban issues? (Please select all that apply)

- Transportation
- Environment
- Economic development
- Public safety
- Transparency of public services
- Health and human services
- Education
- Housing and buildings
- Public space

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40%

Chicago Civic Technology Community Survey

Part III: Urban Issues and Community

12. Have you worked with urban planners, or are you now working with urban planners, to develop your projects or ideas?

- I am now working with urban planners
- I have worked with urban planners
- I am now working with urban planners and I have worked with urban planners
- I have never worked with urban planners

13. Have you worked with neighborhood communities, or are you working with neighborhood communities, to develop projects that address their urban concerns?

- I am now working with neighborhood communities
- I have worked with neighborhood communities
- I am now working with neighborhood communities and I have worked with neighborhood communities
- I have never worked with neighborhood communities

14. Which of the following types of stakeholders do you keep in mind while developing projects?

- General public
- Non-profit organization
- Local community
- Corporate stakeholder

[Back](#) [Next](#)

50%

Chicago Civic Technology Community Survey

Part IV: Background (This part will ask you information about your demographic, educational level and occupation)

15. What is the zip code in which you currently reside?

Zip code: _____

16. What is your sex? (Please select one)

- Male
- Female

17. What is your age range?

- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65+

Back

Next

60%

Chicago Civic Technology Community Survey

Part IV: Background

18. With which race or ethnic category do you most identify? (Please select one)

- ✓ -- Please Select --
- White
- Black or African American
- American Indian or Alaska Native
- Asian Indian
- Japanese
- Native Hawaiian
- Chinese
- Korean
- Guamanian or Chamorro
- Filipino
- Vietnamese
- Samoan
- Other Asian
- Other Pacific Islander
- Other Hispanic, Latino, or Spanish origin
- Other

19. What is the highest level of education you have completed?

- Less than High School
- High School/GED
- Some College
- Associate Degree
- Bachelor's Degree
- Master's Degree
- Professional Degree (e.g. law, medical)
- Doctoral Degree

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Next

70%

20. Which of the following best describe your current occupation? (Please select one)

- Management, Professional and Technical
- Service
- Clerical
- Self-employed
- University and College faculty or administrator
- University and College staff
- Undergraduate student
- Graduate student
- Retired
- Unemployed
- Other: _____

21. Where are you employed? (Please select one)

- Private-For-Profit, company, business or individual, for wages, salary or commissions
- Private-Not-For-Profit, tax-exempt, or charitable organization
- Local Government employee (city and county, etc.)
- State Government employee
- Federal Government employee
- Self-Employed in Own Not Incorporated business, professional practice, or farm
- Self-Employed in Own Incorporated business, professional practice, or farm
- Working Without Pay in family business or farm
- Not-Apply

Back Next

80%

22. Do you participate as a full-time, a part-time, an intern or a collaborator in a digital start-up?

- I participate as a full-time employee
- I participate as a part-time employee
- I participate as an intern
- I participate as a collaborator (not a full-time, not a part-time, not an intern)
- I do not participate in a digital start-up now, I would like to participate in the future
- I do not participate in a digital start-up

Back Submit

90%

Chicago Civic Technology Community Survey
Thank you!

Thank you for taking our survey. Your response is very important to us.

If you have any questions about this research, please feel free to contact:

Claudia Vicentelo
Department of Urban and Regional Planning
University of Illinois at Urbana-Champaign
email: vicente1@illinois.edu

100%

Smartphone version

Chicago Civic Technology Community Survey

Part I: Participation *(This part will ask about your participation in Open Gov Chicago and/or Open Gov Hack Night)*

1. In which of the following groups (Open Gov Chicago and/or Open Gov Hack Night) have you participated in or are currently active? (please select one) *

- Open Gov Chicago
- Open Gov Hack Night
- Both Open Gov Chicago and Open Gov Hack Night

2. In which year did you first take part in this group?

2009

APPENDIX B

INTERVIEW PROTOCOL

Interview Questionnaire and Online Questionnaire

Question 1:

What policies, program or projects were implemented, or are currently under implementation by your institution or organization for the purpose of helping to develop a smarter Chicago?

Question 2:

What are the results, or preliminary results, of evaluations of those policies, programs or projects that were implemented?

Question 3:

What is your opinion of open data for the purpose of transparency, governance and community participation?

Question 4:

What do you consider to be the relevant expected and unexpected impacts of open data in Chicago?

Question 4/b (*For institutions of urban planning area only*):

What are the potentialities of open data for use in urban planning?

Question 5:

How is your institution or organization involved in projects to promote Apps development or Apps use?

Question 6:

In which ways do you consider Apps to be improving the quality of life of people in Chicago?

Question 7:

Are there previous evaluations of the impacts produced by Apps used?

Question 8:

What do you consider to be the key factors that can help Chicago become a smart city?

Question 9:

How can technology be crucial for urban development?

Question 10:

What is your opinion concerning the current role of urban planners in urban technology or urban informatics?

Question 11:

In terms of community participation, what do you consider to be the role that is played by the civic technology community in Chicago?

Question 12:

What will be the future actions of your institution or organization for a smarter Chicago?

Question 13:

What current and future plans will be implemented by your institution or organization for the inclusion of people in the civic technology community of Chicago?

Question 14:

What drawbacks and challenges should Chicago address in terms of physical infrastructure to become a smart city?

Additional Comments:

Are there any comments that you would like to add?

Interview Consent Form (page 1/2)

Dear interviewee:

You are invited to participate in this study that is part of the dissertation research of Claudia Vicentelo, a doctoral candidate at the University of Illinois at Urbana-Champaign under the supervision of Professor Tschangho John, Department of Urban and Regional Planning at the University of Illinois at Urbana-Champaign.

Interviews are conducted for the purposes of understanding actions, roles, perspectives and networks of stakeholders that from different sectors are seeking to help Chicago become a smart city. This interview will take approximately one hour of your time. You will be asked about policies, programs and projects for the purpose of transparency, e-governance, open data, community participation and technology in urban context.

With your permission, I will audio recording and take notes during the interview. The audio recording is to accurately record the information you provide, and will be used for transcription purposes only. If you choose not to be audio recorded, I will take notes instead. If you agree to be audio recorded but feel uncomfortable at any time during the interview, I can turn off the recorder at your request. Or if you don't wish to continue, you can stop the interview at any time without any consequences.

Your participation is voluntary, and you must be at least 18 years old to participate in this study. The risks of participating in this study are minimal. The results of this study will be used in my doctoral dissertation and aggregated results can be disseminated by means of journal articles, conference presentations. Data will be handled confidentially. If results of this study are published or presented, individual names and other personally identifiable information will not be used.

For questions about this interview or my dissertation, contact me by email at vicentel1@illinois.edu or contact my advisor, Professor Tschangho John Kim at tjohnkim@illinois.edu.

If you have any questions about your rights as a participant in this study, please contact the University of Illinois Institutional Review Board at 217-333-2670 (collect calls accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

Your participation is extremely valuable to the success of this study. Please take a moment to fill out the consent form. I will keep one copy in my files and you are invited to keep this letter and a copy of the consent form for your records.

Thank you for your time and participation.
Sincerely,

Claudia Vicentelo
Ph.D. candidate
Department of Urban and Regional Planning
University of Illinois at Urbana-Champaign

Interview Consent Form (page 2/2)

- You will be given a copy of this consent form for your records.
 - I am 18 years of age or older.
 - I understand that audio recording will be used for transcription purposes only, and will not include individual names and other personally identifiable information.
- The researcher may make an audio recording of my interview
- The researcher may not make an audio recording of my interview

I have read and understand the above consent form and voluntarily agree to participate in this study.

Participant's Signature

Date

Online Consent Form

Online Questionnaire

You are invited to participate in this study that is part of the dissertation of Claudia Vicentelo, a doctoral candidate at the University of Illinois at Urbana-Champaign under the supervision of Professor Tschangho John Kim, Department of Urban and Regional Planning at the University of Illinois at Urbana-Champaign.

This study includes online questionnaires for the purposes of understanding actions, roles, perspectives and networks of stakeholders that from different sectors are seeking to help Chicago become a smart city.

This online questionnaire will take approximately 30 minutes of your time. You will be asked to complete an online questionnaire about policies, programs and projects for the purpose of transparency, e-governance, open data, community participation and technology in urban context.

Your decision to participate or decline participation in this research is completely voluntary and you have the right to terminate your participation at any time. If you do not wish to complete this online questionnaire just close your browser. There are no risks to individuals participating in this online questionnaire beyond those that exist in daily life.

Your participation in this research will be completely confidential and data will be averaged and reported in aggregate. Possible outlets of dissemination may be co-investigator dissertation and aggregated results can be disseminated by means of journal articles, conference presentations and web portals. Although your participation in this research may not benefit you personally, your participation in this study will be significant because it will contribute to the body of knowledge on Chicago as a case study of a smart city.

If you have questions about this research, you may contact Claudia Vicentelo by email vicentel@illinois.edu or contact Professor Tschangho John Kim at tjohnkim@illinois.edu.

If you have any questions about your rights as a participant in this research or any concerns or complaints, please contact the University of Illinois Institutional Review Board at 217-333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

Please print a copy of this consent form for your records, if you so desire.

I have read and understand the above consent form, I certify that I am 18 years old or older and, by clicking the submit button to enter the online questionnaire, I indicate my willingness voluntarily take part in the study.

SUBMIT

IRB Protocol approval letter

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Office of Vice Chancellor for Research
Institutional Review Board
528 East Green Street
Suite 203
Champaign, IL 61820



September 30, 2013

Tschangho John Kim
Urban & Regional Planning
210 Temple Buell
MC-619

RE: *Planning in Cyberenvironments: An Analysis of the Impacts of Open Data in Chicago*
IRB Protocol Number: 14177

EXPIRATION DATE: September 29, 2016

Dear Dr. Kim:

Thank you for submitting the completed IRB application form for your project entitled *Planning in Cyberenvironments: An Analysis of the Impacts of Open Data in Chicago*. Your project was assigned Institutional Review Board (IRB) Protocol Number 14177 and reviewed. It has been determined that the research activities described in this application meet the criteria for exemption at 45CFR46.101(b)(2).

This determination of exemption only applies to the research study as submitted. Please note that additional modifications to your project need to be submitted to the IRB for review and exemption determination or approval before the modifications are initiated.

We appreciate your conscientious adherence to the requirements of human subjects research. If you have any questions about the IRB process, or if you need assistance at any time, please feel free to contact me or the IRB Office, or visit our website at <http://www.irb.illinois.edu>.

Sincerely,

Dustin L. Yocum, Human Subjects Research Exempt Specialist, Institutional Review Board

c: Claudia Vicentelo

APPENDIX C

DEFINITION OF CONCEPTS

Big data

Collection of data sets large and complex in volume, variety, and velocity of data generation. Big data exceed the capability of traditional software data analysis. These data sets increase by ubiquitous collection that include procedures such as mobile devices, remote sensors, radio-frequency identification (RFID) and wireless networks.

Cyberenvironments

Collection of computational resources, data and visualization of resources available online based on integration of resources in participatory use and collaboration. Urban Cyberenvironments bring a collaborative dimension in time and space, in the form of urban interactive and collaborative ecosystems. This form exists in real-time.

E-governance

Evolution of traditional governance to government's ability to engage with other institutions, and within networks supported by information and communication technologies (ICTs), improving government efficiency and effectiveness; making government practices more accountable, transparent, and efficient, and facilitating direct citizen participation. E-governance involves three main contributions: e-administration (internal government process), e-services (delivering efficient services), and e-society (building networks and interactions).

E-planning

The use of information and communication technologies (ICTs) in urban and regional planning. E-planning supported by ICTs can be implemented in the planning process facilitating participation, and in urban systems seeking efficiency.

Genius loci

Conjunction of physical and symbolic characteristics built by cultural, social, local values created by people interaction and local environments that define the uniqueness of place and sense of place that make it identifiable.

Innovative milieu

The concept emphasizes the local synergy as an essential component of innovation, in which interactions and collective “learning and labor” become the core of local synergies. The innovative milieu concept takes into consideration the social structures that constitute the point of origin of innovative behaviors in which “knowledge,” “interactions,” and “frictions” among members in this environment are essential components of the innovative milieu.

Knowledge planning

Knowledge planning or “k-planning,” is based on Cyberenvironments, and knowledge can provide the basis for developing future smart cities by considering the “re-concentration of knowledge.” This occurs through the process of transforming information into knowledge, where knowledge is built by dynamic synergies, interactions, and frictions of “cloud environments.”

Network society

The network society is a social structure comprised of linkages between the technological paradigm and the social organization—a characteristic of the information age. The network society manifests itself in many different forms that have been shaped by culture, institutions, and history. There are two social forms of time and space in the network society: the “space of flows” and “timeless time.”

Open data

Structured data which are publicly available and can be used and restructured by users into new contents. Open data should include the following principles: it should be public, accessible, described, reusable, timely, and well-managed post-release.

Open data (first order)

The outcome of the open data at the first order has focus on transparency of government. Governments (federal, state, and local) make public datasets available by open data platforms such as web portals. These data sets are accessible to be downloaded and reused by the public.

Open data (second order)

Open data in the second order is an evolution of open data first order. This second order focuses on collaboration with decision-makers seeking urban solutions. This second order has a transition from virtual space (first order) to physical space (second order).

Smart city

A city knowledge-based, efficient, and effective, able to be competitive, cohesive, and environmentally sustainable, supported by the use of information and communication technologies (ICTs), which promote interaction and collaboration between citizens and decision-makers to improve living conditions and society.

Ubiquitous geographic information

Ubiquitous geographic information (UBGI) provides geographic information to users that they can use anywhere, anytime, and with different devices. The goal of UBGI is to make geographic information transparent and easy to access, supported by information and communication technologies. UBGI requires services available to the general public without a need to previous training in geographic information systems (GIS).

Ubiquitous society

Ubiquitous society developed by impact of ubiquitous synergy of technologies and ubiquitous information. The real-time dimension is part of ubiquitous society, where people (person to person) and objects (object to object) are also able to communicate between themselves. This experience is an evolution from the network society to the ubiquitous society, where people interact and communicate in real-time anywhere even if they are not part of networks.

APPENDIX D

TAXONOMY

Taxonomy literature review

Research Areas	Specific Concepts		Authors
Planning Theory	Rational planning	<ul style="list-style-type: none"> • Power in planning • Scientific method • Control systems 	Forester (1974, 1989) Friedmann (1987) Alexander (2000) Yiftachel (2008)
	Communicative planning	<ul style="list-style-type: none"> • Communicative action • Communicative process • Meaning of information 	Healey (1992) Sager (1994) Innes (1995, 1998)
	E-planning	<ul style="list-style-type: none"> • Multidimensional • IT integration 	Silva (2010) Horelli & Wallin (2010)
Network Society	Digital age	<ul style="list-style-type: none"> • Space of flow • Power networks • Virtual Space of power • Right and ownership to access 	Castells (1997, 2000, 2009) Sassen (1997) Rifkin (2000)
	Urban planning in cyberspace	<ul style="list-style-type: none"> • Human and machine • Cybernetic city model • Urban environments • Human, network and space • Contemporary urbanism • Network society • Space of flows • Time and space • Planning in cyberspace • Technologies in urban development • Place - based to Virtual - based 	<ul style="list-style-type: none"> • Wiener 1948; Beer, 1975. • Swanson & Johnson, 1964. • Mitchell, 1995 • Castells, 1997. • Graham and Healey, 1998. • Shiode, 1999, 2000. • Beauregard, 2005. • Augiri, 2005. • Corey and Wilson, 2006. • Kim, 2008. • Kim, Claus, Rank and Xiao, 2009
	Information and Communication Technology (ICT) & Cities	<ul style="list-style-type: none"> • Telecommunications & cities • Infrastructure as nervous systems • ICT & planning • Ubiquitous city 	Graham & Marvin (1996) Mitchell (2000) Albrechts & Mandelbaum (2008) Kim (2008) Maeng & Nedović-Budić (2008)
	GIS & planning	<ul style="list-style-type: none"> • IT in planning participation 	Aitken & Michel (1995) Fley (2005) Hanzl (2007). Nedović-Budić (2011) Silva (2011)
	Smart cities	<ul style="list-style-type: none"> • Engineering-based • Knowledge-based economy • Emerging, green and ubiquitous technologies • Interconnection • Interoperability • Real-time information • Decision support systems • Smart layers 	<ul style="list-style-type: none"> • Juan, Wang, Leckie and Li, 2011. • Kehua Su, Jie Li, & Hongbo Fu, 2011
	Open Data	Big Data Collaborative environments	Sawicki & Craig (1996) Batty (2012)

REFERENCES

- Albrechts, L. and Mandelbaum, S. L. (2005). *The network society: a new context for planning?*. New York London: Routledge.
- Alexander, E R. (2000). Rationality revisited: Planning paradigms in a post-postmodernist perspective. *Journal of planning education and research*, 19(3), 242-256.
- Allmendinger, P. and Tewdwr-Jones, M. (2001). *Planning futures: new directions for planning theory*. London: Routledge.
- Alusi, A., Eccles, R., Edmondson, A, and Zuzul, T. (2011). *Sustainable Cities: Oxymoron or the Shape of the Future?*. Harvard Business School.
- Aydalot, P. (1986). *Milieux innovateurs en Europe*. GREMI, Paris.
- Aydalot, P. and Keeble, D. (1988). *High technology industry and innovative environments: the European experience*. Routledge, London.
- Aurigi, A. (2005). *Making the digital city: The early shaping of urban Internet space*. Aldershot, Hants, England: Ashgate.
- Batty, M. (2012). Smart City, Big Data. *Environment and Planning B, Planning and Design* 2012, 39 (2), 191-193.
- Batty, M. (2013). The future cities agenda. *Environment and Planning B, Planning and Design* 2013, 40 (2), 191-194.
- Batty, M. (2014). City 1.0, City 2.0, City n.0, ..., City t. *Environment and Planning B, Planning and Design* 2014, 41 (1), 1-2.
- Beauregard, R. (2005). Planning and the network society: discursive correspondences. In Albrechts, L. and Mandelbaum, S. L. (Eds.). *The network society: a new context for planning?*. New York, London: Routledge.
- Beer, S. (1975). *Platform for Change*. Published by John Wiley & Sons.
- Camagni, R. (1995). The concept of innovative milieu and its relevance for public policies in European lagging regions. *Papers in Regional Science*, 74: 317-340.
- Castells, M. (1997). An Introduction to the Information Age. From *City 7*, pp. 6-16.
- Castells, M. (2000). Materials for an exploratory theory of the network society. *British Journal of Sociology*. Vol. No. 51. No. 1. pp. 5-24.
- Castells, M. (2009). *Communication Power*. Oxford University Press.

- City of Chicago. (2011). Open Data Portal. Retrieved from <https://data.cityofchicago.org>
- Code of America. (2012). City Partner: Chicago. Retrieved from <http://codeforamerica.org/2012-partners/chicago/>
- Corbin, J. & Strauss, A. (2008). Basics of qualitative research: techniques and procedures for developing grounded theory. Thousand Oaks, CA: Sage.
- Corey, K. E., & Wilson, M. I. (2006). Urban and regional technology planning: planning practice in the global knowledge economy. Oxon: Routledge.
- Creswell, J. (1998). Qualitative inquiry and research design. Thousand Oaks, CA: Sage Publications.
- Dawes, S. S. (2008). The evolution and continuing challenges of e-governance. *Public Administration Review*, 68(s1), S86-S102.
- Desouza, K. C. & Bhagwatwar, A. (2012). Citizen Apps to Solve Complex Urban Problems. *Journal of Urban Technology*, 19 (3), 107-136.
- Forester, J. (1974). *Social Change: Problems of Technology and Planning*. Institute of Urban & Regional Development University of California, Berkeley.
- Forester, J. (1989). *Planning in the Face of Power*. Berkeley, CA: University of California Press.
- Fley, K. (2005). ICT-enforced Community Networks for Sustainable Development and Social Inclusion. In Albrechts, L. and Mandelbaum, S. L. (Eds.). *The network society: a new context for planning?*. New York, London: Routledge.
- Friedmann, J. (1987). *Planning in the Public Domain*. Princeton: Princeton University Press.
- Graham, S., & Marvin, S. (1996). *Telecommunications and the City: Electronic Spaces, Urban Places*. London: Routledge.
- Graham, S., & Healey, P. (1999). Relational concepts of space and place: Issues for planning theory and practice. *European Planning Studies*, 7(5), 623-646.
- Graham, S. (2004). *The cybercities reader*. London: Routledge.
- Hanzl, M. (2007). Information technology as a tool for public participation in urban planning: A review of experiments and potentials. *Design studies*, 28(3), pp. 289-307.
- Harrison, C., & Addott, I. (2011). A Theory of Smart Cities. Proceedings of the 55th Annual Meeting of ISSS, Held at University of Hull Business School, UK, July 17-22, 2011.

- Harrison, C. (2012, January 5). Urban Information Networks, Part 3: Open Data 2.0. Retrieved from <http://asmarterplanet.com/blog/2012/01/urban-information-networks-part-iii.html>
- Healey, P. (1992). Planning through debate: The communicative turn in planning theory. *The Town Planning Review*. Vol. No. 63. No. 2., pp. 143-162.
- Healey, P. (2006). *Collaborative planning: Shaping places in fragmented societies*. Basingstoke, Hampshire: Palgrave Macmillan.
- Horelli, L., & Wallin, S. (2010). The Future-Making Assessment Approach as a Tool for E-Planning and Community Development: The case of Ubiquitous Helsinki. In Silva, C. N. (Eds.). *Handbook of Research on E-planning: ICTs for Urban Development and Monitoring*. Hershey, PA: Information Science Reference.
- Hunt, D. B., & DeVries, J. B. (2013). *Planning Chicago*. American Planning Association.
- Illinois Open Technology Challenge. (2012, October 20). Governor Quinn Launches Illinois Open Technology Challenge. Retrieved from <http://www3.illinois.gov/PressReleases/ShowPressRelease.cfm?SubjectID=2&RecNum=10646>
- Illinois State. (2012). Open Data Portal. Retrieved from <https://data.illinois.gov>
- Innes, J. E. (1995). Planning theory's emerging paradigm: Communicative action and interactive practice. *Journal of Planning Education and Research* 14: pp. 183–189.
- Innes, J. E. (1998). Information in communicative planning. *Journal of the American Planning Association*. Vol. No. 64, No.1, pp. 52-63.
- Jessop, B. (1997). Capitalism and its future: remarks on regulation, government and governance. *Review of International Political Economy*, 4(3), 561-581.
- Jivén, G, Jiven, G, & Larkham, P J. (2003). Sense of place, authenticity and character: A commentary. *Journal of urban design*, 8(1), 67-81.
- Juan, Y-K., Wang, L., Wang, J., Leckie, J. O. and Li, K.-M. (2011). A decision-support system for smarter city planning and management. *IBM Journal of Research and Development*, vol.55, no.1.2, pp.3:1-3:12.
- Kalantari, H., Kakantari, E., & Maleki, S. (2011). E-survey (survey based on email & web). *Procedia Computer Science*, 3, pp. 935-941.
- Kehua Su, Jie Li, & Hongbo Fu. (2011). Smart city and the applications. *Electronics, Communications and Control (ICECC), 2011 International Conference on*, 1028-1031.

- Kim, J. T. (2008). Planning for knowledge cities in ubiquitous technology spaces: opportunities and challenges. In Tan Yigitcanlar, Koray Velibeyoglu and Scott Baum (Eds.), *Creative Urban Regions: Harnessing Urban Technologies to support Knowledge City Initiatives*. IGI Global: Hershey, PA.
- Kim, T. J., Claus, M., Rank J. S. and Xiao, Y., (2009). Technology and Cities: Processes of Technology-Land Substitution in the 20th Century. *Journal of Urban Technology*, 16,1:63-88.
- Latour, B. (1997). *Science in action: how to follow engineers and scientists around society*. Cambridge, MA: Harvard University Press.
- Lee, S., Han, J., Leem, Y. and Yigitcanlar, T. (2008) Towards Ubiquitous City: concept, planning, and experiences in the Republic of Korea. In: Yigitcanlar, Tan and Velibeyoglu, Koray and Baum, Scott, (eds.) *Knowledge-Based Urban Development: Planning and Applications in the Information Era*. IGI Global, Information Science Reference, Hershey, Pa., pp. 148-169.
- Loader, B. (1997). *The governance of cyberspace: Politics, technology and global restructuring*. London: Routledge.
- Madanipour, A., Hull, A., & Healey, P. (2001). *The governance of place: Space and planning processes*. Aldershot, Hampshire, England: Ashgate.
- Maeng, D.M., Nedovic-Budic, Z. (2008). Urban Form and Planning in the Information Age: Lessons from Literature. *Spatium*, 17-18 :1-12.
- Mistri, M. (1999). Industrial districts and local governance in the Italian experience. *Human Systems Management*, 18, 131-140.
- Mitchell, W. (1995). *City of Bits: Space, Place, and the Infobahn*. The MIT Press.
- Mitchell, W. (2000). *E-topia: Urban Life, Jim--But Not As We Know It*. Published by The MIT Press.
- Mossberger, K., Tolbert, C. J., & Franko, W. (2013). *Digital cities: The Internet and the geography of opportunity*. New York: Oxford University Press.
- Myers, J. and McGrath, R. (2009). Cyberenvironments. In Cope, B. & Kalantzis, M. (Eds.). *Ubiquitous learning*. Urbana, Ill: University of Illinois Press., pp. 119-130.
- Nedović-Budić, Z., Crompvoets, J., & Georgiadou, Y. (2011). *Spatial data infrastructures in context north and south*. Boca Raton, FL: CRC Press.
- Norberg-Schulz, C. (1980). *Genius Loci: Towards a phenomenology of architecture*. New York: Rizzoli.

- Open Data Executive Order. (2012, December 10). Mayor Emanuel Expands Open Data on City Portal with Executive Order. Retrieved from <http://www.cityofchicago.org/content/dam/city/depts/mayor/Press%20Room/Press%20Releases/2012/December/12.10.12Portal.pdf>
- Open Datasets Released (2012, December 10). 21 Datasets Released in Conjunction with Mayor Rahm Emanuel's Open Data Executive Order. Retrieved from <http://www.cityofchicago.org/content/dam/city/depts/mayor/Press%20Room/Press%20Releases/2012/December/12.10.12HighValueDatasetsFINAL.pdf>
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. SAGE Publications, inc.
- Rhodes, R.A.W. (1996). The new governance: Governing without government. *Political studies*, 44(4), 652-667.
- Rifkin, J. (2000). *The Age of Access: The New Culture of Hypercapitalism, Where All of Life is a Paid-For Experience*. Putnam Publishing Group.
- Robinson, R., Rittenbruch, M., Foth, M., Filonik, D., and Viller, S. (2012). Street Computing: Towards an integrated open data API for cities. *Journal of Urban Technology*, 19(2).
- Saldaña, J. (2009). *The coding manual for qualitative researchers*. London Thousand Oaks, Calif: Sage.
- Sang-Yun, H. and Kim, T. J. (1989). Can Expert Systems help with Planning? *Journal of the American Planning Association*, 55:3, 296-308.
- Sager, T. (1994). *Communicative Planning Theory*. Aldershot: Avebury.
- Sassen, S. (1997). Electronic Space and Power. *Journal of Urban Technology*, Vol. No. 4. No. 1., pp. 1-17.
- Sawicki, D. S. & Craig, W. J. (1996). The Democratization of Data: Bridging the Gap for Community Groups. *Journal of the American Planning Association*, 62 (4), 512-523.
- Silva, C. N. (2010). *Handbook of Research on E-planning: ICTs for Urban Development and Monitoring*. Hershey, PA: Information Science Reference.
- Silva, L. (2011). Institutionalization does not occur by decree: institutional obstacles in implementing a land administration system in a developing country. In Nedović-Budić, Z., Crompvoets, J., & Georgiadou, Y. (Eds.). *Spatial data infrastructures in context north and south*. Boca Raton, FL: CRC Press.
- Shiode, N. (1999) Diffusion of the Internet and paradigm shift in urban planning. In P. Rizzi (ed.), *Computers in Urban Planning and Urban Management*, Milan: Franco Angeli, pp. 15:1-22.

- Shiode, N. (2000). Urban Planning, Information Technology, and Cyberspace. *Journal Of Urban Technology*, 7(2), 105.
- Socrata. (2010). Open Government Data Benchmark Study. Retrieved from <http://www.socrata.com/benchmark-study/>
- Stoker, G. (1998). Governance as theory: Five propositions. *International social science journal*, 50 (155), 27-28.
- Swanson, L., & Johnson, G. O. (1964). *The cybernetic approach to urban analysis*. Los Angeles: University of Southern California, Graduate Program in City and Regional Planning.
- Sue, V. M., & Ritter, L. A. (2007). *Conducting online surveys*. Los Angeles: Sage Publications.
- Tsing, A. (2005). *Friction: an ethnography of global connection*. Princeton, N.J: Princeton University Press.
- Yiftachel, O. (1998). Planning and social control: Exploring the dark side. *Journal of planning literature*, 12(4), 395-406.
- Yiftachel, O. (2008). The Dark Side of Modernism: Planning as Control of an Ethnic Minority. In Bridge, G., & Watson, S. (Eds). *The Blackwell City Reader*. Malden, MA [u.a.: Blackwell., pp. 535-541.
- Yin, R. (2009). *Case study research: design and methods*. Los Angeles, California: Sage Publications.
- United Nations. (2008a). *World Urbanization Prospects: The 2007 Revision Population Database*. Retrieved from <http://esa.un.org/unup/>
- United Nations. (2008b). *State of the World's Cities 2010/2011*. Retrieved from <http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2917>
- United Nations. (2009). *Planning Sustainable Cities: Global Report on Human Settlements*. Retrieved from <http://www.unhabitat.org/content.asp?typeid=19&catid=555&cid=5607>
- United Nations. (2010). *World Habitat Day 2010: Better city, Better Life*. Retrieved from <http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2937>
- United Nations. (2011). *The Economic Role of Cities*. Retrieved from <http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3260>
- Van den Broeck J., Argeseanu Cunningham S., Eeckels R., and Herbst K. (2005). Data Cleaning: Detecting, Diagnosing, and Editing Data Abnormalities. *PLoS Med* 2(10): e267.
- Van der Meer, A. & Van Winden, W. (2003). E-governance in cities: a comparison of urban information and communication technology policies. *Regional Studies*, 37(4), 407-419.

Welsh, E. (2002). Dealing with Data: Using NVivo in the Qualitative Data Analysis Process. Forum: Qualitative Social Research, 3 (2), 20-26.

Wiener, N. (1965). Cybernetics: or, Control and communication in the animal and the machine. Cambridge, Mass: M.I.T. Press.

Williams, K., Durrance, J. C., & Rosenbaum, H. (2009). Community informatics. *Encyclopedia of library and information science*