The London School of Economics and Political Science

Cities on the Path to ‘Smart’:

Information Technology Provider Interactions with Urban Governance through Smart City Projects in Dubuque, Iowa and Portland, Oregon

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A thesis submitted to the Department of Sociology of the London School of Economics and Political Science for the degree of Doctor of Philosophy,
London, July 2016

Declaration

I certify that the thesis I have presented for examination for the MPhil / PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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Abstract

Information and communication technologies are increasingly being infused into city systems and services as part of a growing trend to make cities 'smart'. Through the design and implementation of these efforts, large information technology (IT) providers are interacting with local government policy and planning processes via: (a) strategy—project objectives, priorities and approaches; (b) engagement—which actors are involved, the roles they play and the interactions between and among them; and (c) representation—how the local government portrays the project through narrative and brand. In the discussion below, I argue that as smart projects multiply, interactions around this proliferation will pave the way for IT providers to more broadly inform urban governance processes. For in effect, IT providers are not just selling smart technologies. Rather, they are propagating a set of assertions about the role, structure, function and relationships of local government. These assertions are informed by neoliberal and entrepreneurial principles, bound up with the concept of smart, and attractively wrapped within the smart city imaginary. This imaginary is largely created by IT providers, and cannot be pursued without them.

Within my approach, I view smart initiatives not simply as technical but social and political strategies, for while these projects are about technological innovation, they are also about 'innovations' in the relationships, interactions and discourse that surround them. To capture both the discursive and material realities of these projects, my methods of examination included key informant interviews and case study analysis of two cities in the United States, Dubuque, Iowa and Portland, Oregon. I focus specifically on smart projects led by IBM, an influential actor in the smart city market, and use Dubuque as a primary case study with Portland for comparison. My work provides an in-depth view of the IT provider IBM alongside the rise of the corporate entrepreneurial smart city, and sheds light on what these initiatives might mean for municipal administrations and city residents in similar urban environments.

Acknowledgments

My completion of this dissertation reflects not only my own abilities, but also the tremendous support and encouragement I have received along the way. It began with Lina Abirafeh and Mary Patterson—who together, perhaps conspiratorially, raised the idea of me pursuing a doctoral degree, something that I would not have done otherwise. Nor would this degree have been possible without Ed Bevan, who secured my IBM scholarship, and along with Justin Cook and Reena Jana, provided me the flexibility that I needed to pursue this research while I worked. Amy Loomis, Peter Williams, Colin Harrison, Tom Erickson and Angela Warner all provided insight that helped me through this process. Virginia Tech's Metropolitan Institute provided me an office in which much of this work was written, with faculty and graduate assistants always there to provide words of encouragement.

In both Portland and Dubuque, local government officials and representatives from involved organizations were extremely helpful by providing me with information and granting me (often several) interviews over the years. Without this support, this research would not have been possible.

Daiana Beitler provided critical guidance and support that kept me going along the way and got me across the finish line. My family provided a keen ear to listen to my frustrations as I developed this research and worked full-time; and, along with Michelle Munn, never failed in their belief that I could complete it. Throughout all of this, Lunden Blake helped me keep balance between body and mind. Last, but most certainly not least, Fran Tonkiss and Don Slater provided invaluable feedback throughout my research and drafting.

To each of you, I give my sincerest thanks for all that you have done to help support me over the years as I have pursued this work. I am deeply grateful.

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List of Abbreviations

AMI	Advanced Metering Infrastructure
API	Application Program Interface
ATM	Automated Teller Machine
CDO	Chief Data Officer
CEO	Chief Executive Officer
CFGD	Community Foundation of Greater Dubuque
CIM	City in Motion
CIO	Chief Information Officer
CRM	Customer Relations Management
CTO	Chief Technology Officer
FOAK	First-of-a-Kind
GBS	Global Business Services
GDDC	Greater Dubuque Development Corporation
GDF	Global Delivery Facility
GE	General Electric
GIS	Geographic Information System
GPS	Global Positioning System
HP	Hewlett-Packard
IBM	International Business Machines
ICMA	International City / County Management Association
ICT	Information and Communication Technology
IT	Information Technology
M&C	Marketing & Communications
POV	Point of View
PPP	Public-Private Partnership
R&D	Research & Development
S&D	Sales & Development
SCC	Smarter Cities Challenge
SD	Sustainable Dubuque
SDSC	Systems Dynamics for Smarter Cities
SSD	Smarter Sustainable Dubuque

On the Path to 'Smart'

1 Introduction

The ways in which people perceive, interact with, and operate within cities is increasingly being shaped by the unseen. In any given moment, there is a barrage of information being exchanged between people, between objects and between people and objects. Individuals and organizations connect through phone calls, email, instant messaging, video chatting, images, texts, tweets and social connectivity websites, among others. Residents report on the functioning of city services through sites such as FixMyStreet, Walk Score or OpenPlans.[1] Police and emergency vehicles send signals to traffic lights to permit quicker response times; the global positioning system (GPS) helps drivers better understand transportation flows. Cameras—lodged within automated teller machines (ATMs), stores, gas stations, street lights, building entrances, traffic intersections, etc.—visually record individuals' comings and goings. Electrical grids report power line problems, and in some cases self-repair; while automated buildings report water leaks and inefficient usage (Hill, 2008; The Economist, 2010a, 2010c). With every passing second, data multiplies exponentially, rapidly expanding across all aspects of city life. This information is incessant, ubiquitous and ever-changing—shaped by, and continuously shaping and reshaping, urban environments.

With this rising presence of data, local governments are increasingly considering how the technologies that generate these data can be utilized to improve urban infrastructure, services and planning. The result has been the emergence and proliferation of 'smart' initiatives, or new urban forms associated with the increased use of and reliance upon technology (Hollands, 2008). Examples of these projects include congestion charging in Singapore and Stockholm that through wireless and sensor technologies enable automatic, real-time payment without cars stopping for tolls (IBM, 2009a, 2011a; Stockholmsforsoket, 2006); a transportation and

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[1] For example, see: https://www.fixmystreet.com/, https://www.walkscore.com/ and https://openplans.org/.

emergency response command center in Rio de Janeiro that integrates and analyzes in real-time data from over thirty government agencies (IBM, 2010b); the Amsterdam Smart City initiative that brings together business, citizens and government to develop projects to help conserve energy (Deakin and Al Waer, 2011); and the networked master plans for Songdo and Masdar (Fast Company, 2011; Ouroussoff, 2010). As the market for these types of projects grows, large technology providers clamor to spread their wares, leaving an indelible mark on a growing number of cities around the world.

1.1 Aims, Objectives and Approach

My investigation explores this mark on cities by examining how information technology (IT) providers are interacting with urban governance through the design and implementation of 'smart' projects, and sheds light on potential implications of this trend. To illuminate these issues, I look at the IT provider International Business Machines (IBM) and how, through its Smarter Cities[2] projects, the organization has interacted with local government policy and planning processes in two American cities—Dubuque, Iowa and Portland, Oregon. I focus on IBM for two reasons. Firstly, IBM is my employer and has been for the duration of this research.[3] This insider status has provided me with full access to a wealth of data and individuals that would not have been afforded to me had I chosen to examine case study projects implemented by one of IBM's competitors. Secondly, IBM is considered by industry analysts[4] to be one of the first and leading providers in the 'smart' city market

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[2] "Smarter Cities" has been trademarked by IBM to refer to its solutions and services within the 'smart' city market. In the context of this research, it should be noted that when I refer to Smarter Cities my reference goes beyond just the trademark. Rather, I am explicitly referencing IBM's entire campaign to develop and expand its presence and work in this market, including relevant research, marketing, advertising, sales, communications, products, offerings, operations, presentations, websites, social media, webinars, and enablement materials, among others. When specifically referencing this IBM campaign, I keep Smarter Cities capitalized so it is not to be confused with the generalized nomenclature of 'smart' within urban discourse that typically refers to the adoption of these technologies within urban environments.

[3] I further discuss my relationship with IBM and the constraints and limitations this posed for my research in Chapter 3.

[4] Industry analysts such as Frost and Sullivan (World News, 2014), Navigant Research (PR Newswire, 2013), Forrester Research, Inc. (2013) and IDC (IBM, 2013b) ranked IBM as the lead provider of 'smart' city solutions for 2013 and 2014.

(Hamm, 2009b; IBM, 2013a; PR Newswire, 2013; World News, 2014)—evidenced in part by the fact that in the five years since I began this research, the company has gone from implementing roughly fifteen 'smart' city projects to over ten thousand (IBM, 2014b). IBM's role and presence in the smart city market make it an important actor to understand (McNeill, 2014; Söderström et al., 2014).

Due to this focus, my analysis is informed by IBM's definition and understanding of the concept of 'smart'. 'Smart'[5] as defined by IBM, and as implicitly agreed upon by the local government actors participating in IBM projects, refers to the merging of physical infrastructure (e.g. roads, grid, water) and natural systems (e.g. waterways, weather) with digital infrastructure (broadband,[6] Internet and data centers) to create new technical systems within cities (Bevan and Briody, 2009; IBM, 2009a). As such, the aim of smart initiatives, according to IBM, is to enable the continuous capture, aggregation and analysis of data from various types of systems to provide insight in ways that allows more effective and efficient, or optimized, operations. Within this context, IBM, and the actors with whom it collaborates, perceive a smart city as one that takes advantage of data and advanced analytics to gain insight, integrate disparate systems, predict consequences and suggest proactive responses (Dirks and Keeling, 2009; Dirks et al., 2009; IBM, 2009a). Within recent years, IBM's definitional framework has been slightly broadened to include a more citizen-centric perspective (IBM, 2014b, 2014j) in an attempt to create new business opportunities.

Given that my research explores the intersections of the public and private sectors in addressing urban issues, and that IBM's Smarter Cities' strategy and approach construes the city as a market (Watson, 2010), I have grounded my analysis in conceptual literature that sheds light on theory surrounding the private sector's growing role within the public sphere, namely that from the neoliberal and urban entrepreneurial traditions (Brenner and Theodore, 2002; Harvey, 1989a; Peck and Tickell, 2002). This literature—situated within a certain place, era and time—

[5] From this point forward, when I use the term smart it will refer to IBM's definition of the concept unless otherwise noted. Thus, I will no longer use single quotation marks to signify the that this term has various meanings and understandings.
[6] "The term broadband refers to the wide bandwidth characteristics of a transmission medium and its ability to transport multiple signals and traffic types simultaneously. The medium can be coaxial cable, optical fiber, twisted pair, DSL local telephone networks or wireless" (Carty, 2002, p. 4).

theorizes about the spread of capitalistic strategies and systems, and posits how they have informed, and are purportedly continuing to inform, the public sector. Hence, these traditions provide a conducive framework for understanding IBM’s strategy and approaches to smart city projects and the ways in which the organization steers interaction with local governments. In addition, to enable exploration into a broader set of actors interacting with local government policy and planning processes, I employ a conceptualization of urban governance that goes beyond elected officials and formal structures of government to include a wider coalition and set of actors addressing urban affairs (Harvey, 1989a). These conceptual underpinnings and definitions are described further in Chapter 2.

Initial key informant interviews with urban experts and technical consultants who have worked with smart projects helped me identify my framework for analysis and research questions. In these interviews, interviewees repeatedly acknowledged three main areas in which IT providers seemed to interact most frequently with urban governance. These areas include: (a) *strategy*—i.e., project objectives and how to prioritize and achieve them; (b) *engagement*—in terms of which actors are involved, the roles they play, and their interactions with and expectations of each other; and (c) *representation*—or how the local government portrays the project through narrative and brand. I elaborate on this analytical framework in Chapter 2, and the methodology for these interviews in Chapter 3. Based on this framework, my research addresses several questions: How are smart projects, steered by IT providers, interacting with local government city objectives, priorities and approaches, and what might be the implications of this interaction? How are smart projects changing the roles and expectations of local government and city residents, and what is the role of the IT provider within this transformation? And, how might smart project narratives and brands be informing the redesign of urban governance mechanisms?

While exploring these questions, I view smart initiatives not simply as technical but social and political strategies, for these projects are concerned not only with technological innovations but also with ‘innovation’ in the relationships, interactions and discourse that surround these interventions. I look at projects where the tech provider[7] and / or local government have self-described their efforts as smart. I do not set out to ascertain if these efforts are smart or to evaluate their level of smartness. Although observations made from exploring these questions may point to wider tendencies of the smart city trend within other urban environments, these findings are not necessarily germane to all similar types of cities or situations. My assertions are more likely to be applicable to smart efforts by other large IT providers in American cities of similar local governance structure and size.

Since the number of urban environments where smart technologies are being infused across city systems and services is increasing (Fast Company, 2011; PR Newswire, 2013; The Economist, 2010c), and since other large technology providers are also gaining opportunities to become involved in urban governance through smart projects, it is important to understand this trend in closer empirical and analytical details. To date there has been "little critical reflection on the wider implications of technologically rooted entrepreneurial urban development" or the consequences of these initiatives (Kitchin, 2014a, p. 2). In academia, those within the sciences or computer sciences have focused on smart technologies and associated policies (Batty, 2013; Harrison et al., 2009; West, 2011), while other analyses of smart have tended to focus on the discourse created around the concept (Greenfield, 2013; Hollands, 2008; Shelton et al., 2014). While these are useful areas of analysis, they fall short of providing "detailed genealogies of the concept and initiatives", the evolution of associated rhetoric, and empirical case studies that compare and contrast smart projects in different cities (Kitchin, 2014a, p. 1). My research begins to fill these gaps by offering an in-depth view of a smart city IT provider alongside the rise of the corporate entrepreneurial smart city, and from these findings, suppositions on what these initiatives might mean for municipal administrations and city residents in comparable urban environments.

[7] Throughout this work, I refer to information technology providers as both IT providers and tech providers. The "tech provider" nomenclature is common parlance within the IT industry. I believe the shortening of "information technology provider" to "tech provider" within the industry, while less awkward, also reflects to an extent a common theme within this industry—the attempt to simplify the complex to increase (or at times decrease) transparency and understanding. While I do not examine this specific aspect of simplification within my work, I do explore simplification by the IT provider as it relates to smart projects.

1.2 Structure of Thesis

In Chapter 2, I describe the conceptual underpinnings that informed my research and analysis framework. I begin by discussing the emergence of smart initiatives, the various applications and manifestations of the smart concept, and potential broader implications of these endeavors. I then look at theories around the context within which these projects have emerged, including neoliberal and urban entrepreneurial traditions that highlight the intersections of the public and private sectors within the public domain. In this discussion, I elaborate on how the assumptions of smart align with urban entrepreneurial characteristics and a neoliberal ethos applied to localities. I end this chapter by situating my framework for analysis within conceptual debates around what I have defined as strategy, engagement and representation. In Chapter 3, I present my methodology. For each research technique employed—desk research, key informant interviews and case study analysis—I explain my approach to the method, how it contributed to my analysis and the advantages and disadvantages of this method in the context of my research. I complete this chapter with a discussion on my insider status with IBM and the challenges and risks associated with this positioning.

To identify key issues and trends to inform my case study analysis, I provide a deeper examination of conceptual debates and theories around my analytical framework of strategy, engagement and representation in Chapter 4. I juxtapose this conceptual analysis with the perspectives of IT providers, thereby giving insight into how different actors are defining and understanding smart initiatives. I look at strategic aspects of and approaches employed within smart projects, and the typical engagement arrangements around them in terms of the types of actors involved and their interactions with and expectations of each other. I discuss, on a broad level, how these smart project strategies, approaches and partnership arrangements may influence aspects of urban governance. I then look at the role of narrative in urban planning, and how smart project narratives may be informing the redesign of urban governance mechanisms due to the way that they shape how urban problems are understood and conceived, which in turn informs the solutions that are devised to address these challenges. I end this section by discussing how smart projects can be construed as not only a technological ‘fix’ but also a ‘brand fix’ for cities.

Before turning to my case studies, I devote an entire chapter to explore the IT provider IBM in Chapter 5. I discuss the evolution of IBM’s Smarter Cities campaign and look at the narratives that this actor has created around smart initiatives. I highlight the ways in which IBM has been able to disseminate its Smarter Cities stories and brand through the implementation of these projects and the associated narratives and partnership arrangements that go along with them. I provide a critical analysis of the IT consulting that is part of these endeavors, and look at how IBM has helped shape the smart city market, including the approaches of other smart city providers. I end with a discussion of how IBM’s Smarter Cities campaign, while affecting external forces and actors, also has had impact internally on the firm.

Chapter 6 through 9 are my city case study chapters, where I apply observations and suppositions from Chapters 2, 4 and 5 to see how these have or have not manifested in smart projects in Dubuque and Portland. Findings from each case study city are detailed in two chapters. The first chapter on the Dubuque case study, Chapter 6, starts with an overview of the city and its sustainability strategy and looks at how the local government is pursuing smart technologies through the city’s Smarter Sustainable Dubuque endeavor, which involves a range of smart technology projects, including smart water and electricity portals. In this chapter, I look at how IBM has interacted with the local government around the strategy and engagement arrangements associated with these projects, and what the implications of this interaction might be. In Chapter 7, I examine the narratives and brand created around smart projects in Dubuque, and how the IT provider IBM has shaped these forms of representation, which have gone beyond smart projects to inform the way that the local government represents the city.

In Chapter 8, the first case study chapter on Portland, I introduce the city by providing a brief social and historical context and then discuss aspects of IBM’s interactions with strategy and engagement processes, viewed through the lens of a research project on crowdsourcing to inform urban planning. Chapter 9 outlines the Systems Dynamics for Smarter Cities project in Portland, where a systems thinking modeling tool was developed to inform decision making and resource allocation. In this chapter, I examine IBM's interactions with urban governance around project strategy and representation. This chapter provides insight into a case where IT provider interactions have had negligible effect on the local government and / or its processes—an example that contrasts the Dubuque experience, where the local government's boosterish approach to smart has led to this concept being integrated into aspects of city strategy, engagement arrangements and representation.

I conclude my investigation in Chapter 10, which discusses key findings from my analysis of smart projects in Dubuque and Portland. In this chapter, I explore how together, these case studies offer snapshots of two cities' very different paths to smart. In one, the local government charged forward without hesitation, seeking the dazzling images of the smart city proffered by IBM. In the other instance, the local government treaded slowly considering the value of the journey and the desirability of the destination. I end this chapter by discussing how, through interactions around smart projects, IBM was able to promote its assertions about local government and governance. This IBM vision is informed by entrepreneurial and neoliberal principles, and reinforces the notions of the privatization, commodification and marketization of public provision. Extrapolating from these observations, I explore the implications that these endeavors may have for local governments and city residents in similar urban environments.

2 Debates and Conceptual Underpinnings

Cities[8] are often viewed as centers for innovation and creativity, enabling the intermingling of people, knowledge and resources to bring new ideas to fruition (Florida, 2002, 2008; Glaeser, 2011). Just as cities have enabled the creation of new technologies, technologies have played a key role in the configuring and reconfiguring of urban environments. Over the past two centuries the power elevator (Goodwin, 2001), the skyscraper (Dupré, 2008), sewer and sanitation systems (Melosi, 2000), electrification (Hughes, 1983; Nye, 1990), the subway and rail systems (Middleton, 2003), the car (Naess, 2006), and telecommunications (Graham and Marvin, 1996) have all affected the growth and development of cities. Recent debates within urban discourse, especially within advanced capitalist milieus,[9] have increasingly shifted to discussion around integrating smart technologies into city systems and services (Hollands, 2008). This trend is touted by those supporting smart projects as the next paradigm shift within cities to spur growth and development. As noted by Marvin and Luque (2013), smart projects are "being represented as the response to almost every facet of the contemporary urban question" (p. 2).[10] Given this emphasis on applying smart projects to ameliorate varied urban challenges, it is critical to understand the nature and evolution of the smart city trend.

In this chapter, I explore the debates and conceptual literature key to informing my research approach and questions. I begin by looking at the technological precursors to smart, for the application of information and / or communication technologies to urban systems is not a new phenomenon. I then discuss the concept of smart and the various ways in which it has manifested and been applied—reflecting to some extent the elasticity of the term, and how this affords tech providers with a myriad of ways

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[8] Conceptualizations of what comprises a city vary. For the purposes of this research, I view cities not as active agents but things (Harvey, 1989a), as fluid and dynamic versus stable and bounded (Amin and Thrift, 2002, p. 37). Through my work, a city is seen as a public urban sphere "made of multiple orders of value and groups of people often running parallel to each other" (Farais, 2010, p. 19).

[9] This trend of the concept of smart being woven into debates about urban development is most predominant in Western countries (Hollands, 2008), but is not confined to them, also appearing for example in initiatives in China, Saudi Arabia, South Korea and the United Arab Emirates (Fast Company, 2011).

[10] Marvin and Luque (2013) refer to this as "Smart Urbanism".

to package and sell these technologies. I follow with a section that explores suppositions about the broader implications of this for urban environments.

After reviewing the concept and some of the potential consequences of smart endeavors, I turn to examine the conceptual literature that informed my analysis of IT provider interactions, namely select works from the neoliberal and urban entrepreneurial traditions (Agranoff, 2003; Brenner and Theodore, 2002; Harvey, 1989a; Peck and Tickell). Given that private sector and public sector interactions are at the center of smart projects, this literature proved useful in illuminating various theories around how these sectors come together to address urban issues and challenges, and what their roles, processes, perspectives and models within this may be. I end with a discussion that outlines my research questions and explains my analytical framework to explore these questions—for this framework has shaped the way that I have organized and relayed my findings and observations in Chapters 4-10.

2.1 Technological Precursors to Smart Projects

Smart projects did not appear in a vacuum. Rather they stem from decades of advances in information and communication technologies (ICT) and their applications within urban environments. Three advances have been critical in setting the stage for smart projects city to emerge: fiber optics, cellular phones / networks and the Internet. In the 1990s, copper wires began being increasingly replaced with optical fibers, or bundles of thin strands of glass or plastic that carry signals through burst of laser light, creating the “infobahn”, or information superhighway (Mitchell, 1995, pp. 3-5). Around the same time, telephones became mobile, free from the cable network that tied them (ibid.). Soon after, the commercial expansion of the Advanced Research Projects Agency of the U.S. Department of Defense’s network, ARPANET, was replaced by a National Science Foundation-funded network that opened protocols to expand for broader communication between computers, birthing the Internet (Roberts and Steadman, 1999, Chapter 8, kl. 6457, 6584[11]).

Concomitant to advances in ICT, sensor technologies have also improved, leading to a huge rise in instrumentation. As of 2010, there were already one billion transistors per human and four times more radio frequency identification (RFID) tags than people in the world (Dirks et al., 2009, p. 1; IBM, 2009a, p. 9; Palmisano, 2010a). Significant within this trend, and also a key component of the smart city, is the exponential rise of people acting as sensors by providing information through cell phones, digital cameras, and / or the Internet—there are over five billion mobile subscriptions and over two billion people on the Internet (International Telecommunications Union, 2010; Mobithinking, 2010). This rising instrumentation has implications for cities as it is extending the technical to human (Bijker and Law, 1992; Latour, 2005), moving sensors from the hands of experts and into the hands of everyday users:

> Anything and anyone—machines, devices, everyday things, and particularly humans—can become a sensor, gathering and transmitting information about the real world. (The Economist, 2010a)

And, as objects are progressively more equipped with sensors to generate data, they are also increasingly being made to communicate with each other, providing knowledge about the systems in which they are connected. There are about 30 billion networked objects in the world (Press, 2015), creating an "Internet of things" [12] where the physical is wrapped with virtual, and is growing exponentially (IDC, 2009; Schmidt, 2010). This web of interconnectivity between objects and / or people is changing city landscapes and the relationships between and among things and people within cities in ways that IT providers are deeming to be smart.

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[11] For all Kindle edition books that do not contain page numbers I provide the chapter number and Kindle location for referencing.
[12] The concept of an "Internet of things," where real and virtual worlds are connected, dates back to the late 1980s and stems from the work of Palo Alto Research Center (PARC) researchers on ubiquitous computing in Silicon Valley (PARC, 2011).

Yet, despite the way smart city projects are being packaged and sold, the notion behind using “rational, rigorous and more ‘scientific’ methods of quantitative and computational data analysis” to make a city smart is not new (Shelton et al., 2014, p. 2). For over a century, planners and engineers have sought to make the management of cities more scientific, and to date, “grand solutions to social planning” have not yielded great results (Shelton et al., 2014). As sagely noted by Anthony Townsend (2013), “if the history of city building in the last century tells us anything, it is that the unintended consequences of new technologies often dwarf their intended design” (p. 14). An examination of modeling and its application to cities provides a good example of such grand solutions and unintended consequences. Initial applications date back to the 1950s with military, computer science, business and electrical engineering applications being foisted onto urban environments (Townsend, 2013, pp. 79-81). During the Second World War, Norbert Wiener from the Massachusetts Institute of Technology (MIT) conceived “cybernetics”, the idea that information flows created by sensing and feedback mechanisms can optimize performance within any kind of system. In his cybernetics hypothesis, interactions between things (or variables) within a system can be represented by mathematical equations, and predictions can be made by changing inputs and then observing ripple effects that show up within the system. This concept of cybernetics was applied to modeling transportation, land use and social services in American cities like Pittsburgh and New York City. Almost immediately, problems with this approach became apparent (Townsend, 2013, pp. 79-81).

Joe Flood (2010) examined this approach to urban planning through modeling in his book *The Fires: How a Computer Formula Burned Down New York City--and Determined the Future of American Cities*. In this work, Flood demonstrates the risks and vulnerabilities associated with reducing complex city issues to data and algorithms by examining how such a model failed in New York City. Under the auspices of the RAND Corporation and its computer models, city leaders were guided to make decisions to save millions of dollars by closing several fire stations in some of the city’s poorest neighborhoods. This over-zealous focus on efficiency, fused with an overreliance on technocrats and algorithms, resulted in a series of difficult-to-control fires in the South Bronx, the Lower East Side, Harlem and

Brooklyn over the next decade, leaving thousands dead and hundreds of thousands displaced. Despite this blatant failure of urban modeling, RAND sold its approach across the United States, laying the foundation for technocratic decision making, a mainstay of smart endeavors, to take hold (Flood, 2010, pp. 19-24, 263-277). This application of computer modeling is just one example of how over time technologies have been packaged and sold to local governments. Smart projects provide a myriad of new examples of how technological advancements can be marketed and commodified within urban environments.

2.2 Unpacking the Concept of Smart

With the rise of ICT, local governments have increasingly explored strategies and programs to integrate these technologies across city services and systems—a pursuit generating diverse nomenclature, including: “wired” (Dutton et al., 1987 in Kitchin, 2014b), “cyber” (Graham and Marvin 1999), “digital” (Ishida and Isbister, 2000 in Kitchin, 2014b; Yovanof and Hazapis, 2009 in Nam and Pardo, 2011), “intelligent” (Komninos, 2002; Moser, 2001 in Nam and Pardo, 2011), “virtual” (Albino et al., 2015; Nam and Pardo, 2011), and “ubiquitous” (Albino et al., 2015; Townsend, 2013), among others (Castells, 1996; Graham and Marvin, 1996, 2001). The term smart was first used in the 1990s to typically refer to the application of ICT to city infrastructure systems, with the California Institute for Smart Communities being one of the first actors to explore how a community could be designed to become smart. A few years later, the Center of Governance at the University of Ottawa broadened the term’s application by expanding the concept to include a governance-oriented approach instead of a sole emphasis on ICT (Albino et al., 2015). Since, the term smart has taken hold across government, academia and the private sector, and has quickly become an urban labelling phenomenon (Albino et al., 2015; Kitchin, 2014b).

A review of relevant literature however—whether blogs, news articles, press releases, books, case studies, academic journals or technical “white papers”—makes it clear that despite all this rising attention to smart cities, there is no commonly shared definition of the term (Albino et al., 2015; Hollands, 2008). Rather, it varies according to city, context, conditions, project, city system, technologies, local government, tech provider and individuals, among others. Viewpoints of smart held by local governments, the private sector, civic actors, city residents and academics vary, between and amongst each other (Hollands, 2008; Kitchin, 2014a):

> Ask an IBM engineer and he will tell you about the potential for efficiency and optimization. Ask an app developer and she will paint a vision of novel social interactions and experiences in public places. Ask a mayor and it is all about participation and democracy. (Townsend, 2013, p. 15)

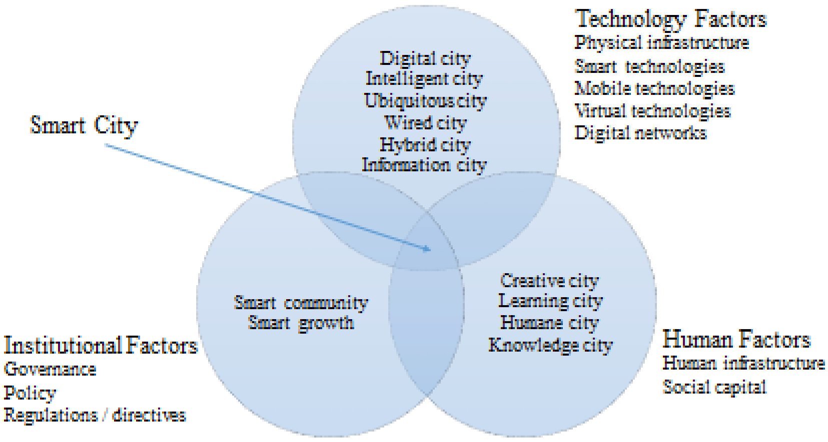
This elasticity and variability of the concept has benefitted tech providers, enabling them to package and sell their technologies in numerous ways; for smart is portrayed within urban discourse as a panacea to many city-life woes (Marvin and Luque, 2013; Miller, 2013). The term itself tends to carry positive connotations—for example, if a project, program or policy is not smart, then it is likely to be ineffective, inefficient or unwise (Hollands, 2008). It is a label that automatically infers "positive transformation" (Söderström et al., 2014, p. 5). Yet, degrees of smart remain fuzzy. Since it is a self-designated label assigned by city officials or those implementing smart projects or policies, and is without standardized indicators to measure levels of smart, it can become difficult to say how much smart exists in reality or remains a matter of clever marketing—or, lies somewhere in between (Albino et al., 2015; Hollands, 2008; Söderström et al., 2014).

Reproach of smart projects within broader urban discourse can be challenging, for it is tough to be critical of these initiatives without sounding like a Luddite. If you are against smart initiatives, you may be seen as being against progress, efficiency and enhanced understanding. Frequently within urban discourse, smart is portrayed as the only way forward. As noted by Alan Wiig (2015), narratives about the smart city "cast a largely uncritical eye on the entire process, assuming there is no other path forward but to use information technologies to 'solve' urban problems" (p. 260). It would seem that smart narratives are constructed in ways to diminish debate. To an extent, technology is driving the conversation, rather than the conversation driving the technology—hence giving power to the term, and the IT providers that harness it.

2.2.1 Taxonomies and Applications of Smart

Several academics have conducted taxonomies of the varied conceptualizations and applications of smart to help better elucidate the underpinnings of this trend (Albino et al., 2015; Kitchin, 2014b; Nam and Pardo, 2011; White, 2015). Each of these various applications reflect different approaches that tech providers have undertaken to package and sell smart technologies. In addition to smart projects emphasizing the application of ICT, they have also included focus on learning environments (Coe et al., 2000; Deakin and Al Waer, 2011; Florida, 2005); innovation (Deakin and Al Waer, 2011; Florida, 2005); changes in urban governance practices (Deakin and Al Waer, 2011; Kitchin et al., 2015; Steinert et al., 2011; White, 2015); economic development (Caragliu et al., 2009; Hollands, 2008); sustainability (Duany et al., 2010; ICC, 2010; Steinert et al., 2011; The Climate Group, 2008); and branding ploys (Hollands, 2008; Shelton et al., 2014). Despite this wide variation, it is clear that smart is not just the employment of ICTs in city operations (Hollands, 2008; Caragliu et al., 2011), nor is smart an end in itself, rather it is a means to other desired outcomes (Eger, 2009, p. 48).

Figure 1. Fundamental components of the smart city



Source: Nam and Pardo, 2011, p. 286.

In their analysis of the varied applications of the concept, Taewoo Nam and Theresa Pardo (2011) categorized smart endeavors into three dimensions: technology (infrastructures of hardware and software), people (creativity, diversity and education), and institutions (governance and policy)—finding that variations of the concept are mutually connected and not independent of each other, as illustrated in Figure 1. They conclude that “given the connection between the factors, a city is smart when investments in human / social capital and IT infrastructure fuel sustainable growth and enhance a quality of life, through participatory governance” (Tam and Pardo, 2011, p. 286).

Rob Kitchin (2014b), in his article “The real-time city? Big data and smart urbanism”, classifies varied understandings of smart into two main camps, one with a narrow aperture focused on using sensors and ICT to monitor and manage city operations; and the other with a broader vision linked to the development of a knowledge economy. In the first instance, “pervasive and ubiquitous computing and digitally instrumented devices” are built into and across city infrastructure and systems to “monitor, manage and regulate city flows and processes, often in real time” and mobile devices are used by city residents to engage with the environments around them and share data they create through this engagement (Kitchin, 2014b, p. 2). In so doing, Kitchin proposes that the city becomes more “knowable and controllable”, thereby enabling improved performance of city services and increased participation (2014b, p. 2).

In the second instance, where smart is applied more broadly, Kitchin states that it refers to the development of a knowledge economy within a region or urban environment. In this conceptualization, a city that is smart is one where its economy and governance are “being driven by innovation, creativity and entrepreneurship, enacted by smart people” (2014b, p.2). Here, information and communication technologies are used as platforms for spurring ideas and innovations and bringing them to fruition—i.e., ICT is combined with human and social capital to spur urban growth and development (Caragliu et al., 2009 in Kitchin, 2014b). In elucidating the difference between these two visions of the smart city, Kitchin notes that in the first instance, ICT is primarily used to manage and regulate the city from a “largely technocratic and technological perspective” (2014b, p. 2). In case of the latter, the smart city vision “encompasses policies related to human capital, education, economic development and governance and how they can be enhanced by ICT”, where technologies enable innovation and growth (ibid.). Despite these variations, Kitchin posits that there are underlying themes that unite the two—a neoliberal ethos that prioritizes “market-led and technological solutions to city governance and development” and a prioritization of data capture and analysis to inform decision making, with data as an essential component to make a city smart (2014b, p. 2).

There have been several academics who have explored the broader conceptualization of smart as classified by Kitchin (2014b), where a city becomes smart by using technology to create a knowledge economy (see Caragliu et al., 2011; Coe et al., 2001; Florida, 2005). In this vein, Mark Deakin and Husam Al Waer (2011, 2012) have explored how ICT can be applied within urban environments to foster innovative and creative partnerships that may not have emerged otherwise due to the “information-rich and highly communicative qualities” of the smart transition (2012, p. 8). They posit that learning, knowledge transfer and capacity building, facilitated by ICT projects and programs, are key elements to making a city smart (Deakin and Al Waer, 2011, 2012). Similarly, J. Ramon Gil-Garcia, Theresa Pardo and Taewoo Nam (2015) note that “technology enables smart but it is a human capacity. ICT alone does not make a city smart, human actors drive the process and change” (p. ix). In their conceptualization of a smart city, Gil-Garcia et al. (2015) suggest that a city is not truly smart unless there is public sector innovation that is leveraged from smart city projects. Hence, to them, cities that are smart creatively combine new technologies and innovation within the public sector (Gil-Garcia et al., 2015).

Another conceptualization of the smart city encompasses how ICT is applied to city systems and services to spur economic growth (Caragliu et al., 2011; Hollands, 2008; White, 2015); yet another explores how technology in cities could be used to empower citizens by adapting those technologies to their needs rather than adapting their lives to the technological exigencies (Kitchin, 2014b; Vanolo 2014). These diverse examples of the application of smart demonstrate the elasticity of the concept—variability that has afforded IT providers ample opportunity within the smart city market to partner with local government agencies in the pursuit of a wide range of outcomes. These desired results are also broadly defined. A smart city is generally depicted as one that is able to “create and maintain a strong attractiveness, safety and security, abundant economic opportunity, sophisticated and effective infrastructures of all kinds, and a healthy natural environment based on a model of smart democratic governance" (Gil-Garcia et al., 2015, pp. viii-ix). In this manner, smart projects are portrayed as a solution to a host of city challenges. In Europe for example, according to the European Parliament's Directorate-General for Internal Policies, "smart City initiatives can be considered a useful vehicle for cities to achieve their Europe 2020 targets", which touch upon employment, innovation, the environment, education and poverty (Manville et al., 2014, p. 63). In this case, it is believed that smart city projects across each of these focus areas will help achieve the European Union's overall strategy goal of "boosting growth and jobs across the region in order to create a smart, sustainable and inclusive economy" (Manville et al., 2014, p. 63). Here, as commonly elsewhere within urban discourse, it would seem that no matter what city system or service, smart projects are considered as useful tools to ameliorate and enhance returns.

What is often ignored within this discourse around smart is the fact that just because the technology is available does not mean that it should be employed. Utopian conceptualizations of smart cities can lead to overlooking alternative avenues of promising urban development, including those that do not depend on a business-led model (Caragliu et al., 2011), or cheaper, low-tech solutions that could have greater impact. In this vein, some experts within urban discourse criticize smart projects as nothing but clever marketing, where the same or similar technologies are utilized but just packaged differently to create and increase demand. Without the backing of research and development (R&D) investment to create new core technologies, one could convincingly argue that smart projects are nothing more than off the shelf components that have been pieced together and compellingly packaged (Hollands, 2008; Marvin and Luque, 2013; Townsend, 2013, p. 110). Whether truly 'new' technologies or not, the case for smart projects as presented by IT providers is alluring, and examples of smart projects abound across the world.

For instance, Ottawa, Canada's "Smart Capital" project aims to enhance business, local government and community through the use of Internet resources (Albino et al., 2015). In the United Kingdom, local governments are trying to grow their smart city sector for export. In India, Prime Minister Narendra Modi announced a plan for 100 smart cities shortly after being elected to office in 2014 (White, 2015). In the United States, the cities of San Diego and San Francisco have focused on applying ICT to water, sewer and electric infrastructure as a means to become smart. In the European Union, numerous cities—including Barcelona, Amsterdam, Berlin, Manchester, Edinburgh and Southampton—have pursued smart city policies across a range of sectors to enhance quality of life, spur economic growth, enhance efficiencies and foster sustainability (Albino et al., 2015). Chinese cities like Beijing, Shanghai and Shenzhen are adopting smart city initiatives to help promote sustainability; and in Southeast Asia cities like Singapore, Taiwan and Hong Kong are promoting economic growth through smart programs (ibid.).[13]

As one can see from these examples, the majority of initiatives undertaken for a city to be designated smart look nothing like the tabula rasa examples of Masdar and Living PlanIT Valley, which have been built from the ground up (see Appendix 11.1 for additional details). Instead, most local governments pursuing smart projects adopt them piecemeal, project-by-project, system-by-system. In general these smart projects are not interconnected, with each city having its own path for smart technology adoption and application. Often, local governments decide to pursue this designation by adding smart technologies first to city infrastructure systems, such as water, energy or transportation—systems that are integral to a city's existence, functioning and health (Braudel, 1992; Byrne and Rich, 1985; Swyngedouw, 2004). In Appendix 11.2, I provide examples of smart technologies applied to these city infrastructure systems, and how smart projects can also be utilized to inform the urban planning around them. As these types of initiatives spread across city systems around the world, they present a range of implications for cities that extend beyond the system to which they are applied.

[13] I highlight additional examples of smart city projects in Chapters 6-9 as they relate to my case studies.

2.3 Broader Implications for Urban Environments

In Chapters 6-10, I explore the initial repercussions of the IBM Smarter Cities projects that I observed in Dubuque and Portland. Beyond these observations, there are a broad range of potential implications for urban environments that have been noted by other academics exploring the significance of the smart and related technological trends, including, among others, increased exclusion, autocratic decision making, commodification of infrastructure and social, economic, and political fragmentation—each are discussed briefly below.

2.3.1 Networked Urbanism

In most Western cities, from the 1920s until the 1960s, or the period of high modernism, city leaders often worked to standardize the development of water, energy, transport and communication infrastructures, which were typically viewed as public goods, and most often delivered through public or private monopolies. These networked infrastructures became critical aspects to city functioning, and given their growing normalization and ubiquity, in many ways have been taken for granted (Graham and Marvin, 2001, pp. 10-12). Local governments and city residents have assumed a basic level of infrastructure functioning, but outside of that do not have great insight into how these systems work, nor into how they consume the resources these systems provide (Giddens, 1990, pp. 29, 59; Graham and Marvin, 2001, pp. 10-12). As noted by Matthew Gandy:

> Until recently, the understanding of technological networks and the 'hidden city' [has] been largely left to engineers whilst other 'visible' aspects of urban design [have been] perceived as the traditional domain of architects and urban planners. (2004, p. 365)

An examination of infrastructure systems can shed light on dynamics within a city, including the technical and governance aspects related to these systems (Dupuy, 1991; Graham and Marvin, 2001, pp. 9-11). It is this type of analysis that Stephen Graham and Simon Marvin (2001) conduct in their book *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. In this work, Graham and Marvin apply a Science and Technology Studies lens to examine infrastructure networks and their associated technologies, and how these are inextricably linked to social practices, values, policies and the economy—ascertaining that urban infrastructure is both technical and social (2001, p. 8). They document the rising frequency with which these standardized network infrastructures are being replaced with "premium network spaces", where higher quality infrastructure projects enable qualified users to withdraw from the standardized, public networks (Graham and Marvin, 2001, pp. 389-390). This trend is facilitated by mounting consumerism and neoliberal principles such as progressive liberalization and privatization of formerly public services and infrastructures. Examples of these "premium network spaces" include contained fiber-optic networks accessible only to those in a certain region; drinking water and sewage services secured solely for formal communities; fee-based high occupancy vehicle or express lanes, also known as private highway corridors; and gated communities (Graham and Marvin, 2001, pp. 2-5, 10-13).

Smart projects may further enable and entrench these types of premium networks, leading to economic, political and social fragmentation within urban regions (Graham and Marvin, 2001). As suggested by Castells (1996, 1997, 1998), the processes associated with these network changes directly support the emergence of an increasingly urbanized, globally integrated and highly fragmented network society, stitched together by smart city systems. For example, socioeconomic and technical divides may lead to exclusion from or lack of access to some city systems, resulting in increased stratification within cities (Castells, 1996, 1998; M. Davis, 1992; Graham and Marvin, 2001, p. 247; Madon et al., 2009; McLaughlin and Muncie, 1999). While "social biases have always been designed into urban infrastructure systems, whether intentionally or unintentionally" (Graham and Marvin, 2001, p. 11), smart technologies have the potential to solidify and reinforce boundaries to access and exclusion (Madon et al., 2009; Star, 1999).

As the public goods associated with city infrastructures increasingly become 'marketable commodities' and they are integrated with smart technologies, the use of and access to these systems will be decreasingly perceived as integral parts of modern citizenship or city resident rights (Gandy, 2004, p. 371). This restructuring of infrastructure systems will also reorganize “urban forms, lifestyles and landscapes” (Mitchell, 1999 in Graham and Marvin, 2001, p. 15). Further contributing to this notion of fragmentation within cities is the fact that these types of projects may divert resources and attention away from broader urban challenges (Harvey, 1989a). For example, Harvey (1989a) finds that such endeavors can lead to adverse effects on the distribution of income: “concentration on spectacle and image rather than on the substance of economic and social problems can also prove deleterious in the long-run, even though political benefits can all too easily be had” (p. 16).

On top of this, smart initiatives have the potential to exacerbate issues of access, especially if they are primarily driven by governments and business. In his book *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*, Anthony Townsend (2013) explores the dangers of the tech provider’s “top-down” approach to urban development that comes hand-in-hand with projects that are overseen by large IT companies. Instead, Townsend suggests that there should be space for community-based “bottom-up” innovation and entrepreneurialism[14] (pp. 18, 86, 110). One key issue with a top-down approach is that it implies that data and analytics are a tool of government for facilitating their means and furthering their ends (Townsend, 2013, pp. 86, 249). Especially in the case of IBM narratives, data and analytics are discussed as apparatuses for city leaders to improve their operations and systems—there is little, if any, discussion on how city residents themselves can use these to improve or enhance city life. However, this top-down approach does not always go hand-in-hand with smart projects; there are many examples of smart city endeavors emerging from the bottom-up, reflecting a more communitarian and participatory approach to urban governance (Deakin and Al Waer, 2011). This civic model of smart projects however is not one typically reflected or emphasized in IT provider approaches or narratives.

[14] The terms top-down and bottom-up are common within change and / or organizational management discourse, and in general refer to actions or policies initiated at the highest level or lowest level, respectively (Hamel, 1996; Sirkin et al., 2005).

As the role of the private sector is expanding in the management and provision of infrastructure services within cities, it accentuates the potential for a top-down approach. And, while doing so, it also changes the ways in which cities have been customarily understood—as mechanisms to support markets, versus being a market. Large parts of urban operations traditionally have been publicly owned, controlled and managed (Boas and Gans-Morse, 2009; Brenner and Theodore, 2002; Peck and Tickell, 2002). Yet, within the smart city market, "the infrastructure sector is now one of the most important sectors in international flows of finance, capital, technology and expertise" (Graham and Marvin, 2001, p.14). Linked to this expanded private sector role, is the increasing number of collaborative relationships (mergers, acquisitions, partnerships, etc.) between utility companies and infrastructure corporations (Curwen, 1999; McGowan, 1999). This is driving urban governments to become more entrepreneurial as the private sector increases its involvement in public services and cities increasingly compete against each other in a bid to draw in business and investment.

2.3.2 Government Vulnerability and Responsibility

From a technical perspective, there are two rather large risks associated with the adoption of smart technologies: their tendency to be "buggy" and "brittle" (Townsend, 2013, pp. 252-280)—each of which have implications for local government stability and accountability if problems these problems emerge. Cities and city systems are quite complex. As they become integrated with smart technologies, they become even more complex, with the potential of system bugs growing exponentially with each line of code or interaction. And, given the nature of computing, with various coders, developers and programmers from numerous companies creating modules of coding that are plugged together to create perhaps just one computer system, it is impossible to fully test any system before it is implemented. Hence, bugs will emerge. System failures will become a normal part of city systems—just like our own personal computers, laptops, e-readers, and cell phones can fail, so will city systems, or parts of city systems (Townsend, 2013, pp. 276, 280). And, finding and addressing these bugs will be even more complex than the process for personal devices, for failure will be on a grander scale, in a more complex environment, with the potential for cascade effects and much broader implications for individuals, businesses and government (Townsend, 2013, p. 276). These bugs can emerge from nonintentional mistakes in coding, or a result from hacking, which present yet another grand threat (Kitchin, 2014b).

On top of that, smart systems are also brittle and break. Part of this fragility stems from the reliance of smart systems on cellular networks and the Internet. Although the latter has proven stable to date, cellular networks fail often, especially when overloaded with users or hit by natural disasters. Another potential area for failure stems from the fact that many smart city systems also rely upon or integrate GPS and its satellite network. As more and more city systems integrate smart technologies that pull on these systems—cellular networks, the Internet and GPS—the potential for systems failing grows (Townsend, 2013, pp. 260-262). When a smart city system breaks or fails, from either bugs or brittleness, who is accountable? At times it can be unclear who is responsible, or able, to fix the problem according to capability, contractual, legal and / or ethical obligations. Will it be the local government? The IT providers? The telecommunications providers? Due to the structure of these projects, accountability is spread across a wide range of groups, including not only contractors but subcontractors as well, making it difficult to address any issues that emerge (McNeill, 2014). This presents risks for local governments associated with the stability of city services and systems as smart projects spread.

Debate over who should pay for integrating smart technologies into city systems is a key area of contention associated with these projects—presenting local governments with issues related to funding responsibility. Smart projects are often unfunded mandates, as the notion of smart is often tacked onto something else (City in Motion Meeting, 2011b). While efficiencies may be gained, questions emerge around issues like to whom do these efficiencies accrue and how does that relate to who is paying for the endeavor? For example, funding for smart transportation projects, depending on type and scope, will fall to system users (i.e., city residents and businesses through taxes), local government, businesses and / or potentially state or federal agencies. For smart utility projects, funding sources will also vary, with potential for state or federal assistance, but most often the heavy burden rests upon the end-user, city residents and businesses (Confessore, 2007; Dobnik, 2007; Gandy, 2004; Hakim and Rivera, 2007; Zifcak, 2010). Further, maintenance of these systems is something that is often not considered until after smart projects are fully installed, and the need for continued operations raises several key questions: Will these costs stay the same for maintenance? Will they gradually increase? What types of unexpected, and unbudgeted, problems may emerge to add to anticipated costs? Who pays for required system / software updates? To an extent with smart projects the local governments fall to the mercy of the IT provider to keep things running along smoothly; and in the case of cloud city services, the local government is completely reliant upon the IT provider at all times, for they provide the continual backend operations upon which other services depend and reside. Despite these potential risks, and the challenges they may pose to local governments, the adoption of smart city projects is still on the rise (Fast Company, 2011; PR Newswire, 2013; The Economist, 2010c).

2.3.3 Propagating the Smart City

Through the partnerships around smart projects, ideas, frameworks and approaches are spread. Alan Wiig (2015) in his article "IBM's Smart City as Techno-Utopia Mobility", looks at this policy mobility in his examination of IBM's Smarter Cities Challenge (SCC).[15] He posits that the smart city is a "mask for entrepreneurial governance" strategies (p. 258) by situating these strategies within recent debates about policy mobilities around the global transfer of governance best practices (McCann and Ward, 2010, 2011 in Wiig, 2015). He finds that just as with sustainability policy, smart city best practices are being globally transferred through IT providers (like IBM) through the design and implementation of these projects, as well as the partnerships and narratives around them (Wiig, 2015). These 'best practices' include fostering "globalized business enterprise"; for according to Wiig, "smart city efforts are best understood as examples of outward-looking policy promotion for the globalized economy" (Wiig, 2015, p. 258-259). And, instead of

[15] I discuss IBM's Smarter Cities Challenge further in Chapter 5.

local governments focusing on more traditional forms to boost business enterprise, such as downtown redevelopment, Wiig notes that smart city policies propose city-wide benefit through “digital governance augmentation” (2015, p. 258-259).

Another ‘best practice’ surfaced by Wiig’s examination of IBM’s Smarter Cities Challenge, is that “implementation of the smart city policy was secondary to the utility of the initiative in selling the city as a promising location for the globalized enterprise to set up businesses” (p. 259). In other words, Wiig found that the primary goals of local governments through SCC projects seemed to focus more on making the city seem smarter to draw in more businesses, rather than on the technological gains that can be derived from these endeavors. Wiig further noted that rising competition between cities is pressuring local governments around the world to adopt these practices (Jensen, 2005, 2007; McCann, 2011, 2013; Prince, 2014 in Wiig, 2015). So, as more and more local governments turn to smart city projects, and thereby potentially the associated policies, Wiig postulates that pressure will mount on other local government officials to follow suit or else be seemingly left ‘behind’. And, as local governments adopt the concept of smart, intralocal competition compels city officials to promote this transformation through narrative and brand. Conveniently, the public-private partnerships that typically serve as the foundation of smart projects create a perfect network to spread the associated boosterish messaging, or narrative themes, that local governments use to help attract funding and resources.

Thus, it becomes a circular cycle with no set beginning or end. With rising neoliberal pressures, increasing competition between cities makes local governments feel compelled to promote their city in an attempt to draw in business and other resources deemed scarce. Smart projects are construed as one way to make a city seem more attractive. As local governments pursue these projects, they are exposed to or adopt the entrepreneurial approaches that integral to the design of these initiatives. As these endeavors are implemented, the smart concept and all that goes along with it is further promoted through the surrounding partnership arrangements and narratives. In this fashion, this cycle demonstrates the interconnections between smart project strategies, engagement arrangements and narratives, and how these seemingly inform and reinforce each other.

2.4 Conceptual Grounding for Analysis

IBM's Chief Marketing Officer, Jon Iwata, has described the firm's Smarter Cities campaign as a market-making process (Iwata in Watson, 2010). Within IBM's approach and strategy, cities are viewed as markets, and smart technologies are commodified, packaged and sold to local government clients (among others). While IBM staff have stated this perspective explicitly, they are by no means unique, for other tech providers and consultancies within the smart city market approach cities and smart technologies in the same manner. This view of extending "market discipline, competition and commodification" to the public sector stems from neoliberal strategies, interpretations and doctrines (Brenner and Theodore, 2002, p. 350) and is simpatico to entrepreneurial management approaches within urban environments. Hence, I grounded my analysis in conceptual literature that explores the relationships and interactions between the public and private sector, and how the private sector is purportedly gaining influence within the public realm. In the section below, I discuss suppositions about how neoliberal strategies and doctrines and entrepreneurial management approaches have manifested within urban environments (Agranoff, 2003; Brenner and Theodore, 2002; Hall and Hubbard, 1996; Harvey, 1989a; Peck and Tickell, 2002), and explore how these trends interrelate with the concept of smart.

2.4.1 The Emergence of Smart: Neoliberal and Urban Entrepreneurial Trends

According to Neil Brenner and Nik Theodore (2002), neoliberal doctrines and strategies began as a mode of free-market economic theory in the United States and gained momentum in the 1980s, mutating and transforming over time. These doctrines and strategies emphasize, among others, "the reduction of corporate taxes, the shrinking and / or privatization of public services and the intensification of inter-locality competition" (Brenner and Theodore, 2002, p. 350), often resulting in decreases in government spending to enhance the role of the private sector in the economy (Boas and Gans-Morse, 2009; Larner and Laurie, 2010; Peck and Tickell, 2002). Within this interpretation of governance transformation, neoliberal doctrines have increasingly informed urban restructuring as they filtered down to localities, affecting each with variation (Brenner and Theodore, 2002). As these doctrines have been adopted by local governments, Jamie Peck and Adam Tickell (2002) posit that they have influenced the 'rules' being formed around intralocal competition, hence "shaping the very metrics by which regional competitiveness, public policy, corporate performance, or social productivity are measured" (p. 387). A notion important to consider given that smart projects are often proffered by tech providers as an easy means to boost city brand, and hence gain competitive edge.

Within this theoretical tradition, cities in the advanced capitalist world are construed as critical arenas in which neoliberal policy experiments have manifested (Brenner and Theodore, 2002). In this line of thinking, urban environments become neoliberal laboratories for testing policies such as "place marketing, enterprise and empowerment zones, local tax abatements, urban development corporations, public-private partnerships, and new forms of local boosterism to workfare policies, property-redevelopment schemes, business-incubator projects, new strategies of social control, policing and surveillance, and a host of other institutional modifications within the local and regional state apparatus" (Brenner and Theodore, 2002, p. 368). Several of these policies were apparent within the smart projects that I examined in my case studies. As such, I posit that smart projects can be construed as a continuation or extension of such neoliberal policy experiments within urban environments given their emphasis on / ability to accentuate place marketing, intralocal competition, public-private partnerships, boosterism, business innovation, surveillance and social control, among others. It would seem that neoliberal tendencies have created an enabling environment for smart projects that, as implemented, reinforce and accentuate this transformation of urban governance.

For the purposes of this work, I approach urban governance as the management of explicit public problems amongst the coalitions, partnerships and / or networks involved in aspects of urban affairs (Ansell, 2011, p. 4).[16] In this manner, urban governance does not just include elected officials and formal structures of government. Rather, it can be traced through the varied coalitions and processes between and among nongovernmental organizations, citizens, civic groups, social movements, educational and religious institutions, businesses, commerce associations, local financiers, real estate and property developers and appointed city officials, among others (Harvey, 1989a). As noted by David Harvey:

> Urban governance means much more than urban government. The real power to reorganize urban life so often lies elsewhere or at least within a broader coalition of forces within which urban government and administration have only a facilitative and coordinating role to play. (1989a, p. 6)

Within this conceptualization of urban governance, the role of the private sector is considered—not only as actors but also in terms of the processes and approaches that these actors bring to managing public challenges. Thus the relationships formed around addressing public issues also become channels for extending a neoliberal ethos. As described by David Harvey in his exploration of governance transformation within the U.S. city of Baltimore, neoliberal trends have led urban governance to become much more oriented to the provision of a 'good business climate' and to the construction and promotion of all sorts of enticements to bring capital into cities. This has instigated entrepreneurial managerial styles within local governments and an increased presence and role of the private sector. In short, according to Harvey, "the task of urban governance is, in short, to lure highly mobile and flexible production, financial, and consumption flows into its space" (1989a, p. 11).

Within this shift, Tim Hall and Phil Hubbard (1996) state that the public sector has increasingly adopted private sector characteristics, such as "risk-taking, inventiveness, promotion and profit motivation" (p. 153). Yet, while there has been a spate of academic analysis examining urban entrepreneurial trends, (see Agranoff,

[16] I recognize that this is one of many theoretical models and is more suited toward understanding urban governance within the United States, where both of my case studies are located, and may be less applicable to Europe, Asia and other parts of the world (Keating, 1991 in Pierre, 2005).

2003; Cox, 1993; Hall and Hubbard, 1996; Harvey, 1982, 1985a, 1985b, 1989a; Pierre, 1999), this management style still remains loosely defined with broad parameters. There is little agreement on the defining features of what constitutes, or does not constitute, this reorientation—or how fundamental this shift has been. Some aspects associated with this shift, such as a focus on economic growth and / or place marketing, are by no means new to urban governance. There is also a lack of clarity around how this urban entrepreneurialism exists: does it supplement or supplant more traditional city managerialism? Can these two coexist in tandem, or are they mutually exclusive (Hall and Hubbard, 1996)?

Despite the ambiguity associated with this reorientation to urban entrepreneurialism, data do suggest that local governments are adopting "more initiatory and proactive roles" and that this shift has "reconstituted the traditional relationships between community and state at the local level" (Hall and Hubbard, 1996, p. 155). These more initiatory and proactive roles adopted by local governments tend to lead to partnership with the private sector on more speculative initiatives that result from the entrepreneurial policies that are underwritten by the private versus public sector (Deakin and Edwards, 1993 in Hall and Hubbard, 1996; Graham and Marvin, 2001, p. 14). As this reorientation continues, public policy becomes more reliant on private funding; and concurrently, the private sector becomes more reliant upon public funds, helping to blur the line between the two (Agranoff, 2003; Pierre, 1999). Harvey, describing the impetus to this transition, noted that:

> …in the face of widespread erosion of the economic and fiscal base of many large cities in the advanced capitalist world… urban governments had to be much more innovative and entrepreneurial, willing to explore all kinds of avenues through which to alleviate their distressed condition and thereby secure a better future for their populations. (Harvey 1989a, p. 4, referring to the consensus from a 1985 colloquium in Orleans)

Within the United States, where both of my case studies are located, boosterism and entrepreneurialism have long been key features of urban systems, and have taken "center-stage in urban policy formulation and urban growth strategies" (Harvey, 1989a, p. 4). Additionally, state and national governments have increasingly narrowed their purview of provision due to rising economic challenges. This has led to a devolution of power, placing mounting responsibility on local governments to provide services and infrastructure (Eisinger, 1997; Greenblatt, 2011). Within these constraints, local governments have turned to the private sector as partners due to the dearth of state funds and provided services. As a result, leaders from the business community "have frequently played the coordinating role in North American growth coalitions, with rentiers, landlords and utility companies often crucial players" (Hall and Hubbard, 1996, p. 157). In this process, the private sector is taking a growing role in shaping communities across the United States. Smart projects provide tech giants an entrée into this process. Due to the complex nature of these initiatives, they almost always involve the private sector, as these projects are typically too large, specialized and intricate for any local government to manage and implement on its own. With this involvement, there is an increased tendency to view public sector matters and processes through a private sector lens, leading to the adoption of entrepreneurial models and the thinking that comes along with them (Agranoff, 2003; Pierre, 1999).

2.4.2 Alignment with the Concept of Smart

As noted by Robert Hollands, there are several assumptions that regularly go along with smart projects (2008); assumptions that clearly reflect the term's lineage and perspective from large IT providers (Townsend, 2013, p. 7). Even a quick glance reveals that these assumptions align well with IBM's definition of and approach to smart, which construe cities as markets, smart technologies as commodities and smart as a 'standard' for intralocal competition. And, despite the obvious potential conflicts between some of these assumptions (e.g. pro-business bias and sustainability) (Hollands, 2008), this litany of promises has led to governments around the world to increasingly explore what it means to be a smart city and how they can adopt technology to make their cities smarter:

- Cities are increasingly competing with each other for talent, residents, businesses, investment and tourists (Begg, 2002), and cities designated smart are better able to attract and retain these resources (Coe et al., 2000; Hollands, 2008);

- Smart technologies help spur urban renewal and economic growth (Graham and Marvin, 2001, p. 306; Hollands, 2008; Townsend, 2013, pp. 107, 222);
- Technologies should be emphasized in city strategy for the perceived gains that they create (Eger, 1997; Hollands, 2008), and IT connectivity is inherently beneficial to city operations and city residents (Wiig, 2015);
- The use of smart technologies helps optimize the management of resources, including supporting 'sustainability'[17] (Hollands, 2008; Miller, 2013; Townsend, 2013, pp. 58, 83) and improving economic and political efficiency (Eger, 1997; Hollands, 2008; Marvin and Luque, 2013);
- Smart technologies routinely involve community participation, and with this, there is an implied consensus around implementing these technologies (Coe et al., 2000; Hollands, 2008; Komninos, 2002, p.188); and,
- Smart projects necessitate a pro-business bias, including the use of business models, frameworks and processes (Hollands, 2008; Townsend, 2013, pp. 5, 31).

These assumptions of smart underscore the notion that the smart city accentuates and reinforces urban entrepreneurial strategies and practices (as outlined in Figure 2), furthering the influence of a neoliberal ethos. With entrepreneurial strategies and approaches there is a belief that cities will benefit by taking "an entrepreneurial stance to economic development" (Harvey, 1989a, p. 4); a mindset instrumental in creating environments conducive for smart projects to emerge, and one that is supported by smart assumptions. Thus, through the lens of my conceptual underpinnings, as smart projects are implemented, they demonstrate how cities are becoming "increasingly central to the reproduction, mutation, and continual reconstitutions of neoliberalism" by serving as "incubators for many of the major political and ideological strategies through which the dominance of neoliberalism is being maintained" (Brenner and Theodore, 2002, pp. 376-377). This notion of smart projects functioning as neoliberal policy experiments and supporting entrepreneurial

[17] Throughout this work, when I use the term sustainability, unless otherwise noted, I am referring to the mainstreamed version used in the United Nation's World Commission for Environment and Development's (1987) Brundtland Report, *Our Common Future* (in Cook and Swyngedouw, 2012, p. 1961).

management styles in urban environments is fleshed out in Chapters 6-9, as it was evident in the smart projects that I examined in both Dubuque and Portland.

Figure 2. Urban entrepreneurialism and the concept of smart

Characteristics of urban entrepreneurialism	**Assumptions associated with the concept of smart**
A reorientation from traditional to entrepreneurial managerialism (Hall and Hubbard, 1996; Harvey, 1989a; Wood, 2008)	Smart projects necessitate a pro-business bias, including the use of business models, frameworks and processes (Hollands, 2008; Townsend, 2013, pp. 5, 31)
Fostering and encouraging local growth and development (Hall and Hubbard, 1996; Harvey, 1989a; Wood, 2008)	Smart technologies help spur urban renewal and economic growth (Graham and Marvin, 2001, p. 306; Townsend, 2013, pp. 107, 222)
Inventiveness / riskiness[18] (Hall and Hubbard, 1996; Harvey, 1989a; Wood, 2008)	Technologies should be emphasized in city strategy for the perceived gains that they create (Eger, 1997; Hollands, 2008)
Place promotion / local boosterism (Hall and Hubbard, 1996; Harvey, 1989a; Wood, 2008)	Cities are increasingly competing with each other for talent, residents, businesses, investment and tourists (Begg, 2002), and that cities designated smart are better able to attract and retain these resources (Coe et al., 2000; Hollands, 2008)
Profit motivation (Hall and Hubbard, 1996; Harvey, 1989a; Wood, 2008)	The use of smart technologies help optimize the management of resources, including supporting sustainability (Hollands, 2008; Miller, 2013; Townsend, 2013, pp. 58, 83) and improving economic and political efficiency (Eger, 1997; Marvin and Luque, 2013)

2.5 Framework for Analysis

As mentioned in the Introduction, observations from early key informant interviews with smart project experts and consultants shaped the development of my analytical framework and research questions. Through these interviews, I ascertained that IT providers seem to interact most frequently with urban governance via: (a) *strategy*—which I have defined as project objectives and how to prioritize and achieve them; (b) *engagement*—which in my research includes involved actors, the roles they play, and their interactions with and expectations of each other; and (c) *representation*—which I have understood to be how the local government portrays the project through

[18] While inventiveness and riskiness are not the same thing, projects that are inventive are often new, which means that they are most likely not well tested. Thus risk often accompanies these types of initiatives.

narrative and brand. I discuss the coding and classification from these interviews in Chapter 3.

Based on this framework, I derived the following research questions to guide my investigation: How are smart projects, steered by IT providers, interacting with local government city objectives, priorities and approaches and what might be the implications of this interaction? How are smart projects changing the roles and expectations of local government and city residents, and what is the role of the IT provider within this transformation? And, how might smart project narratives and brands be informing the redesign of urban governance mechanisms? In the section below, I briefly elaborate on this framework by discussing the conceptual grounding of these concepts, what each means within the context of this research, and how these concepts relate to urban governance and interrelate with each other. In Chapter 4, I examine these areas in-depth as they relate to smart city projects.

2.5.1 Strategic Planning

For the purposes of this research, I have defined strategy to refer to project objectives and priorities, and the processes and actions that must be undertaken by involved actors to achieve them. Robert Denhardt (1985) hypothesized that strategic planning practices typical to the private sector first emerged within urban governance in the 1980s—roughly about the same time that neoliberal doctrines began to spread. In his article "Strategic Planning in State and Local Government", Denhardt posited that due to the rapidity of "social and technological changes" and the "turbulence and complexity which such changes generate" (Toffler, 1980; Naisbitt, 1982 in Denhardt, 1985, p. 174), public sector agencies began turning to models employed by private corporations to "systematically plan for their future development" (Denhardt, 1985, p. 174). In other words, public sector agencies adopted this practice in hope that it would help deal with rapid and complex change.

According to Peter Drucker (2007), this type of strategic planning addresses not only future goals and objectives, but also what needs to be done first in order to meet them (p. 245-248, 267). Within this approach, a future focus is thought to enhance decision making in the present; a notion that aligns well with the future orientation of smart project narratives, which frequently emphasize that local government actors must take action now to purportedly avert some impending crises. Thus, the logic behind using strategic planning in smart initiatives directly aligns with the way that project messaging is typically constructed. Further, Denhardt notes that strategic planning also provides “an opportunity for widespread substantive involvement” of stakeholders, including leaders and citizens, “in defining the direction of the community or the agency as it moves into the future” (Denhardt, 1985, p. 175). Hence, within this defined approach to strategic planning—or establishing objectives, priorities and how to achieve them—a wide range of stakeholders are involved; for formulating strategy is seen as a participatory process. This segues into the second concept of my analytical framework, engagement.

2.5.2 Engagement

Within this investigation, I use engagement to refer to the governance arrangements around smart projects, which includes involved actors, the roles they play, and their interactions with and expectations of each other. In the case study projects that I examined, this engagement typically took place within the structure of a public-private partnerships, and included the involvement of citizens, for smart projects frequently require some sort of contribution (e.g., funding, behavior change) from city residents to be ‘successful’.

In his 2003 article “Leveraging Networks: A Guide for Public Managers Working Across Organizations”, which looks at intersections between the public and private sectors in urban governance, Robert Agranoff (2003) states that the knowledge, power, resources and other means to solve complex problems are distributed across many individuals and organizations. This, he posits, is resulting in new forms of governing (ibid.). As a result, governments establish collaborative relationships with a wide array of nonprofit and for-profit agencies and organizations to deal with concerns related to the economy, health, justice, social services, the environment, transportation and education, among others (Rose, 1999, pp. 15-16; Rose and Miller, 1992). Within the consequent public-private partnerships, “the public and private actors involved do not act separately but in conjunction, operating as a network”

(Agranoff, 2003, p. 8)—a notion that the private sector supports due to the opportunity it creates. Yet, governments also find PPPs attractive, for at the heart of many of these types of arrangements is an effort by local government to try and "attract external sources of funding, new direct investments, or new employment sources" (Harvey, 1989a, p. 7). The proclivity for local governments to turn to PPPs for urban development initiatives offers an environment primed for smart projects. Predictably, smart project narratives, often when created by IT providers, echo this need for public and private collaboration.

2.5.3 Representation

Finally, within this work I view representation as the ways in which smart projects are portrayed through narrative and brand. By narrative, I am referring to the various stories that are created to promote, align stakeholders and encourage support around these endeavors. There are often various messages within a narrative; while a myriad of narratives make up discourse. Narratives can help shape and inform brand, which refers to the symbolic associations that local governments aim to create through strategies to promote place. I have chosen both narrative and brand as elements to make up what I term as representation due to the significance that interviewees repeatedly placed on these two notions during my initial set of interviews (a theme that was reinforced continually throughout my case study research). In fact, in some initiatives, project narratives and brand can be as prominently emphasized as, if not more than, the involved technologies and the outcomes that they are expected to deliver (Wiig, 2015).

While smart project narratives and brands are typically applied by local governments in a specific location, time and place, they are informed by a broader discourse around these endeavors created by the IT providers and consultancies selling these wares. James Merricks White (2015) explores this IT provider smart city concept, which he refers to as a global "smart city imaginary", or a placeless imaginary that "draws on general trends and addresses a broad audience" (p. 3). This imaginary, often promoted by those selling smart city solutions, presents a future where city officials are able to manage or avert systemic crises—"where urban strife is simultaneously posed and resolved" (White, 2015, p. 3). The way that this imaginary is expressed in narratives is important to note—for how urban challenges are described affects the types of solutions chosen to address them, as well as how they are addressed (Jessop, 1997).

When examining the entrepreneurial city for example, Bob Jessop (1997) identified a close link between "economic strategies and economic discourses since it is only in and through the latter's mediation that problems are identified, policies pursued and crises resolved" (p. 1). As cities reimagine themselves as economic, political and cultural entities where the local government pursues entrepreneurial activities to improve city competitiveness, according to Jessup (1997), what follows is a redesign of urban governance mechanisms, "especially through new forms of public-private partnership and networks" (p. 1). Jessop noted that this transformation to an entrepreneurial city is evident through "the wide range of self-presentational material emitted by cities and / or agencies involved in their governance" (1997, p. 1). Similarly, the narratives that shape the smart city imaginary—i.e., the seductive images of ideal cities that have been 'enhanced' and 'improved' through the application of the smart technologies—are informing the redesign of urban governance through smart project design and implementation. And since tech providers are frequently the creators of smart project narratives and significant contributors to the smart city imaginary, they are driving the ways in which these changes in urban governance are taking place.

While I have separated these areas for analysis, there is not clear delineation between them, for strategies inform who is involved and the governance arrangements around these actors, while also shaping the stories told. Similarly, who is involved will affect the strategies formed around smart projects, as well as the narratives created to promote and gain support for these endeavors. And, narratives can shape what strategies are chosen as well as who is involved in these initiatives and what their roles may be. Further, it is unclear in terms of which of these areas comes first to then influence the others.

Conclusion

As highlighted in the discussion above, despite fantastic claims in compelling narratives and attractive packaging, the premise behind the smart city—i.e., using data and analytics to improve decision making and resource allocation within urban environments—is not new. Planners and engineers have sought to make the management of cities more scientific for over a hundred years (Shelton et al., 2014). Just as the premise behind the smart city is not a novel concept, it is also not a clear one. There are a myriad understandings, definitions and conceptualizations of the concept of smart—ranging from, among others, perceiving "the city as visualized facts" (Kitchin et al., 2015, p. 6), to focusing on creating learning environments and fostering innovation (Deakin and Al Waer, 2011; Florida, 2005); from spurring economic development (Caragliu et al., 2009; Hollands, 2008), to enhancing sustainability (Duany et al., 2010; Steinert et al., 2011). In many ways, the smart city trend has become an urban labelling phenomenon, almost referring to all and sundry applications of ICT across city systems and services (Albino et al., 2015; Kitchin, 2014b).

Regardless of variation, with each smart project there are common assumptions that reinforce characteristics of urban entrepreneurialism, and include an emphasis on smart technologies in city strategy (Eger, 1997; Hollands, 2008) in a bid to: (a) improve city attractiveness and competitive edge, thereby helping to entice resources (Coe et al., 2000; Hollands, 2008); (b) spur economic development (Graham and Marvin, 2001; Hollands, 2008), in part through an increased private sector role and use of their business models and practices (Hollands, 2008; Townsend, 2013, p. 5, 31); (c) enhance optimization, facilitating political and economic efficiency (Eger, 1997; Hollands, 2008) and sustainability efforts (Hollands, 2008; Miller, 2013); and (d) enhance community participation (Coe et al., 2000; Hollands, 2008; Komninos, 2002, p.188). Alongside these assumed positive outcomes, smart city projects present various potential risks to local governments associated with the vulnerability of these systems and the responsibilities that go along with them. Further, smart projects may contribute to increased economic, political and social fragmentation across urban environments by establishing enclaves enabled by smart technologies

(Graham and Marvin, 2001, pp. 389-390), and may reinforce a more autocratic approach to urban planning (Townsend, 2013, pp. 86, 249). Thus, there is an exigent need for these initiatives to be better understood.

Theory around the relationships and interactions between the public and private sector, and how the private sector is purportedly gaining influence within the public realm, provided an open aperture to shed light the potential influence and impact of tech providers interacting with urban governance via smart initiatives. When viewed through a neoliberal lens, smart projects can be construed as mechanisms through which urban entrepreneurial approaches are reinforced and spread. As such, these projects purportedly underscore the critical role that cities are playing in the reproduction and mutation of neoliberal trends within urban environments; a factor facilitated by the increasing role of the private sector in the management and provision of city infrastructure services (Brenner and Theodore, 2002). As a result, there are a growing number of collaborative relationships between utility companies and infrastructure corporations around smart projects (Curwen, 1999). Within these public-private partnership arrangements, smart city priorities, approaches and narratives are spread (Wiig, 2015). And, given the highly boosterish nature of smart endeavors, and how well they facilitate and contribute to intralocal competition, this creates further pressure for cities to become smart (Hollands, 2008; Shelton et al., 2014; Wiig, 2015).

My research questions pertain to the implications of IT providers interacting with local policy and planning processes around project strategy, governance arrangements and representation through narrative and brand. In this regard, I posit that over time as smart initiatives proliferate, this process of interaction will pave the way for IT providers—often more well-versed at working with business enterprises and national governments than municipal leaders—to more broadly inform urban governance processes. In effect, I believe that IT providers are not just selling smart technologies; they are propagating a set of assertions about the role, structure, function and relationships of local government. This set of assertions is informed by neoliberal and entrepreneurial principles, and bound up with the concept of smart and the IT provider perspectives and practices used to implement these projects. Together, these are attractively packaged as a "smart city imaginary" (White, 2015) that is largely created by IT providers and which in practice cannot be pursued without them.

It begins with the way that IT providers intend it to—the pitch. Beguiling images of efficient, prosperous, sustainable and seamless cities entice local governments to buy smart city wares. What is frequently not so apparent within the pitch, but alluded to within smart concept assumptions and project approach, is the implied transformation of urban governance that is part and parcel of IT providers' strategies for cities to become smart. In my analysis, case study findings revealed three areas of urban governance transformation that IBM most frequently promoted to local governments during interactions around smart projects—shifts that conveniently would insert data and analytics, and hence IBM, into a wide range of urban governance activities and processes. These included assertions that local governments should:

- Adopt a data-centric and solutionist approach and employ IT provider business models and practices;
- Transform the roles of and interactions between and among local government and city residents, with the IT provider and / or their technologies acting as an intermediary within this transformation; and
- Promote their city as being smart (thereby endorsing IT providers' smart city solutions and helping to grow the market).

For in effect, I found that IBM is not just selling smart city solutions and offerings. Rather, it is promoting principles about the reconfiguration of urban governance. I explore this further in Chapters 4-10.

3 Methodology and Approach

This work is an empirical exploration of cities adopting smart technologies. In this chapter I elaborate on the methodological approaches I used to explore this topic and the challenges that I faced while conducting this research. Using conceptual literature as a foundation to help understand the concept of smart—including its emergence, evolution, variations and surrounding context—I looked to key informant interviews and case studies to ascertain how theories and observations identified in this literature manifested in actuality. This process of examination was informed and shaped by my insider status at IBM, a factor explored further below. My research is qualitative in nature and primarily concerned with local government, IT providers and city residents. While my primary audience for this work is the academic community, I hope that actors from both local government and IT providers can glean insight from my observations—for local government to attentively approach the smart city trend and for IT providers to be more aware of the potential impact of their work.

This investigation was an iterative process. The latter two stages of research—key informant interviews and case studies—helped me gather multiple sources of evidence to compare against the theoretical propositions identified during earlier research, enabling triangulation of my analytical framework, data and observations as my work evolved. This triangulation contributed to more reliable findings, as it helped me identify trends and patterns that emerged across research techniques and sources. Despite this iterative process, there were some methodological issues that emerged. For example, since I primarily interviewed actors involved with smart projects, by default my universe of interviews did not include all of the groups or individuals excluded from these initiatives. While I was able to speak to a few people who were not affiliated with, or were excluded from, smart endeavors, this was by no means representative of the numbers of those ‘excluded’—a potential weakness when following “historical snowballing” (Bijker, 1992, p. 46). I discuss other methodological challenges encountered throughout this chapter. Figure 3 outlines my methods and approach, and the various activities that I undertook within each to glean insight.

Figure 3. Methods and approach

Method	Activity	Purpose
Desk research	Review of conceptual literature	To gain insight from theory, concepts and debates that relate to the smart city trend
	IT provider smart project materials (including IBM materials)	To understand how tech providers define, describe and portray smart projects, and how they view these contributing to and affecting urban environments
Key informant interviews	Initial key informant interviews	To help establish research scope, approach and my analytical framework
	Interviews with other tech providers and third party organizations that have worked on smart projects or are studying these projects	To understand the IT provider perspective of smart projects, and the broader applications of this trend
	IBM staff interviews (not including IBM staff on case study projects)	To understand IBM's perspectives of and approach to smart projects given that it is the IT provider that I focus on within my case studies
Case study analysis	Interviews with local government officials, smart project staff, IBM project staff, involved third party agencies, and where relevant, city resident participants	To understand how smart projects have evolved in the case study cities, and the meanings to which actors involved have assigned to these projects
	Participation in relevant events	To aid in understanding the processes and engagement around these endeavors in case study cities
	Narrative review of smart project materials	To understand how involved actors describe and assign meaning to these initiatives
Inside observer	My work with IBM related to the smarter cities campaign (note, I have not been involved in the design, implementation or evaluation of any smart projects in Dubuque or Portland)	To shed light on IBM as an IT provider in the smarter city space, including its relevant organizational structure, processes, frameworks and approaches

Although observations made within this research may point to wider tendencies of smart technology adoption within urban environments, they are not necessarily applicable to all similar types of cities or situations (Law and Mol, 2002). Given the structure of my case study analysis and its focus on two U.S. cities, broader applicability may tend to be more limited to smart efforts led by large IT providers in advanced capitalist environments with similar local government structures. Additionally, it should be noted that the ability of IT providers to insert themselves into urban governance processes will vary greatly depending upon city size. In many ways, the city of Dubuque provided an ideal example for this type of exploration—its small size enabled IBM to interact more deeply and broadly with local governance process around smart endeavors; and, from a research perspective this smaller size facilitated my analysis. It should also be noted that at the time that I launched this research, the concept of a smart city was still relatively new. The ongoing nature of this trend, the way in which this concept has developed and is evolving, and the longer-term focus required to view these projects in their entirety, provided challenges for fully understanding implications. Though over the years of my research, critical analysis and reflect of smart projects have rapidly grown. Thus, while some observations can be drawn from my work, these will be somewhat anecdotal until further related study can be completed. For the above reasons, I do not seek to outline ultimate positions on issues related to smart; rather, my research is oriented and exemplary in nature (Law and Mol, 2002; Lipset et al., 1956; Yin, 1994).

3.1 Desk Research

Given the complexities of smart efforts—in terms of all that they touch and encompass from things tangible and intangible—I explored a broad range of conceptual literature emerging from sociology, urban studies, organizational management and political science. I chose this breadth to help flesh out the exploratory and descriptive aspects (Yin, 1994) of my research objectives as they related to smart city technologies and actors, urban development, urban governance, engagement arrangements, narrative and brand. This enabled me to: (a) gain understanding of the smart concept and how it has been conceptualized and presented by IT providers (namely, IBM); (b) situate my work within broader local government trends and political, economic and historical context; and (c) identify the conceptual literature to inform my analytical approach. This review also enabled me to further refine and situate my observations through an iterative process as my work developed. Given my case studies are both located within the United States, a predominant amount of the literature reviewed is U.S.-centric. Applicable theories, debates and concepts from this conceptual review are highlighted throughout this work, but are primarily discussed in Chapters 2 and 4; the case study chapters look at how these theories and debates applied in practice.

To understand how IT providers are defining, describing and approaching smart projects, I examined materials produced by tech providers (e.g. Arup, Cisco, General

Electric, Hewlett-Packard, Microsoft and Siemens) active in the smart city market. I also examined materials created by others documenting this trend, such as industry analysts and the media. Since IBM is the IT provider in the case study projects that I examined, I reviewed a wide range of IBM's Smarter Cities materials produced across various IBM divisions. To highlight narrative themes contained within IBM Smarter Cities materials, I closely examined six documents recommended by lead IBM Smarter Cities Marketing & Communications and Sales & Development staff as those that best represent IBM's thinking and perspectives on smart cities (discussed in Chapter 5). Of all the materials I reviewed to understand the IT provider perspective, I used fifty items to inform my analysis. Some of the materials reviewed were not used to inform this stage of research as they strayed too far from the topic at hand. Figure 4 illustrates the type of author for materials reviewed. Relevant observations from this stage are included throughout this work.

Figure 4. Material reviewed to inform tech provider perspective

Author / Creator	**# of documents**
IBM	36
Other Tech Providers	7
Media	4
Industry Analysts	3
Total	**50**

3.2 Key Informant Interviews

A few months after I commenced my desk research I conducted seventeen initial key informant interviews to inform my research scope, analytical framework and methodology. Four of these were conducted in person, with the remainder being conducted by phone. They all took place in early to mid-2010. In these interviews, I asked four basic questions to understand how these actors understood and assigned value and meaning to these initiatives: (a) what is a smart project; (b) why do cities adopt smart technologies; (c) what types of actors are involved in these projects; and (d) what are typical smart project outcomes. Within these interviews, interviewees repeatedly raised themes related to the governance structures of these projects (fifteen out of seventeen interviews), partnership arrangements (fifteen out of seventeen interviews), and issues related to narrative and / or brand (ten out of seventeen interviews).

Figure 5. Initial interviews that informed analytical framework

Interviewee type	# of interviews	# who referred to strategy / governance	# who referred to partnership / engagement	# who referred to representation / narrative / brand
IBM staff who work on smart projects	6	5	5	2
Smart project experts external to IBM	8	7	8	5
Urban governance experts	3	3	2	3
Total	**17**	**15**	**15**	**10**

Figure 5 illustrates the type of interviewee and the number of responses per classification grouping. Based on feedback from this set of interviews, I established an analytical framework that focused on governance and partnership arrangements, narrative and brand. As my research and observations evolved, I shifted this classification to strategy, engagement and representation to better capture and illuminate my findings. Figure 6 illustrates how I coded the topics raised within this initial set of interviews to deduce my analytical framework.

Figure 6. Coding to derive analytical framework

Terms I classified under strategy	Terms I classified under engagement	Terms I classified under representation
Politics / political realities	Partners / partnership	Narrative
Human processes	Alliance	Brand (city brand)
Governance / governance model	Public-private partnerships	Image (city image)
Strategy / community strategy	Network	Stories
Priorities	Engagement / participation	Reputation
Political will	Ecosystem	Perceptions of city
Management	Cooperation	Vision (city vision)
Political processes	Consensus	Sell / attract (tie to competitiveness)
Bureaucracy	Relationships	

Observations from these interviews also aided in identifying additional conceptual literature to review and integrate into my work, most notably around issues related to urban governance trends, place marketing, narrative and the growing emphasis on data and analytics within urban environments and all that this entails. I chose these individuals judiciously based on initial research to understand the smart concept. Yet, given these interviews were conducted at the inception of my work, I may not have chosen the same individuals three years into my study. For this reason, I consistently conducted additional interviews with urban experts and those involved in smart projects throughout my research to triangulate these initial findings and ensure the applicability of my analytical framework.

This second set of key informant interviews gave me deeper insight into how smart city providers, including IBM, were conceptualizing, understanding and applying the concept of smart, serving as a complement to written narratives by these actors. They enabled me to understand how, in general, the shared perspectives of individuals who worked for smart city providers aligned with what was presented within documents created by these organizations. Questions for these interviews were semi-structured and open-ended, and slightly varied according to area of expertise.[19] These interviews, which were all conducted by phone in late 2010 and throughout 2011, breakdown as follows:

- Twenty interviews with experts from private sector companies that work in the smart city market (such as Arup, Cisco, CH2MHill, HDR and EveryBlock.com), and other organizations working on issues related to this trend (e.g., OpenPlans, Mayors Institute on City Design and The Climate Group); and
- Thirty-two interviews from experts within IBM to gain deeper insight on the organization's perceptions of smart, narrative themes and branding, solutions and approaches.

From these interviews, I used nine (of twenty-one) expert interviews and twenty-one (of thirty-two) IBM interviews for empirical data for my analysis. Interviews not used did not provide information directly useful to my analysis as they digressed too far from my area of focus. Of the twenty-one interviews from IBM, I interviewed a range of staff to understand the various organizational perspectives of Smarter Cities.

[19] See Appendix 11.4 for an illustrative interview guide.

Figure 7 details the number of IBM staff and departments that were represented in these interviews.

Figure 7. Types of IBM staff interviewed

Department	# of interviews
Marketing & Communications; Sales & Development; Smarter Cities Challenge	10
Dubuque project	4
Portland Project	3
Smart subject matter expert	4
Total	**21**

Interestingly, almost none of the key informant interviewees (or those interviewed for my case studies, which are discussed below), focused on the smart technologies employed in smart projects or the technological aspects of these projects. This was true even during interviews with the IT experts. Hence, this reaffirmed my emphasis on the social and political, and consequent economic, aspects of these endeavors. One key weakness with these key informant interviews is that I interviewed primarily those who have worked on or are associated with smart projects, hence I did not speak to many of people excluded by these initiatives. Thus small factors excluded or overlooked by this approach could have built upon themselves, becoming graver as I continued to only focus on the involved actors. Findings from these interviews primarily informed my non-case study chapters, though observations are included throughout this work.

It should be noted that in all of my key informant and case study interviews (described below) I followed human subject protocol based on principles of respect for participants in the research and recognition of the risks they might face in participating. To this end, I did not include any information in this work that interviewees asked to remain confidential. Informed participant consent was obtained verbally, and to the best of my ability I tried to ensure that each person understood the nature of my research, the purpose of their participation and the expected final outcome. Unless otherwise noted, I refer to interviewees by their title or role to help maintain a level of privacy. However, I do attribute direct quotes from individuals in instances where I have found these quotes through publicly available resources. To help foster full disclosure, and improve the chances of hearing all feedback—both positive and negative—all interviews that I conducted for the purposes of this research were not recorded, rather they were captured in handwritten notes (Kirk and Miller, 1986; Valadez and Bamberger, 1994; Yin, 1994).

3.3 City Case Studies

I chose to utilize case study analysis to complement my other methodological approaches for I felt that this manner of examination would best be for highlighting how smart city endeavors are manifesting in actuality, shedding light on specific examples of the discursive and material realities of smart projects. This approach enabled me to examine smart efforts in the cities in which they were taking place over a period of a few years, thus helping me to make sense of and interpret smart efforts and trends in terms of the meanings that key involved actors brought to them over time. Finally, case study analysis provided me with greater ability to examine how IBM interacted with local governance processes and how smart projects may reinforce and accentuate urban entrepreneurialism and the assumptions of smart (Hollands, 2008). This included examining how these efforts interact with intralocal competition, place marketing, the prevalence of public-private partnerships, a private sector bias, policy mobility, the transfer of business models and practices, and an emphasis on efficiency that relies upon the increased use of data and analytics.

Before conducting my fieldwork, I applied the following criteria to help select my two case study cities:

- IBM was involved in the smart efforts being examined (which meant that at the time I began my research, this limited my pool of selection to roughly fifteen projects);
- The city was applying technology in new ways to help inform city planning processes or it had already identified smart as a goal within its city strategy and was envisioning this process to include utilization of IT to improve the functioning of two or more city systems;
- The smart projects being examined had been up and running for at least one year (so that adequate data would be available on the project)—though this

proved difficult in Portland since several smart projects fell through during the course of my research;

- The cities provided similarities (e.g. focus on sustainability and 'citizen engagement'[20] in smart projects) that enabled comparison with each other, while also providing noteworthy contrasting examples, such as city size, governance model, approach to smart, etc.;
- Key stakeholder groups and actors agreed to provide access to relevant data and to participate in interviews; and
- Substantive data on the city's social, economic, political and cultural processes was readily available.

Against these criteria, a total of five potential case study cities were identified. This list of potential cities was then reduced through other criteria such as locality, resources required (e.g. travel costs to and from city), and level of responsiveness / interest by key involved actors, among others. Based on these criteria, I selected two case study cities within the United States: Dubuque, Iowa and Portland, Oregon. I choose Dubuque as my primary case study site because it fit all of my selection criteria and because it was deemed IBM's first Smarter Cities "living lab"[21] in the world—a site where smart technologies and their related solutions are tested and piloted by IBM before being replicated and applied on larger scale. The significance placed on this joint partnership to approach Dubuque as a living lab has translated into more attention to this city by IBM—and thus, more resources to help inform my research in terms of data gathered, evaluations undertaken, and subject matter experts deployed to work in this city. Additionally, the smart endeavors in Dubuque have garnered national and international media coverage, which I thought would be useful for my analysis of smart projects and city representation (Acohido, 2009; BBC News, 2011; Dillow, 2011; Forbes, 2007; Hamm, 2009a; Hoffman, 2009; Lindsay, 2010; Lohr, 2009b). As a small city, Dubuque has been able to push smart efforts forward more rapidly than larger cities that face cross-boundary issues

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[20] By citizen engagement, or civic participation, I am referring to "the practice of consulting and involving members of the public in the agenda-setting, decision-making and policy-forming activities of the organization or institutions responsible for such functions" (Rowe et al., 2004, p. 89).
[21] I discuss the "living lab" approach in Chapter 4 and in the Dubuque and Portland cases study chapters.

(political, financial, procedural, jurisdictional, etc.). As a result, this decreased the likelihood of the efforts stalling or halting during my research fieldwork.

I chose Portland as a second case study for comparison due to the fact that the local government has been seen as a leader in urban planning and citizen engagement for decades (Mayer and Provo, 2004; Ozawa, 2004b), and their pursuit of smart technologies to advance their approach in these areas raises interesting questions as to how an emerging smart agenda might be integrated with pre-existing governmental strategies that are seen as 'progressive' or participatory. In addition, the city is also seen as a leader in urban sustainability (Grist, 2007), an element often featured within smart city discourse. The city met all of my criteria for selection, and due to IBM's close relationship with the local government, and in particular the former Mayor (who was in office during most of my research), I was able to have access to city officials that otherwise might not have agreed to my interviews. Finally, I was interested in the case study due to the contrasting viewpoint that the local government had on smart projects versus that of Dubuque. While local government officials within Portland were interested in seeing how smart technologies might be applied to urban planning processes, they approached these projects with reservation. Given the varying level of buy-in to the concept of smart, and all that that entails, I thought this case study would generate interesting data to contrast with the Dubuque experience, where the concept of smart was embraced wholeheartedly.

Together, my two city case study examples shed light on how the local governments in small and medium-sized advanced capitalist cities are utilizing smart projects to help reach their desired goals, including improved sustainability and citizen engagement. The case study of Dubuque enables an examination of smart projects that mainly focused on infrastructure, where 'technical' issues around utilities have implications for civic engagement and participation. Whereas in Portland, public concerns were rendered in part 'technical' through smart initiatives. Just as these approaches to achieving desired outcomes varied, so did the reasoning behind them. In Dubuque the local government sought to foster sustainability and be perceived as smart to help make the city more attractive, thereby drawing in business, resources and talent (which would then purportedly spur economic growth). To achieve these ends, the Dubuque local government engaged city residents to help solve sustainability problems through their choices around resource consumption. In Portland the local government pursued these ends to help improve the city's environmental impact by making city systems more efficient through improved decision making for resource allocation; and engaged city residents to make urban planning seem more inclusive and participatory. Each of these desired outcomes—enhanced sustainability and increased civic engagement—aligns with assumptions associated with the concept of smart (Hollands, 2008); while approaches to achieve these outcomes reinforce tendencies for a more entrepreneurial approach to city management. Findings and observations from my case study analysis are included in Chapters 6 through 9.

It should be noted that my case study selection was limited by my affiliation with IBM, which also influenced the ways in which those interviewed in my case study analysis responded to me. IBM is a tech giant that has varying relationships with each case study city. In Dubuque, IBM set up a Global Delivery Facility (GDF) office as an integral part of the relationship the company established with the local government to implement smart city projects. This influx of resources—in terms of IBM brand, investment and talent, among others—caused local government officials, and other city actors involved in smart projects, to highly value their relationship with the company, and therefore were much less likely to critique the smart projects being implemented. In Portland, while IBM worked on various projects within the city, the local government felt much less obligated to IBM since it was just one of many IT provider partners with which the local government and other involved smart actors did business. Another limitation with my case study approach is that I choose to examine cities both located in the United States, thus confining my analysis to urban trends and patterns typical to this type of advanced capitalist environment. Similarly, the scale of these two cities may also affect the transposition of my observations to other urban environments of varying sizes.

During my case study research, I used a tiered visitation schedule to help mitigate the sometimes unpredictable and slow trajectories that smart city projects can take. The timing of each visit was coordinated with periods of increased activity to help ensure the best use of time and resources. Case study site visits generally lasted a few weeks per round. I conducted my site visits to Dubuque in September 2010, December 2010, December 2011 and September 2013; and site visits to Portland in August 2010, February 2011 and October 2013. See Appendix 11.3 for timelines detailing the various activities undertaken within these site visits.

There have been difficulties associated with a case studies approach in this context. To date, smart efforts within cities have advanced sporadically, with delays in funding and other issues slowing or halting project progression, making case study fieldwork somewhat unpredictable. To help combat this, I choose case study cities in which there were several smart projects already being discussed or underway, and I adopted a tiered timetable approach to my fieldwork to help compensate for delays. For these same reasons, I made repeated visits to case study sites over a few years period, instead of remaining for one long concentrated stay. In the case of Portland, having a few of my potential case study projects fall through was particularly informing—for these experiences gave me great insight into the potential hindrances and frailties associated with launching and implementing of these endeavors.

3.3.1 Case Study Interviews

During my case study visits, I conducted interviews with key actors involved in smart efforts to explore how they interacted with, assigned meaning to and were affected by these projects. These interviews shed light on how: (a) oral narratives did or did not align with written narratives created by local government and smart project actors; and, (b) urban entrepreneurialism and the assumptions of smart are being reinforced and spread through stories about and interactions around smart endeavors. As noted above, data derived through this process may have been influenced by each local government’s relationship with IBM. Dubuque city leaders had a tendency for boosterism when describing smart initiatives perhaps to protect their relationship with IBM—a company seen as a valuable asset to the city in terms of how it is perceived to contribute to the local economy and brand. Those interviewed in Portland were more likely to be candid in their response given IBM's tangential relationship to the local government and its city plan.

Questions for interviews conducted during case study visits were semi-structured and open-ended for each interview series, which varied according to city, actor, role, type of smart project, etc. (thus, these interview questions built on, but varied slightly from, the interview guide created for key informant interviews, as shown in Appendix 11.4). I conducted over seventy-five case study interviews with local actors involved in the smart endeavors in Dubuque and Portland. Roughly sixty percent of these interviews were conducted in person during fieldwork, with forty percent being conducted by phone due to unavailability during my site visits. All of these interviews were conducted specifically for the purposes of my dissertation research and are not to be confused with the IBM interviews that I observed that were held to evaluate the Smarter Water and Smarter Electricity Pilot Studies in Dubuque (described below). These interviews break down as follows:

- Forty-one stakeholder interviews in Dubuque, including interviews with smart project team members, IBM project staff, the Mayor, the City Manager and Assistant City Managers, Resource Management Coordinator, Sustainable Community Coordinator, the City Information Services Manager, and representatives from funding agencies, utility companies, local businesses and civic organizations; and
- Thirty-six stakeholder interviews in Portland, including interviews with IBM project staff, smart project staff, the Metro Council, the local government's Bureau of Planning and Sustainability, TriMet, the Portland Business Alliance, the Portland Sustainability Institute, Portland State University and third party organizations involved in smart projects, among others.

From these interviews, I used thirty-five for empirical analysis from Dubuque and twenty-four from Portland (the interviews not used, while often informative for background or context, did not contribute directly to the issues that I examined and thus were not included among my empirical data). In both Dubuque and Portland, I interviewed key local government and IBM actors numerous times over the years to help clarify and validate my observations and findings. Figure 8 illustrates the breakdown by interviewee type in Dubuque and Portland. There were slight variations in types of interviewees between the two cities due to the differing nature and structure of the smart projects examined. Observations from these interviews are fleshed out in the case study chapters.

Figure 8. Types of interviewees from Dubuque and Portland

Dubuque		Portland	
Interviewee type	**# of interviews**	**Interviewee type**	**# of interviews**
Local government	16	Local government	5
Involved in smart project implementation	6	Involved in smart project implementation	6
Utility company	2	Relevant subject matter expert	10
IBM project staff	4	IBM project staff	3
Smart project participant	7		
Total	**35**	**Total**	**24**

3.3.2 Participation in Related Activities

During early stages of the fieldwork I participated in various smart project events and activities within the case study cities to triangulate fieldwork and interview observations, build rapport with interviewees and gain greater access to relevant data (Kirk and Miller, 1986; Lofland et al., 1971; Platt, 1992; Valadez and Bamberger, 1994). While this participation was not instrumental in my analysis, it did provide me with broader context and understanding of the smart projects that I examined and each city's approach to them. In the case of the Dubuque events, given all were conducted to further and promote Smarter Sustainable Dubuque, I recognized that only the most beneficial and favorable aspects of smart projects were presented and shared. Observations from these activities are included in the case study chapters:

- Attending a Dubuque City Council Meeting on Smarter Sustainable Dubuque, a Dubuque2.0 Steering Committee meeting, an Iowa Power Fund Committee Meeting, and a dinner convening representatives from City Council, Dubuque2.0, the Smarter Water Pilot Study management team, the Greater Dubuque Development Corporation, the Iowa Power Fund, and utility companies (during fieldwork in September 2010);

- Participating in a Smarter Sustainable Dubuque Tour and a City Council Tour of Dubuque, held during an event showcasing the city's smart efforts (during fieldwork in September 2013);
- Participating in a "J&M Café" Session in Portland, which weekly convenes economists, business leaders, and technical experts interested in and / or working on sustainability within the city (during fieldwork in August 2010);
- Attending several IBM internal sessions that discussed the development, implementation and impact of the systems dynamics modeling tool used in Portland (by phone throughout 2011 and 2012); and
- Joining four City in Motion design discussions between IBM, Portland State University, HDR Engineering, the Dubuque Metropolitan Planning Organization, the East Central Inter-government Agency, which handles transportation planning in Dubuque, as well as the local government office responsible for land use planning (these discussions were all by phone in 2011).

In addition to the above, I participated in three different sets of interviews led by IBM in Dubuque—activities all conducted on behalf of IBM to evaluate and better understand the smart efforts being implemented in this case study city. The materials developed from these interviews have been used by both IBM and the local government as promotional tools to raise awareness of the city's Smarter Sustainable Dubuque initiative and IBM's Smarter Cities work. Signed consent to use and reference the interviews was obtained by IBM for all of those interviewed for all three interview sets. The first set of interviews explored constituency building and sustainability in Dubuque and was held with various city leaders and project participants. The second two sets of interviews involved participants from the Smarter Water and Smarter Electricity Pilot Studies. I elaborate on these sets of interviews below.

On December 7-8, 2010, IBM's Corporate Marketing & Communications team conducted a series of interviews with various Dubuquers to discuss the topics of sustainability and constituency building, and how these relate to the city's partnership with IBM around smart projects—an effort to support IBM's Smarter

Planet Leadership Series.[22] These interviews were filmed, turned into videos, and then used for various promotional purposes by both IBM and the local government. Several of these interviews are available publicly on YouTube, and each interviewee gave consent for the interview material to be moved to the public realm. The interviews gleaned information on local culture, constituency building, leadership, collaboration, and interviewees' perspectives of smart. In all, eleven interviews were conducted in this set with representatives from local government, civic organizations, the business community, and volunteer households that participated in the smart project pilots. I drafted the questions for these interviews and posed some of the questions during filming. Full transcripts from these interviews were provided to IBM, which I have used as a source document for direct quotations; those that are readily publicly available are included in the bibliography (see Buol, 2010; Burbach, 2010b; Dickinson, 2010a; Dregne, 2010b; Grover, 2010; Hawks-Goodmann, 2010; Kohlmann, 2012; Lyons, 2010a; Schultz, 2010; Steinhauser, 2010; N. Van Milligen, 2010).

Additionally, as part of the project evaluation process, IBM Research conducted two sets of interviews with Dubuquers who participated in the smart project pilots I examined. The first set of these pilot evaluation interviews, held December 8-10, 2010, involved speaking to ten Smarter Water Pilot Study participants. The second set of evaluation interviews took place from November 28-December 2, 2011, and involved interviewing fifteen city residents who participated in the Smarter Electricity Pilot Study. These interviews were conducted to learn more about: (a) how participants were interacting with the smart technology portals; (b) if the portals were improving participant understanding of the resources; and (c) if the portals were affecting participant consumption patterns. I observed and participated in most of these evaluation interviews. Results from these interviews were integrated into pilot reports, which included anonymized interview excerpts from interviewees. These reports were made available to IBM employees, the local government of

[22] The Smarter Planet Leadership Series was created to help 'educate' leaders implementing smart projects on the types of skills and capabilities that IBM staff felt were necessary for 'successful' project implementation. These lessons were encapsulated in a series of PDFs, videos, case studies and PowerPoint presentations made available online through various webpages on ibm.com and via YouTube. See: http://www-07.ibm.com/innovation/au/leadership/stories/index.html for additional information (accessed April 3, 2016).

Dubuque, and other actors involved in the smart pilots such as Dubuque2.0, and are available online for public consumption (see Erickson, et al., 2012; Naphade, 2011, 2012).

3.3.3 Smart Project Narrative Review

A review of the narratives associated with case study smart projects allowed me to explore how the assumptions of smart and urban entrepreneurial perspectives are being woven into smart city materials and aiding in the spread of these endeavors. I was able to observe how factors like data centrality, solutionism, pro-business bias, and intralocal competition are enacted and reinforced through the stories created around and about smart city projects, while molded to fit the local context and environment. Further, this review shed light on pathways of policy mobility associated with smart initiatives, mobility facilitated through partnership arrangements and the boosterism that frequently adjoins these projects. My approach to this review, which is not a complete discourse analysis, was informed by the work of Gubrium and Holstein (2008), who note that:

> concern with the production, distribution and circulation of stories in society requires that we step outside of narrative material and consider questions such as who produces particular kinds of stories, where are they likely to be encountered, what are their consequences, under what circumstances are particular narratives more or less accountable, what interests publicize them, how do they gain popularity, and how are they challenged. (p. 19)

Thus in reviewing smart project narratives, I have looked at who creates them, what story themes, or messaging, are common within them, how they are shared and disseminated, how they engage their intended audience, how they are used and how they are countered. Where relevant, I compare smart project narratives with messaging from IBM's Smarter Cities strategy and approaches and the assumptions of smart to: (a) demonstrate how smart is being recreated around the local context; (b) shed light on how those involved in these initiatives are assigning meaning to them; and (c) ascertain how IBM may be informing these processes of recreation and meaning. To do so, I examined a range of narratives created by actors involved in smart endeavors—ranging from interviews (with me, with IBM, or recorded on

YouTube or in print), project documents, media coverage and materials created by involved actors, including that developed by IBM, the local government and other third party relevant actors. I viewed this narrative activity as a sense-making process (Ochs and Capps, 2001, p. 15). It is important to note that my intent was not to conduct a complete discourse analysis for this research, for I do not examine the structure of narratives or employ methods of analysis typical to cultural or linguistic studies (Hyvärinen 2008). A list of the materials used for this review can be found in Appendix 11.5.

For the narrative review for the Dubuque case study, in addition to examining interviews conducted with IBM staff, smart project participants, the local government, and other third party actors involved in implementation, I reviewed materials created by those involved in smart project design and implementation—the local government, IBM and the quasi-governmental and private sector actors who aided in promoting these endeavors. In addition, I examined local, national and international media coverage. Of these I used fifty-four items as empirical data to inform my analysis; those not used did not directly relate to or inform my findings. Figure 9 details the sources of the materials examined.

Figure 9. Dubuque smart project materials used to inform narrative review

Author / Creator	**# of documents / materials**
Local Government	17
IBM	8
Media	19
IBM and local government	1
Third party actors involved in projects	9
Total	**54**

For the Portland case study narrative review, in addition to examining interviews that I conducted with IBM staff, project staff, involved third parties and the local government, I analyzed IBM and local government project documents, reports and PowerPoint presentations; the local government's website pages; materials created by third party actors involved in design and implementation; and local and national media coverage. Of these I used twenty-two items as empirical data to inform my analysis—less than half of what I used in Dubuque, primarily due to the fact that the local government and IBM did not produce as many materials to discuss or promote the smart efforts in Portland. Figure 10 details the sources of the materials reviewed for the Portland narrative review. Findings from my examination of this empirical data for the narrative review have been incorporated into the Dubuque and Portland chapters.

Figure 10. Portland smart project materials used to inform narrative review

Author / Creator	**# of documents**
Local Government	0
IBM	9
Media	13
IBM and local government	0
Third party actors involved in projects	0
Total	**22**

As this work developed, I realized that IBM, due to my inside observer status at this organization, in effect became a third case study. Throughout my research, I worked for IBM on its Smarter Cities campaign to some degree for several years while conducting this work. Given this role, I had insider status (Spradley, 1980, p. 61) to a major IT provider within the smart city market—a factor that provided me with access that has not been afforded to many others examining the smart city trend. While this insider status was a boon for gleaning insight into this actor, this also complicated my analysis, for I sat inside the object that I was trying to understand, making distancing myself from the topic and actor difficult at times—a risk and limitation that I elaborate on further below.

3.4 An Inside Observer

It is important to note that throughout the period of my doctoral research, I was fully employed by IBM, who funded this degree through their continuing education program, which is available on a scholarship basis to all full-time employees. Despite this sponsorship however, I am not required to show any of my research or writing conducted for this degree to any actor within the company. The idea for pursuing my PhD stemmed from a project that I worked on right after the Smarter Cities campaign was announced in early 2009. I was tasked to examine urban indicators to help ascertain typical city priorities and areas in which smart projects might be applied—i.e., to help define what being ‘smart’ might mean in the urban context. Through this exercise, it became clear to me that although IBM is an organization highly steeped in technological expertise such as engineering, IT and mathematics, numerous staff initially working on this initiative seemed to lack an understanding of what they called “human systems”, or people and the communities in which they live. Given my anthropological and social sciences background, my interest was piqued into how IT specialists and engineers conceived local government, urban environments and the social systems that buttress each of these. It is from this context that my research emerged.

My placement within IBM, where I have sporadically worked on various aspects of its Smarter Cities campaign, has provided both opportunity and challenges due to this positioning. My involvement with IBM has informed everything about this work—including the selection of my research topic, how I conceptualized and approached this investigation, and how all those with whom I interacted responded and shared information with me due to this affiliation. In fact, my first understanding of the ‘smart city’ came from IBM’s tech provider perspective. My role within IBM also affected my research. Since I work within IBM’s Corporate Marketing & Communications (M&C) department, many of my colleagues have contributed to the development of IBM’s Smarter Cities narratives and brand. This M&C perspective of the Smarter Cities campaign varies from how it is perceived in other divisions working on this campaign, such as, for example, Software Group or Global Business Services (a notion explored further in Chapter 5). Thus, this investigation has been an exercise in “insider anthropology” (Cerroni-Long, 2009), for I came to study the smart city in a situation where I was already an ordinary participant (Spradley, 1980, p. 61). By employing this approach I have been able to directly observe how the Smarter Cities campaign has emerged and transformed over the years of my research, and how actors within IBM have represented and reproduced the perspectives, models and approaches encapsulated within this campaign.

During my research, I have worked on a range of efforts that support IBM’s Smarter Cities initiative and its expansion, thereby giving me access to a wealth of Smarter Cities staff, materials and resources most likely not available to those outside of the company. This support has included identifying performance indicators to help measure Smarter Cities outputs and outcomes related to urban ‘quality of life’ (2009-2010) and developing Smarter Planet educational modules on leadership skills and capabilities that aid in smart project implementation (2011-2012). Additionally, I have worked on promoting IBM’s Smarter Cities initiative within and external to the company (2013-2015). Internally, I led the development of a massive open online course that is geared toward educating all 420,000+ IBM staff on the company’s Smarter Cities point of view and solutions. The objective of the massive open online course is to help staff better represent IBM to clients on the topic of Smarter Cities in terms of, from IBM’s perspective, what it means to be a smart city, why being a smart city is desirable, and what local governments need to do (i.e., the solutions it needs to implement) to become a smart city. Externally, I worked with the IBM Smarter Cities marketing team and Ogilvy and Mather (an advertising, marketing and public relations agency) to create a social community for city leaders from around the world, with the goal of helping members better understand how the growing prevalence of data and analytics across city systems is affecting city leader roles, services and services provision. The community’s website featured articles and case studies on smart city projects that I helped create, and offered a series of virtual roundtables on topics thought to be of interest to city leaders (e.g. crowdfunding, policy advocacy). The purpose of this endeavor was to help city leaders become more comfortable with data and analytics, and therefore more apt to become a buyer of IBM solutions and / or services.

Both of these marketing efforts have provided me with insight into the ways in which IBM marketing is globally informing city aspirations and models for growth and development as local governments adopt or are influenced by IBM Smarter Cities narratives and solutions. In effect, I reside inside of IBM’s powerful marketing machine and can see how its vision is cascading to cities around the world through blogs, press releases, conferences, events, white papers, websites, commercials, ads, tweets, Facebook postings, LinkedIn discussions, etc. Centrally orchestrated narratives on what it means to be a smart city—which is created by marketing staff, not urban experts or professionals—is globally disseminated daily, spreading to cities, local governments and city residents near and far.

Finally, I also served as the technical lead to the Smarter Cities Challenge team in Sendai, Japan to assist the local government in developing consultation strategy and plan recommendations for the relocation of affected groups after the 2011 Tohoku earthquake and tsunami. All of the above efforts that I have supported have been undertaken by IBM to indirectly or directly support the sale of Smarter Cities solutions, offerings and services. These Smarter Cities related roles that I have held within IBM have required interactions with relevant staff across IBM divisions, such as Marketing & Communications, Research, Software Group (SWG), Global Business Services (GBS) and Sales & Development (S&D), and with existing and prospective local government clients, enabling me insight into the interactions between these actors. Thus, my positioning has been strategic, and informative, in terms of exploring how IBM and its Smarter Cities initiative are interacting with urban governance. And, it has provided me with distinctive insight into the emergence and evolution of IBM's Smarter Cities campaign, and all of the research, marketing, solutions and offerings around it, among others. Yet, despite the advantages to this positioning, I also recognize the risks and limitations it poses.

3.4.1 Risks and Limitations

While the goal of qualitative research is to diligently work to minimize the effect or influence of the researcher, the researcher is in fact always part of the process (Kvale, 1996; Mishler, 1986). In this vein, the main ethical concern associated with my research has been the potential bias due to my relationship with IBM. I openly acknowledge that my positioning within the research field has shaped my field of study—in terms of the nature of my research, how I access and view the field, how I conceive the topic and the kinds of questions that I pose in relation to it. Further, due to my relationship all those with whom I interacted within this research knew of my affiliation, and therefore their responses to and interactions with me have been shaped by this affiliation. In particular, case study interviewees' responses have potentially been stinted, and most certainly informed, by my status as an IBMer—particularly within Dubuque, where the local government's relationship with the city is held with high regard and importance. Therefore, this entire research—the formulation of my work; my perspective, conceptualization and approach; interviews and interactions around this examination; and my understanding of observations and findings—has been influenced and shaped by my insider status. Throughout this entire process I have been unable to step outside of the primary IT provider actor that I examined.

Additionally, my positioning within the private sector has posed other challenges besides adding potential bias. While conducting this work, I have been repeatedly challenged by the shifts between the language, mindsets and paradigms of academia and those of the private sector, which can sometimes be fraught with corporate sloganeering and marketing ploys—traps that at times I would find myself ensnared. Working within the private sector has meant that I have had to critically distance myself from the perspectives, approaches and models used by these actors—an exercise that proved challenging throughout this research. Hence, to help mitigate the limitations posed by my affiliation with IBM, I have used outside reviewers from time to time who can objectively examine my work to help address any bias that may have emerged. I have also done my best to revise my own work reflexively in view of my positioning, to the extent possible. My seven years of experience as a social scientist with the World Bank, where I worked previous to IBM, helped ground me through this process. Despite these measures, it was impossible within this investigation to fully divorce myself from the perspective, understandings and interactions that my positioning within IBM brings.

4 IT Provider Interactions with Urban Governance around Smart

In Chapter 2, I introduced my analytical framework, developed to help understand how IT providers interact with local policy and planning processes through smart projects. This framework focuses on interactions around: (a) *strategy*, i.e., project objectives and how to prioritize and achieve them; (b) *engagement*, or involved actors, the roles they play, and their interactions with and expectations of each other; and (c) *representation*, or how the local government portrays the project through narrative and brand. In this chapter, I begin to address my research questions by exploring relevant conceptual theory and looking at the perspectives and approaches that IT providers bring to these three areas of interaction via smart projects. As noted in Chapter 2, to open the aperture of analysis, I view urban governance as not just elected officials and formal structures of government, but rather a "broader coalition of forces within which urban government and administration have only a facilitative and coordinating role to play" (Harvey, 1989a, p. 6).

Below, I start by exploring debates and concepts related to IT provider interaction around strategy, examining how the strategies of smart projects, due to their nature and design, may lead to an increasing emphasis on the importance of data and a solutionist approach to city planning and management. Building on this discussion, I outline ways in which smart projects, through IT provider interaction, may transform governance arrangements, thereby renegotiating the relationships between the local government, IT providers and city residents. For, as designed by IT providers, smart projects insert tech companies into local government-city resident relationships, where they act as an intermediary between the two, resulting in shifting responsibilities and expectations between and among these actors.

Another factor influencing tech provider interactions is the vision that these actors hold for local governments and how they function. I elaborate on this vision below, where government exists as a facilitator for other actors that are responsible for city services provision. This envisioned redesign of urban governance is shaped and informed by the narratives and brands created around smart initiatives, often building upon messaging from IT providers. For this reason, I end this chapter with a discussion on the power of the concept of smart, how this is conveyed through smart narratives, and how local governments are increasingly turning to smart projects as a brand ‘fix’ for their cities in a bid to make their city more competitive. The purpose of this chapter is to begin exploration of my research questions through the lens of my analytical framework and to identify the key issues and debates that will guide my case study analysis in Chapters 6-9.

4.1 Smart as a Lens for Strategy and Approach

In this section, I begin to explore my research question on how are smart projects interact with local government city objectives, priorities and approaches, and what may be the implications of this interaction. As discussed in Chapter 2, smart city projects by IT provider design encourage local governments to function more like a business, reinforcing and accentuating urban entrepreneurial management practices (Hollands, 2008). These projects typically are framed by strategies—i.e. objectives, priorities and the approaches to go about achieving them—that are more akin to something you would find in the private sector. Unsurprisingly, the aims of smart projects frequently align with the assumptions associated with the concept of smart.

In my analysis, I identified three key areas of potential influence from IT provider interaction around smart project strategy: a focus on data, approach to achieve project objectives and changes in required government staff capabilities. I observed that no matter the specific project objectives or priorities chosen, when IT providers interact with local governments around smart project strategy, data and analytics will be at the project’s core. Thus, leading to data centrality within the efforts and data as a central aspect of strategy. Additionally, the professed approach to achieve the selected objectives and priorities will emulate the models, frameworks and approaches of IT providers. Together, these shifts—of focusing on data and utilizing IT provider frameworks and approaches—may translate into a new focus on the skills and capabilities of city officials that do not sit within the IT department.

4.1.1 Data Centrality

Data and analytics are the cornerstone of smart projects. By design, these projects are entirely reliant upon the ability to gather and analyze data, for together these purportedly enable local governments to "do more with less" (Shelton et al., 2014, p. 3), to "optimize through code" (Söderström et al., 2014, p. 17). With this focus come by-products that are not readily recognized—namely, how the increased emphasis on data and analytics may affect the local governments' goals and how to go about achieving them. With the rising prevalence of smart technologies, the amount of data generated on the city and its systems is growing exponentially; as is the emphasis that is being placed on the importance of data and the technologies that gather and analyze it (Mattern, 2013). As described by IBM, this shift to the digital era cannot be ignored by public sector leaders:

> We are currently witnessing a new wave of technological advancement that promises to radically transform how value is created and consumed within the global economy. The integration and convergence of technologies such as Cloud, Big Data, Analytics, Mobile and Social Collaboration, has been called "The 4th industrial revolution", credited with enabling organizations to be more intelligent, more agile, better able to scale their operations, optimize supply chains, shift to new business models or even create new industries with unprecedented speed. (IBM, 2015a)

From this IT provider perspective, data are, in a sense, a new commodity that is ripe for the picking of public sector leaders that have the vision to create systems that can harness and utilize this new power; power that unsurprisingly IBM posits can only be obtained through the solutions and services offered by them (IBM, 2014d, 2014i, 2014j, 2015; IDC, 2009). In this manner, IBM staff are attempting to put IBM at the center of all activity and engines related to economic growth. For, according to IBM in this excerpt, the only path to growth comes from data—a resource that will remain untapped and unharnessed without IBM's solutions and expertise. This perspective has implications for how urban challenges are interpreted and understood, as well as for the type of local government staff hired or appointed. I explore these implications below.

4.1.2 Solutionism

With this emphasis on data, as smart projects spread, there is a rising deference to technocratic approaches where decision making is purportedly ‘evidenced-based’ as described by tech providers (Söderström et al., 2014; Vanolo, 2013), which attempt to fit data to their needs. As stated by IBM on its Smarter Cities website, local governments are “moving beyond policy-based decisions to reshape cities with insights gained from data” (IBM in Vanolo, 2013, p. 8). While urban professionals have informed decision making with city data for ages—considering factors such as population, commerce, trade, demographics, land use, mobility patterns, utility usage and other forms of resource consumption, among others—the integration of real-time data, and the amounts of data being generated and analyzed, is new (Kitchin, 2014b; Kitchin et al., 2015). This swell in data, longitudinal and real time, along with various enabling and driving technologies, is changing the way that governments make decisions about policy and resource allocation as data are more frequently being weighted along with other factors, such as social and / or political agendas (Kitchin, 2014b; Urban Systems Symposium, 2011). As noted by Kitchin et al. (2015), in this “narrowly conceived but powerful realist epistemology” of the smart city, urban environments are perceived as “visualized facts”; a trend that is reshaping “how managers and citizens come to know and govern cities” (p. 6). Purported better information derived from increased data and analytics is assumed to drive better governance, decision making and resource allocation (Wiig, 2015). Conceived in this fashion, the smart city cannot be attained without data (Kitchin et al., 2015), for data act “as a kind of master signifier or obligatory passage point (Callon, 1986) through which all other functions must position themselves” (Shelton et al., 2014, p. 3).

This proclivity for technocratic rationalization / ‘evidenced-based’ decision making is underpinned by the (faulty) assumption that data emerging from smart technologies are neutral. However, “technology of any kind is never neutral; it has the potential and capacity to be used socially and politically for quite different purposes” (R. Williams 1983 in Hollands, 2008, p. 315). As positioned by IT providers, data represent reality (Mattern, 2013). Yet the veracity of data can be affected by what data are collected, how and how often they are collected, the method of collection, and by whom and from whom they are collected. That is also assuming that the local government is actually collecting the data it needs to collect and that it is relaying the data in a way that is visually understood—for visualizations, without proper explanation, can easily be misunderstood as well (Shelton et al., 2014; Urban Systems Symposium, 2011). “While data-driven analyses tend to emphasize their objectivity, accuracy and neutrality, it is important to keep in mind that data are socially constructed, and different forms of data allow for competing representations of place” (Shelton et al., 2014, p. 6). Data are situated spatially and temporally during collection and production, and thus carries the biases of its creators. On top of this, the policy outcomes of data-driven decision making will be shaped by the forms of data used, whether quantitative, qualitative, visual or geographic information system (GIS)-related (Shelton el al., 2014).

Data can also be unreliable. For instance a student can be mathematically gifted, but due to a lack of aptitude for test taking, appear to be behind his / her classmates. The teacher may know through day to day interactions that the student is gifted, but to those evaluating class progress, data will skew in the opposite direction. While this discrepancy is also in and of itself data, this does not easily transfer into quantifiable information, and thus, would most likely be overlooked by typical smart city solutions (Sterett, 2016). Data can also be unreliable due pressures that may result to alter the data, where actors manipulate the data to avoid punitive actions or recourse due to data usage—for example, policemen not reporting minor crimes to make it look like crime rates are lowering within their districts (Townsend, 2013, p. 210). A lack of standardization of data tracking and indicators across silos within the city adds to this complexity, making interoperability of data sets, transparency and extraction of insight difficult (Ford Foundation et al., 2014). Thus, data might have to be cleaned or altered before it can be combined or compared with other data sets if the units of measurement are not comparable, drastically diminishing the utility of the data. While the use of application program interface (APIs) can assist with this process, it is not automatic and as seamless as presented by tech providers.

What is not mentioned in IT provider narratives about the promise of data and analytics is the messiness of big data and the time and cost that is often involved in cleaning data and data sets so that they are useful. As noted by a Susan Sterett, Director of the Metropolitan Institute at the Virginia Polytechnic Institute and State University, in a roundtable on the National Science Foundation's Big Data efforts held in March 2016 in Washington, D.C., "big data is expensive… a lot of big data work is janitorial, it is cost and time consuming to clean and prep data so that it is useful" (Sterett, 2016). While this is no different than most scientific work, which requires substantial data cleaning, it does mean that the promise of big data may not be as readily realized as some hope (Sterett, 2016). As noted by Kitchin (2014b), big data does have limitations, for it generally captures:

> what is easy to ensnare—data that are openly expressed (what is typed, swiped, scanned, sensed; people's actions and behaviours; the movement of things)—as well as data that are the 'exhaust', a by-product, of the primary task / output. It takes these data at face-value, despite the fact that they may not have been designed to answer specific questions and the data produced might be messy, dirty, full of occlusions and biases. It is less well suited to contextualising such data or revealing the complex contingent and relational inner lifeworlds of people and places. (Kitchin, 2014b, p. 9)

Thus, despite the tech provider promises about the solutions and opportunities hidden within big data, there are clearly constraints to the types of information big data is able to provide and flaws hidden within what it is actually able to relay. Finally, with this focus on data, there could be a tendency for local government to begin to manage only those things that they can measure (Bell, 2011). As a consequence of the "presumption that all meaningful flows of activity can be sensed and measured, is taking us toward a future in which the people shaping our cities and their policies rarely have the opportunity to consider the nature of our stickiest urban problems and the kind of questions they raise" (Mattern, 2013). Things raised as problems by the smart system may not even be problems at all; clogs such as the inefficiency of parent-teacher conferences, which tax teachers' time and have difficult to measure outcomes. These tendencies point solutionism—which, as described by Evgeny Morozov, recasts "complex social situations either as neatly defined problems with a definite, computable solutions or as transparent and self-evident processes that can be easily optimized—if only the right algorithms are in place!" (Morozov, 2013, p. 9 in Mattern, 2013). While this computational vision of the city is not entirely new (Mumford, 1961 and Donald, 1999 in Mattern, 2013), what is novel is the reduction of cities to the automated functions of data-generating, collecting and analyzing, and the reification of the data produced. With this logic, all you need is the ‘right’ data set and the ‘right’ algorithms to solve any city problem (Mattern, 2013). All urban challenges, within the simplistic smart city frame, are reduced to engineering problems that can be resolved through quantitative analysis enabled by measurement (Bell, 2011).

As this discussion highlights, smart city initiatives, as envisioned by tech providers, are said to, in some way shape or form, improve city operations and services by better understanding performance and enhancing decision making. Yet, what is unsaid within tech provider narratives of smart projects is that there are methodological and technical issues that may skew data, analysis and understanding (Kitchin et al., 2015); and that these initiatives can be costly and labor intensive. As another offshoot to this data centrality, city officials are increasingly expected to be well versed in the data gathering and analysis that is enabled through smart technologies, including those who sit outside of IT and technology-related offices.

4.1.3 Changing Capabilities and Staff

In this move to data centrality and the rise of big data—i.e., a vast increase in data streams and variability where data are so large and complex that traditional analytics are inadequate—it is generally assumed that government actors will know how to sift through this data, turn it into ‘intelligence’ through advanced analytics, and know how to use this information to allocate resources and inform decision making based on evidence derived from the data. While many urban professionals have been working with data and analytics for decades, responsibilities for associated big data and analytics tasks are being passed along to departments and positions not typically used to these types of functions. In some cases, especially in smaller or less well-funded urban environments, there is a “divide in skill levels between civil servants and employees in the private sector, causing government employees to lag behind in terms of their full participation in the smart city” (Ford Foundation et al., 2014, p. 4). As noted by Gil ElBaz, Chief Executive Officer (CEO) and Founder of Factual, an open data platform developed to maximize data accuracy, transparency, and accessibility that was launched in 2009, “the technical skills required for the management and processing of large data sets are also complex and time consuming… This puts civil servants, nonprofits, and urban residents at a considerable disadvantage” (ElBaz in Ford Foundation et al., 2014, p. 5). A disadvantage not necessarily because the skills cannot be gleaned or learned, but rather that these are expected to be added on top of existing roles and functions, especially in smaller cities with more constrained budgets and smaller staffs.

Further, as cities more frequently employ smart technologies, and as ‘evidence-based’ decision making increasingly influences resource allocation and policy, more and more local governments feel compelled to create new roles to support these practices and processes. As an example of this trend, cities across the United States are adding new roles to local government administration—such as Chief Information Officers (CIOs), Chief Technology Officers (CTOs), and Chief Data Officers (CDOs) in cities like New York City, Chicago and San Francisco—to help better capture and analyze data that can be used to inform decision making and policy processes (Byers, 2011; Diversity/Careers, 2010; Foley, 2010; Shelton et al., 2014; W. Wong, 2011). These staff bring in qualifications “more commonly found in technology startups, such as computer programming and data analytics” (Shelton et al., 2014, pp. 4-5).

For political reasons, no city will rely upon data alone to inform decision making and policy formation. However, as the reliance upon data to inform these processes increases, it also raises questions about the potential social impact for city residents (Urban Systems Symposium, 2011). How will the reliance upon data affect the way that the local government governs? How might it affect resource allocation and policy, and what will be the significance of this especially since data derived in smart projects is frequently divorced from context? How might this data-driven approach to urban governance affect social and welfare issues or minority concerns within city strategy? How will the notion of optimization and efficiency, as relayed via data, affect the human and organic aspects of city life? And, if something cannot be measured, will it not be considered of value?

4.2 Smart as a Framework, Reason and Tool for Engaging

In this section, I begin to examine my second research question by looking into how tech providers may inform engagement around smart projects. Below I explore the roles and expectations of local government and city residents in these initiatives, how these may be shifting within these endeavors, and how IT providers may be involved in this transformation. As outlined in Chapter 2, within my research I use engagement to refer to the governance arrangements around smart projects, which includes involved actors, the roles they play, and their interactions with and expectations of each other. Typically within smart projects this engagement takes place within the structure of a public-private partnership, and includes the involvement of citizens, actors frequently deemed critical for smart project 'success'. Within these governance arrangements, IT providers envision change. As described in an interview that I conducted with a smart city expert at Cisco, by design, smart projects are "ushering in a new way of governance and connecting stakeholders. They are not about new technologies, rather they are changing and informing local government relationships and interactions because of the technologies introduced". In this sense, from the IT provider perspective, smart projects offer a framework, reason and tool for engaging various actors within the city.

4.2.1 Renegotiation of Relationships

Smart projects are most often initiated by local government leaders or decision makers, such as mayors, city councils, city managers, city chief information officers, municipal corporations and / or finance committees. These actors may also become involved in "mobilizing particular policy interventions and exporting them to other localities" (Shelton et al. 2014: 4), which can be seen in cities like Boston, London, Melbourne and Singapore. Central to the implementation of these projects are IT providers, for they typically supply the appropriate infrastructure to make city systems smart.[23] For projects related to a city's infrastructure, utility companies,

[23] ICT providers include, among others, IBM, Cisco, Hewlett Packard, Siemens, Microsoft and Vodafone.

regulatory boards, and / or other related organizations are involved, as well as developers, architects, engineers and construction companies[24] (Bevan and Briody, 2009; Elfrink, 2009; IBM, 2009a; Lohr, 2009b). Critical thinking around smart technologies and their deployment has been informed by industry and professional groups, nongovernmental organizations, advocacy groups and educational institutions.[25] City residents also play a role—acting as partners, beneficiaries, consumers, sensors, developers (creating applications to share and help understand data), or in more uncommon cases, analysts or planners. Each of these actors involved in smart projects have a different vision of what this means—in some cases, even within the same organization interests and intent also vary (Kitchin, 2014a).

The responsibilities, capabilities and power of these relevant actors are distributed asymmetrically within smart projects, as some of these actors hold more sway over the design, production, implementation and operation of smart initiatives. Often these arrangements are fluid, with some actors (e.g. tech providers) making decisions or taking the lead at one point during the project, then deferring to others at another point in the project. To oversee the design, management and implementation of these endeavors, formal and / or informal governance arrangements and partnerships are established between and among the range of actors (Hollands, 2008; McNeil, 2014). To some extent, these arrangements are dictated by the smart technologies involved, and in turn, the shape of these governance arrangements affect involved technologies (as well as which technologies may not be involved) (Akrich, 1992; Bijker and Law, 1992; Law and Callon, 1992). Below I briefly explore how relationships within the city are being renegotiated through smart projects, with a focus on local government, technology providers and city residents. For each of these actors I provide a brief

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[24] Examples of utility companies and other related organizations that have been part of a smart project include, among others: Veolia Environment, Pacific Gas & Electric, Baltimore Gas & Electric, and GDF Suez. Arup, Bouygues Construction, CH2MHill and Jones Lang LaSalle are some examples of developers, architects, engineers and construction companies involved in smart city projects.

[25] Examples of industry and professional groups include, among others Code for America, the International Telecommunication Union, International Society of City and Regional Planners and Urban & Regional Information Systems Association. Nongovernmental organizations and advocacy groups include, among others, Global Cities Dialogue, UN-Habitat, the Global Mayors Forum, Urban Age and the Urban Land Institute. Relevant philanthropic organizations include the Knight Foundation and Bloomberg Philanthropies. Educational institutions such as the Bartlett Faculty of the Built Environment, Imperial College London and Massachusetts Institute of Technology (MIT), have also contributed to the examination of smart cities.

overview of their interests, the challenges they may face in regards to these projects, and how smart initiatives may shift the ways in which they engage with each other.

Local Government Regulators

Local governments are often initiators of smart efforts within cities, spurred by a variety of reasons, some proclaimed, some not. In general, local government actors seek to integrate smart technologies with city systems or services in hopes of, among others: (a) improving their understanding of city operations, functioning and resource consumption (Hollands, 2008; Miller, 2013; Townsend, 2013, pp. 16, 39, 41); (b) promoting, and potentially furthering, environmental and economic sustainability agendas (Hollands, 2008; Miller, 2013); (c) encouraging business development and the attraction / retention of talent (especially within the ICT and ICT-related sectors) and making the city more globally competitive (Begg, 2002; Coe el al., 2000); (d) increasing political visibility and / or chances of re-election; (e) leaving a legacy or footprint before exiting office; (f) enhancing city image and brand (Hollands, 2008); or (g) creating a distraction from other areas of city affairs that may not be considered successful or attractive (Harvey, 1989a). And, local governments seem to pursue smart efforts for several of these reasons, rather than having one as a singular goal. Many local governments seem to support the smart city concept—in the words of Kitchin (2014a), "municipal and national governments, along with supra-national states, such as the European Union, positively endorse the smart city concept as the path to socio-economic progress and more livable, secure, functional, competitive and sustainable cities" (p. 2). Despite local government attraction to the smart city and all that its IT provider enablers proclaim, there are difficulties associated with implementing smart efforts from a local government perspective that span across a range of financial, political, organizational, structural and ethical complexities.

Smart projects often involve a large, up-front investment to which local governments often do not have ready access, as well as additional necessary funding for operations, repair and maintenance. On top of that, returns are seen, if at all, in the long term, quite possibly after any political payoff may result for the leaders who championed these efforts. Hence, these types of initiatives can be risky for any political official given the short duration of political terms and the length of the smart project cycle. No political official wants to be seen as supporting questionable or controversial projects during election periods (Berger, 2011; Farais, 2010; Graham and Thrift, 2007). There are also variances of (political) risk associated with these projects. The private sector can have a vision of making a city smart and fail, while the public sector cannot do so without dire political consequences resulting in losing an election and / or harming citizen trust in and relationships with local government. Thus the risks for adopting smart technologies are inherently higher for the public sector than the private sector (Gandy, 2004; Graham and Marvin, 2001, pp. 97-98). Further, smart projects, through their high levels of involvement with the private sector, tend to be more speculative in nature, and in some cases "capital infrastructure [has been] increasingly used as leverage for other financial activities" (Gandy, 2004, p. 370). Thus capital assets, such as infrastructure systems, are becoming closely linked to new forms of economic development for the city—further shifting local governments into more entrepreneurial, and risky, governance models.

In addition, smart projects are complex projects that can span across organizational boundaries and departments, complicating procurement, management and performance measurement processes. Depending on city size, jurisdictional issues may also pose problems, as a city may have to work across many different geographic and political boundaries—borough, county, municipal and neighborhood to name a few. On top of that, there is a disconnect in the way that many IT providers view making cities smart, with a focus on holistically viewing systems and systems' issues—a perspective that does not map well to government institutions (Grossman, 2011). In part it is for these reasons that smart discourse often alludes to the changes that must take place with government and governance as cities become smarter (Hollands, 2008), where these institutions and their processes must become more politically efficient (Eger, 1997, 2003).

Finally, there are various ethical concerns for city leaders: "as advocates tout technology as the answer to various societal ills, we should take a step back and examine critically what this means for democracy, equity and social justice"

(Franklin D. Gilliam, Jr. the Dean of the University of California Los Angeles Luskin School of Public Affairs in Ford Foundation et al., 2014). The restructuring of urban infrastructure systems from integration with smart technologies will also reorganize urban forms and landscapes (Graham and Marvin, 2001, p. 15). As discussed in Chapter 2, these changes may contribute to fragmentation and socioeconomic and technical divides within urban environments, leading to more exclusion and alienation within cities (Castells, 1996).

Despite these challenges and risks, smart projects remain alluring for local governments that are enticed by the tech provider solutions that can purportedly help tackle any urban woe (Hollands, 2008). And, as municipal leaders increasingly adopt smart projects, they will increasingly engage more with and rely upon tech providers to help address city challenges—further inserting these actors into urban governance processes. Based on the way that smart projects are designed by the IT provider, this has the potential to shape engagement between the local government and city residents.

IT Providers

For IT providers, smart means big business. These actors are central to providing resources and services for these projects, affecting design, implementation, management, maintenance and operations. Forrester Research estimates that by 2017 smart computing technologies will represent about half of spending on IT equipment and software in the United States (in Bartels, 2009). Harbor Research estimates that Internet-enabled devices will net more than $10 billion worldwide in 2014, more than double in growth from 2009 (in Bartels, 2009). Demand for wireless sensors is also growing exponentially—according to ABI Research, in 2009 10 million radio chips for such sensors were sold, which is estimated to rise to 645 million by 2015 (in Bartels, 2009). Additionally, there will be an increased need for storage; IDC estimated that the capacity shipped increased by fifty percent in 2010. Demand for analytics programs is expected to grow from $25.5 billion in 2010 to $34 billion in 2014, according to IDC (in Bartels, 2009). Finally, there will also be growth in software and the platforms needed to integrate the data streams from all kinds of sensors.

This rapid market expansion for the technologies required for smart projects has led to a rush to fill the space by a wide array of IT and ICT providers, among other private sector actors (The Economist, 2010b). While these actors present their smart city solutions as being pragmatic, apolitical and city and citizen-oriented, it is clear that below this rhetoric are “vested interests pushing for the adoption of market-led and technological solutions to city administration, while at the same time seeking deregulation, privatization and more open economics that weakens oversight and enable more efficient capital accumulation” (Kitchin, 2014a, p. 2). Alongside IBM’s Smarter Cities campaign launch, numerous others tech companies have clamored to get into the smart city market, each focusing on their individual firm’s strengths.

As the biggest maker of networking gear, Cisco is another smart city tech provider with its Smart+Connected Communities. Focusing on networking capabilities, their approach aims to bring together people, services, community assets, and information to form a single solution (Cisco, 2010, p. 2). The hardware leader Hewlett-Packard (HP) aims to create a Central Nervous System for the Earth (CeNSE) by building an infrastructure for the Internet of Things. Their CeNSE research and development program aims to build a global sensing network with billions of “tiny, cheap, tough and exquisitely sensitive detectors” (MacManus, 2009). Meanwhile, Siemens and its competitor General Electric (GE) are focusing on smart systems within certain industries, such as health care and manufacturing, as well as within energy. Siemens aims to bring “knowledge to power”, with smart grid technologies for the entire energy supply chain (Siemens, 2010). While GE’s Ecoimagination initiative addresses concerns for the home, alternative energy, smart meters and CO2 emissions (General Electric, 2011). Microsoft has also made the foray into smart city territory by applying its enterprise resource planning system and cloud computing to urban environments, under their premise that “building smarter cities goes hand-in-hand with using resources more effectively” (Microsoft, 2012). These are but of few of the tech providers rushing in to create and fill this market. Additionally engineering, design and architecture firms, among others, are also attempting to acquire the requisite skills and abilities for assisting local governments with smart technology adoption. In their efforts to grow this business, these actors have helped make and inform the smart city market, while giving "institutional definition to a previously diffuse set of commercial and research practices. In particular, the rise of firms such as Siemens, Cisco and IBM (the electrician, plumber and planner of the smart city, as Townsend [2013] neatly puts it) have together formed a powerful coalition of corporate voices proclaiming the significance of smart cities" (McNeil, 2014, p. 10).

While these actors work together to make the smart city market, challenges for IBM and other IT providers are, and will continue to be, the intense competition growing within this market, identifying willing and able clients, and making a profit given constrained economic times. Additionally, IT providers face the immense difficulty of actually making these smart technologies work (McNeill, 2014). In addition to the wide array of complexities surrounding their implementation at a multi-system levels within cities, IT providers also have to contend with the legacy systems that often hinder the interoperability required for data exchange, and the antiquated, and in some cases undocumented, urban infrastructure systems that can date back over a century (The Economist, 2010b, 2010d; Townsend, 2013, pp. 252-280). Further, for most tech giants, working with local government is a foray into new territory, translating into a very sharp learning curve. On top of this, many IT providers are required to collaborate with non-traditional partners, across a range of industries, and with numbers of partners to which they are not accustomed to working. In some cases, new partners may also be competitors in the city next door (The Economist, 2010b, 2010d). Hence, this creates a very tricky landscape to navigate that can potentially complicate how these already challenging efforts are implemented (McNeill, 2014), how they are priced and financed, and how 'effective' they may end up being. Regardless of these challenges, across almost all smart projects the relationships between local government and city residents within smart projects are strongly mediated by corporate actors, not only in terms of how government agencies innovate and implement policy, but also in terms of how city residents are constituted as civic actors (Cohen, 2001; Livingstone et al., 2007; Rose, 1999, p. 164).

City Resident Users

In many cases, local governments state that city residents are the primary beneficiaries of smart endeavors. City residents typically use the services provided by smart city systems, and in some way or form, also fund them through taxes or rate increases (Gross, 2010; Leeds, 2010; Vadari, 2010; Zifcak, 2010). In addition to being the stated beneficiaries, city residents can be engaged in smart projects in various ways, including, among others: (a) providing input and feedback on the systems or services integrated with smart technologies, or on a related urban planning process; (b) acting as application developers when local governments provide open source data created by smart systems; and / or (c) serving as sensors, with citizens willingly entering, or unknowingly contributing to, data that will help the smart infrastructure systems to better function (Grossman, 2011; New York City, 2007; O'Neil, 2010). While the envisioned future for city residents is, as depicted by IT technology providers, one of increased leisure, resources, simplicity and overall high quality of life (Cisco, 2010; IBM, 2009a, 2011a; MacManus, 2009; Siemens, 2010), there are many potential adverse impacts that may affect city residents, such as exclusion, lack of access, social control and increased financial and behavioral responsibility for community well-being (Graham and Marvin, 2001, pp. 158-159, 263-264, 384; Hollands, 2008). In terms of the latter, smart projects can be designed to greatly facilitate this shift in responsibility.

As described by Suzan Ilcan and Tanya Basok (2004), "The task of government today is no longer engaged in traditional planning but is more involved in enabling, inspiring and assisting citizens to take responsibility for social problems in their communities, and formulating appropriate orientations and rationalities for their actions" (p. 132). With this trend, as the interrelations between politics, civic organizations and the economy have changed, the distinction between citizen and consumer has dissolved. Consequently, citizenship increasingly has been redefined in relation to a consumer's right to participate in the marketplace, where through choices around consumption, citizens can affect positive social change (Beck, 2005, p. 170; Glickman, 1999, pp. 1-16; McGovern, 1998). Instead of 'good' citizens being those who actively participate in civic affairs, citizens can contribute through their purchasing power as consumers, thus transforming the meaning of civic life

(Needham, 2003; Livingstone et al., 2007). Most notably, for example, one can see this trend when governments push campaigns and programs related to the environment and sustainability—where emphasis is put on changes in an individual's everyday activities to reach an overall end goal (Hinchcliffe, 1996). Within this, public engagement moves beyond the informed citizen, who keeps aware of pertinent issues, to engagement that seeks action on the part of individuals through the act of consumption.

In this context, as smart initiatives spread across cities and city systems, city residents are no longer being perceived as passive, but as active participants in the city around them as citizen consumers (Kitchin, 2015). By design many smart projects require delegating responsibility to city residents in terms of their behavior and financial obligations (Grossman, 2011). For example, in smart meter projects, it is assumed that if city residents are more informed about their consumption patterns they will make better choices and self-regulate, thus lowering consumption (though the data are still inconclusive around this assumption). In this scenario, for the smart meter project to be 'successful', city residents become partners with key actions they must take—paying for meter installation and changing their behavior (Dillow, 2011).

In addition to citizens being viewed as citizen consumers within smart projects, they can also be construed as customer consumers (Cohen, 2001), where they are 'buyers' of the city as a product and its services. Within the digital revolution in the private sector, there is a rising asymmetry between sellers and customers, who increasingly have more power through increased access and information (Kotler et al., 2002, pp. 36-37). Through the Internet, customers can more clearly demand and get what they want. This has caused businesses to increasingly focus on customer relations management (CRM) for products and relationship management for services in the private sector. Some of these CRM marketing efforts include engaging the customer to get a better idea of their wants, needs and experience with the service or product, typically through a website or app (Kotler et al., 2002). And, as smart projects have spread, this CRM approach has been reinforced within the public sector. Technology tools that open up channels between the local government and citizens—such as 311 or a crowdsourcing panel—can be viewed as a continuation of this trend within the public sector, where the local government is seeking to put the customer, or city resident, first by gaining a better understanding of their needs, wants and experiences of city systems and services (Grossman, 2011).

Despite the emphasis that is seemingly put on city resident engagement in smart endeavors, in the end, the technologies and business and regulatory environments in which smart projects emerge are shaped by local governments and IT providers, not by city residents. Thus, they end up better suited to meet the needs of the regulators and providers, not users (Townsend, 2013, p. 104). That is not to imply however, that city residents have no power within these initiatives, nor that there are no bottom-up smart city projects. As city residents gain access to the knowledge created by smart city systems, and are able to act upon this knowledge, they gain power vis-à-vis those who own, manage and operate these systems (Vanolo, 2014). For instance, a consumer who is unhappy with an energy provider's rate structure can switch to a different provider who perhaps fluctuates rates throughout the day. Likewise, as those who own, manage and operate these systems gain knowledge on how these systems are used by consumers, they gain power over the consumers in terms of how they decide to provide these infrastructure services once they have a better idea of how and when they are used (Gross, 2010; Zifcak, 2010). For example, congestion charging rates can vary for use of bridges or tolled freeways depending on time and number of users—penalizing those using these systems when demand is highest (Ottewell, 2007; Stockholmsforsoket, 2006; United States Department of Transportation, 2008). While power in this context is relational, in the end it will stem from who has access and ownership of the data created by smart projects—typically the implementing parties, which in most cases will be local government, utility providers, and / or other private sector actors including tech firms like IBM.

As evidenced in this discussion, "smart cities involve the creation of new relations between technology and society" (Söderström et al., 2014, p. 6), issuing forth a renegotiation of relationships between involved local government, citizens and third party actors (Shelton et al., 2014). According to the smart city provider Arup,[26] the addition of smart technologies to city infrastructure and services "will allow us [smart city providers] to rewire governments by design, transforming the way they work internally and together with outside partners and citizens" (Buschner et al., 2010, p. 9). This IT provider vision of transformation involves, among others, changes in government function (what government is tasked to do) and governance (how government goes about doing these tasks).

4.2.2 Government 2.0

In their idealized vision of future government, tech providers see themselves and technology as central to addressing city operations and functioning (O'Reilly, 2010, Chapter 2). According to one smart city provider, Arup, this new model is inevitable due to the nature of smart projects, and a breach from current *modus operandi*: "The smart city is so different in essence to the 20th century city that the governance models and organization frameworks themselves must evolve" (Buschner et al., 2010, p. 9). An examination of tech provider materials around this transformation helps shed light on the types of shifts these actors hope to see within urban governance.

To promote smart projects, IT providers posit that by local governments adopting a pro-business bias city leaders will be better able to tackle urban challenges. For example, in their white paper on smart city technologies, Arup states that local governments could better address city problems if they mimicked Internet-based systems, which have had tremendous adoption and participation rates because they are consumer-centric, flexible, responsive and adaptable in real time (Buschner et al., 2010). As posited, by shifting to instrumented and interconnected urban systems, local governments will be able to instantly respond to real-time data, thereby

[26] Arup is an urban design and planning firm operating within the smart city market. Their "Smart Cities Framework" describes a strategy for "urban information architecture", or the organizational layers that support the "urban informatics", or the public interfaces that engage citizens and urban activities. "Instrumenting resource systems" enable these other components, and includes sensors and sensor technologies. They also discuss the interactions between hard infrastructure (smart grid, roads, distributed networks) and soft infrastructure (social networks, communities, legal and cultural systems, etc.) (Buschner et al., 2010).

enabling a new, more adaptable and informed way of managing these systems. In the words of Arup, this new form of:

> management, operation and engagement, (is) perhaps equivalent to the difference between a traditional high-street bookstore and Amazon.com. The latter is a constantly shifting, scalable system that is automatically generated 'on the fly' by constant learning from millions of interactions in near-real-time, within a framework that enables both top-down intervention and bottom-up organization. Every single interaction within Amazon.com reconfigures the offering in real-time. The offering itself is largely constructed from the actions of its users, such that it near-effortlessly moulds itself around the apparent desires of its users. (Buschner et al., 2010, p. 4)

While this type of extreme adaptability will be impossible for cities—which are comprised of tangible, concrete, and often static infrastructure systems—it is still touted as an ideal even though it is modeled after Amazon.com, a virtual store (Buschner et al., 2010). One example of this adaptability promoted by IT providers is through a push to get local governments to deliver services and back-end operations via the cloud. For example, according to IBM, local governments no longer prefer IT-heavy, on premise solutions; instead, city leaders are turning to more "agile, easily consumable functionality" that puts the responsibility of backend IT system operations (system updates, bug fixes, data protection, interoperability) onto the service provider (IBM, 2014b, p. 1). According to this tech provider narrative, moving to cloud enables quicker set up and project returns (IBM, 2014b). This new approach means that local governments rent capabilities versus owning them. Instead of buying the hardware and software necessary for smart projects, there is a monthly fee, thereby making the local government fully dependent upon the tech provider for continuation of services, maintenance and repair.

Rosabeth Kanter and Stanley Litow (2009) outline this IT provider perspective of change within urban governance as a necessity for optimization of resources and processes. According to these two authors, one of whom is a Vice President at IBM,[27] "a smarter city infuses information into its physical infrastructure to improve conveniences, facilitate mobility, add efficiencies, conserve energy, improve the

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[27] Stanley S. Litow is Vice President of Corporate Citizenship and Corporate Affairs at IBM.

quality of air and water, identify problems and fix them quickly, recover rapidly from disasters, collect data to make better decisions and deploy resources effectively, and share data to enable collaboration across entities and domains" (Kanter and Litow, 2009, p. 2). In addition to better managing resources, Kanter and Litow posit that smart technologies help improve political efficiency by addressing city management problems related to knowledge sharing and communication across government sectors and silos—such as weak civic leadership, inability to scale, low social capital, inadequate services and services delivery and jurisdictional issues (Kanter and Litow, 2009; see also Buschner et al., 2010; Dirks and Keeling, 2009).

This IT provider vision of an agile, consumer-centric local government bent on optimization sets the stage for how these actors see the future function of government—where the key tasks of local government focus on enabling nongovernment actors to solve urban problems. To enable this vision, tech providers posit that local governments must leverage collaborative technologies like those that enabled Web 2.0 to create a "Government 2.0" (Eggers, 2007; O'Reilly, 2010). What Government 2.0 means exactly however is unclear. There is no commonly understood meaning, for collaborative technologies could apply across a panoply of applications, including electronic and mobile government services, the use of social media for alerts or awareness raising, aiding in transparency through information sharing, gathering input or feedback through survey or polling mechanisms, adopting cloud computing, crowdsourcing, mobile applications, developer contests, or the like (O'Reilly, 2010). Despite the lack of clarity, given that individuals are more connected than ever before through mobile devices and social media, tech providers see these means as new channels for governments to perform their tasks—whether it be to engage city residents, provide services or enable collaborative problem solving. Tech providers also see it as a means to create new markets.

Moving to Government 2.0, according Donald Kettl (2009),[28] would require a radical departure from what tech promoters refer to as traditional models of "vending

[28] Donald Kettl is professor at the School of Public Policy at the University of Maryland and a senior fellow at the Brookings Institution in Washington, D.C. His viewpoints align with the interests of IBM, as they support further integrating technology into the way government functions and delivers

machine government" (p. 29), a notion that disguises the complexity of government services. Citizens pay taxes and in return expect services, which if not provided or provided adequately leads to their participation in the form of protest, i.e. rattling the vending machine in hopes of fixing it (Kettl, 2009). Contrary to this, Tim O'Reilly[29] (2010) posits that the thinking of Eric Raymond[30] (1999), described in *The Cathedral & the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*, should be applied to the way that local governments function. Raymond, a software developer and open source software advocate, proposes that rather than closed-source software development (represented by the cathedral), software development should be open source, in an ongoing bazaar development method. Along these lines, O'Reilly applies this thinking to government, noting that they should function like the manager of a marketplace, rather than a vending machine:

> In the vending machine model, the full menu of available services is determined beforehand. A small number of vendors have the ability to get their products into the machine, and as a result, the choices are limited, and the prices are high. A bazaar, by contrast, is a place where the community itself exchanges goods and services. (O'Reilly, 2010)

In this scenario, the government will function as a platform that enables a vibrant marketplace, where (private sector) merchants compete with each other to provide goods and services, ushering in more choice and lower prices. What is not mentioned in this narrative is the consequent decreased stability and certainty of government given the rapidity and ease of change. The only way that Government 2.0 could exist as described by tech enthusiasts is if it is heavily reliant and built upon technology—hence it is an attractive notion for IT providers trying to expand and grow the smart city market.

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services. As an example, IBM's Center for the Business of Government posted a blog promoting Kettl's 2009 book referenced above. See: http://www.businessofgovernment.org/blog/presidential-transition/next-government-donald-kettl.

[29] Tim O'Reilly is the founder of O'Reilly Media and has popularized the terms "open source" and "Web 2.0". For example see: http://archive.oreilly.com/pub/a/oreilly/tim/articles/paradigmshift_0504.html.

[30] Raymond's model for collaborative software development has been studied and used by many of the tech giants, including Sun Microsystems, IBM and Intel (O'Reilly, 2010).

4.2.3 Governance 2.0

Given knowledge, power, resources and other means to solve complex problems reside with many individuals and organizations, new forms of governing have emerged (Agranoff, 2003; Stone, 1989, p. 5). Consequently, governments establish collaborative relationships with a wide array of nonprofit and for-profit agencies and organizations to deal with concerns related to the economy, health, justice, social services, the environment, transportation and education, among others (Rose, 1999, pp. 15-16; Rose and Miller, 1992). Within these public-private partnerships efforts, "the public and private actors involved do not act separately but in conjunction, operating as a network" (Agranoff, 2003, p. 8)—a notion that the private sector supports due to the opportunity it creates. But, governments also find PPPs attractive, for at the heart of many of these types of arrangements is an effort by local government to try and "attract external sources of funding, new direct investments, or new employment sources", frequently with the integration of traditional local boosterism (Harvey, 1989a, p. 7).

Public-private partnerships first emerged in the United Kingdom in 1992 and subsequently spread globally (Osborne, 2000; Payne, 1999 and Whitfield, 2001 in Hearne, 2009, p. 11). In general, PPPs focus on either designing, building and finance, or designing, building, finance and maintenance (Hearne, 2009, p. 11). Supporters of PPPs state that these partnerships can handle the notable infrastructure and service deficits that have built up over the past few decades by providing private finance, thereby enabling improved and greater access to services and infrastructure that otherwise would not have been possible (European Commission, 2003; Payne, 1999; PriceWaterHouseCoopers, 2001a; and Public Private Advisory Group on PPPs, 2001 in Hearne, 2009, p. 11-12). Additionally, these partnerships are thought to offer private sector innovation and management skills that will lead to a better quality of service, faster delivery and improved efficiency (Department of Education and Skills, 2007; Economist Intelligence Unit, 1999; and Osborne, 2000 in Hearne, 2009 p. 11-12). Yet, many of these assumed benefits of PPPs have not been achieved, and data show that in fact these partnerships can lead to poor value for money, reduced capacity in the public sector, lower accountability and rising inequality (Grubnic and Hodges, 2003 and Murray, 2006 in Hearne, 2009, p. 12-13). Given the purpose, structure and role of PPPs, they serve as an important mechanism that reinforces and accentuates neoliberal and entrepreneurial trends (Brenner and Theodore, 2002; Harvey, 2005; Monbiot, 2003; and Whitfield, 2006 in Hearne, 2009, p. 12-13).

The proclivity for local governments to turn to PPPs for urban development initiatives offers an environment primed for smart projects, as smart discourse echoes this need for public and private collaboration. For example, one of the first widely shared documents extolling the benefits of smart from an IT provider perspective, “Informed and Interconnected: A Smarter City Manifesto”, describes how city leaders must work with others to meet the growing challenges their cities face (Kanter and Litow, 2009). This broad-based involvement, which may or may not exist in reality during smart project design or implementation, is linked to the promises of all that smart technologies can purportedly help attain:

> Real reform and community transformation will require that a new model be built, and built from the ground up. Every type of stakeholder, from those who plan and deliver services to those who receive them needs to be involved in the design. Government officials at the federal, state, and local levels and experts from the private and voluntary sector must be intimately engaged. Professionals who spend their days delivering services need to be at the table along with the people who receive those services. What might be possible through access to key data for reductions in administrative and operational costs or increases in accountability and return on investment? Nothing short of a revolution. (Kanter and Litow, 2009, p. 22)

Within this revolutionary vision that IT providers have for urban governance, third party actors are increasingly involved, with the private sector playing a prominent (if not dominant) role in project implementation. Yet, how the interests of businesses, local government, and city residents are balanced is unclear—as the interests of these various actors are not always aligned (Kitchin, 2014a; Monbiot, 2000, pp. 5-17). While the interests of city residents and local government actors will vary depending upon smart project, the interests of private sector actors will remain the same; they will be driven by the market, with financial gains as the main goal. That is not to say however that corporate interests will always diverge from those of city governments and / or denizens, for similar agendas may arise if there are compatible pressures on private sector actors within the marketplace (Slater and Miller, 2007).

While there are upsides to these types of partnerships to assist in governing, with communities and individuals being more involved, there are also disadvantages. Usually projects led by PPPs are more speculative, have less accountability and the risks lay primarily with the local government, not the private sector. Distributed governance arrangements over these endeavors can lead to gaps in the required mechanisms for effective implementation. In some cases, these projects are pulled together with numerous small-scale partnerships, leading to limited coordination, insufficient resources, and frequently conflicting end goals. In terms of expertise emerging from these partnerships, all "too often their main (if not sole) material existence takes such forms as consultants' reports, outline proposals, non-binding agreements, glossy brochures, more or less regular conferences, meetings, or seminars, cultural exchanges, data bases, and information centres" (Jessop, 1997). And, the increased emphasis on boosterism within these partnerships can drown out critique or pushback that may emerge (Jessop, 1997).

As referenced in Chapter 2, with increased use of PPPs to pursue city objectives and rising privatization of public services, there tends to be greater socioeconomic inequity (Agranoff, 2003; Stoker, 1998). A concern to be noted given that disparities in equality may result from the spread of smart technologies as well; for those with access to smart systems and their information will be better informed than those without, giving them an unfair advantage (Graham and Marvin, 2001, pp. 383-384). Part of this risk is linked to the fact the IT provider has the potential to have greater influence in these projects than its city partner. In the cases where the IT provider is a large multinational conglomerate, this reality cannot be ignored. These tech giants can outweigh their city counterparts in array of resources, including size (staff versus population), perceived expertise and financial strength. Yet, while large corporate actors like IBM can clearly be in asymmetrical relationships with local governments given their size, "the apparent power of corporations in this space of relational / territorial negotiation is sometimes over-determined" (McNeill, 2014, p. 3)—a factor I examine further in Chapter 5.

Smart city initiatives are extremely challenging, and whether or not firms providing these solutions are 'successful' will depend upon internal knowledge management of the corporation as well as the nature of the urban problems that they are addressing. In general, organizations working on smart city projects are not "specialist global consultancies"; rather, they are usually firms comprised of consultants, systems engineers, software developers, marketers, and maintenance operations staff, which may or may not have professional urban experience (McNeill, 2014, p. 3). Further, giant tech providers are not one unified actor; they are complex organizations, comprised of varying divisions, purposes, processes, etc. Together, these complexities associated with tech giants diminish the potential influence they may have in smart endeavors.

4.3 Representing Smart: a Theme in Narrative and Brand

In this section begin to explore my third research question by examining how smart project narratives and brands may be informing the redesign of urban governance mechanisms. As noted in Chapter 2, I view representation as the ways in which smart projects are portrayed through: (a) narrative, or the stories created around smart projects; and (b) brand, the ways in which local governments promote place or specific initiatives. The influence of smart project narrative and brand is central to my analysis for the power of the "smart city imaginary to capture the minds of corporations, policymakers and average citizens makes it an important means through which cities are being (re)constructed in the 21st century" (Shelton et al., 2014, p. 9). Hence, understanding this imaginary will help shed light on how the reimagining of the city through a smart lens may be linked to a redesign of urban governance mechanisms (Jessop, 1997). Below, I explore why smart project narratives are important to help make sense, convey meaning, persuade and create a shared vision to those leading and operating smart endeavors. I provide an overview of the messages usually contained within smart project narratives, especially those created by IT providers, and discuss how these messages are pervading within urban discourse. I end this section by examining how smart projects can be a symbolic fix for cities and affect place promotion strategies, such as co-opting IBM's brand. I explore IBM specific Smarter Cities narratives and brand in Chapter 5, “IBM as a Smart City Actor”.

4.3.1 The Importance of Narrative in Planning

In the urban context, the role of narrative has been recognized within planning theory as being important because stories provide involved actors with an understanding of the city planning problem they have to solve and help create a shared vision of some future state. Narratives are imperative to planning because they can serve as “powerful agents or aids in the service of change, as shapers of a new imagination of alternatives” (Sandercock, 2003, p. 18). The images shaped by narratives “have performative and causative power” (Miller, 2013, p. 11), which inform “agendas, research trajectories, projects and policies” (Smith, 2009, p. 462). Thus, within urban planning, narratives shape what is done, how it is done and who is involved, while enabling involved actors to imagine an alternative future and what their role in making that future may be (Söderström et al., 2014; Throgmorton, 1996; Van Hulst, 2012). Smart projects create opportunity for IT providers to inform local government narratives about these endeavors, creating a smart city imaginary that may or may not spread beyond these projects to broader city representation.

Narrative is a powerful tool for persuasion, and exists as a form of rhetoric—or, “the use of language as a symbolic means of inducing cooperation in beings that by nature respond to symbols” (Burke, 1950, p. 43). “Something of the rhetorical motive comes to lurk in every ‘meaning’, however purely ‘scientific’ its pretensions. Whenever there is persuasion, there is rhetoric. And wherever there is ‘meaning’, there is ‘persuasion’” (Burke, 1950, p. 172). Within the context of political debates, rhetoric often takes on a negative connotation as empty slogans or marketing. However, aptly posed, rhetoric can be a compelling call to action, having an effect on people's decisions and behavior (Bitzer, 1968; Myers and Macnaghten, 1998). Narratives can be a strong means for a call to action, such as in the case of sustainability, a concept often linked closely to smart. In their study of the rhetoric of sustainability, Myers and Macnaghten, (1998) found that “effective rhetoric is a precondition, not an alternative, to environmental action” (p. 335).

The persuasiveness of narratives hinges upon, among other things, the identities that they help create and the commonplaces that they employ.[31] These commonplaces are all-purpose and recurring arguments that connect “a few general categories to a wide range of possible realizations” (Myers and Macnaghten, 1998, p. 336). One of the ways that commonplaces are effective is that they can be applicable in both general and specific situations. Typically commonplaces are present tense and signify ‘truths’ that most consider to be enduring. A commonplace is brief—it can be relayed in a sentence, phrase, or even picture. The same commonplace can be stated in many ways, as wording is not fixed (Jessop, 1997; Myers and Macnaghten, 1998). “Like proverbs, commonplaces can lead from the same unarguable, even anodyne, statement to widely different implications” (Myers and Macnaghten, 1998, p. 338). The abstraction of commonplaces is a key feature of rhetoric associated with policy discourse. The generalization of smart within urban discourse enables it to be customized and adapted by different organizations, for different audiences and for different purposes, all the while still upholding the basic tenets, or commonplaces, of smart—which align with and reinforce the assumptions of smart.

While a narrative might originate from one person, communication by its very nature is multidimensional. Thus, narratives are not static, relayed from source to receiver; rather narratives set off a complex web of interactions that most often involve adaptation to the original narrative. How people relate to, perceive and interpret narratives will vary, as will how they share these narratives as they are communicated and disseminated (Myers and Macnaghten, 1998). In the Dubuque case study for example, smart project narratives were typically relayed through political messages, media, advertising, town meetings or other forms of discussions with residents, and other forms of non-traditional public relations. As third party organizations and citizens engaged with these narratives through community forums, blogs and websites, smart increasingly became embedded within city discourse around environmental and economic sustainability. This also empowered those

[31] In the context of this work, commonplaces refers to the classical rhetorical tradition of listing frequently used arguments, or general ideas applicable to many subjects, to which a speaker might turn in various situations (Myers & Macnaghten, 1998).

participating in the co-creation of the discourse and gave them ownership, which helped contribute to the ‘success’ of these projects.

Narratives about smart projects play important and varied roles in their design and implementation. Each smart project has various sets of narratives—those created by the IT provider, the local government, leaders within the business community, those affected by smart projects and those creating smart counter narratives, among others. The purpose of these narratives, or stories, varies depending upon author, as does the intended audience. Within my research, I found that most narratives about smart efforts: (a) proposed stakeholder gains, and future risks if smart technologies are not adopted; (b) served as an invitation to stakeholders to support and participate in smart projects; (c) outlined rules and expectations for stakeholder engagement; and / or (d) shared the local government’s vision of smart technology adoption within the city—a vision built on identified objectives and priorities, and how to go about achieving them. Regardless of purpose, while smart city narratives may seem plausible, and by many accounts utopian, this “does not mean that they are true, even if they are associated with ‘truth effects’” (Jessop, 1997). All narratives are selective, and as important it is to note what is stated, it is also important to consider what is not, and what is kept out of discourse. For, in a sense, narrative attempts to “hegemonize public and private discourse in the interests of specific accumulation strategies or political projects” (Jessop, 1997). Given the consensus on the need for cities to become smart, one could interpret this as a result of converging public narratives, or as Greenfield (2013) referred to it, a preemptive consensus.

4.3.2 Smart Narratives and Command

Despite variation in conceptualization, within smart city narratives the application of technologies across city systems and services is deemed beneficial (Eger, 1997; Hollands, 2008) and necessary to avoid future threats and risks (White, 2015; Wiig, 2015). The future urban picture depicted in these narratives is bleak—rapidly rising city populations, scarce resources and the devastating effects of climate change. But, as the story goes, if local governments choose to employ smart technologies across city systems and services, perils from these threats can be minimized; citizens and their way of life can be protected (White, 2015). “Urban strife is simultaneously posed and resolved” (White, 2015, p. 3). Missing from these narratives is alternative ways to slow or halt urbanization or climate change; for smart technologies only seem to mitigate, not avoid, the predicted future duress (White, 2015). Additionally, these narratives do not offer alternatives to using technologies to ‘solve’ urban challenges (See Graham and Marvin, 2001); nor do they discuss the adverse effects of smart city solutions such as the potential for growing urban inequality (Wiig, 2015). Rather, as described in smart city narratives, the utopian future enabled by technology is safe, efficient, sustainable and prosperous (Hollands, 2008). And it is this techno-utopian future enabled by smart technologies that is promoted by IT providers, who have catered these types of narratives to broad audiences for wider appeal (White, 2015), with consequent impact in cities around the world.

> This [smart city] rhetoric does work in the world. It sets agendas, influences perceptions of what it means to be ‘advanced’, recalibrates norms and guides the allocation of resources. (Greenfield, 2013, Chapter 14, kl. 1390)

Discourse informs policy, which shapes governance structures and approach. When examining the entrepreneurial city for example, Bob Jessop (1997) identified a close link between “economic strategies and economic discourses since it is only in and through the latter’s mediation that problems are identified, policies pursued and crises resolved” (p. 1). As cities reimagine themselves as economic, political and cultural entities where the local government pursues entrepreneurial activities to improve city competitiveness, according to Jessup (1997), what follows is a redesign of urban governance mechanisms, “especially through new forms of public-private partnership and networks” (p. 1). Jessop noted that this transformation to an entrepreneurial city is evident through “the wide range of self-presentational material emitted by cities and / or agencies involved in their governance” (1997, p. 1). Similarly, the narratives that shape smart city imaginary—i.e., the seductive images of ideal cities that have been ‘enhanced’ and ‘improved’ through the application of smart technologies that are promoted by tech providers—are informing the redesign of urban governance through smart project design and implementation. And since tech providers are creating these narratives and imagery, they are driving the ways in which these changes in urban governance are taking place. As this associated discourse spreads, it further promotes and reinforces notions of high-tech urban entrepreneurialism (White, 2015).

One main problem associated with this smart discourse is that few are questioning it as it rapidly spreads throughout media—though this is changing as familiarity and experience with smart city solutions grow. In his book *Against the Smart City*, Adam Greenfield (2013) describes this rapid dissemination, where with the launch of a smart city initiative, tech provider marketing departments release glossy, convincing materials that promote their brand and solutions across numerous social media channels, populating smart city discourse almost instantaneously with their narratives. From here, Greenfield states, technology bloggers from around the world who are under pressure to publish are alerted of the new technology, and readily, and unquestioningly, amplify these smart city messages through their blog channels. Within minutes of the corporation's smart city press release, the story is being summarized, quoted and shared through even more social media channels (Greenfield, 2013, Chapter 14, kl.1344-1390). Within hours, a wealth of online commentary about smart cities appears, with little critical evaluation. As Greenfield explains, "a framing or perspective originating in a deeply interested party has simply become an unquestioned part of the fabric of consensual knowledge" (2013, Chapter 14, kl. 1356). The result, according to Greenfield, is that municipal workers who are pressed for time and lacking high-tech training, when they come across the barrage of smart city messaging throughout social media, instead of investigating further they reproduce the narratives throughout their institution. Soon, he notes, the smart city becomes a certainty:

> The savvier staffers start to feel confident using these terms: speaking in them, thinking in them. While misgivings may in fact be prevalent, there are likely to be relatively few in the bureaucracy who are able to express them forthrightly — that is to say, who are sufficiently comfortable with the technology to understand precisely what is being proposed, familiar with the way their city works to convincingly articulate why this is problematic, assured of their own position to feel safe in doing so and passionate about the issue to willingly shoulder the risk involved. When finally pressed to make a recommendation as to how the city's resources should be allocated, the easiest thing for a committee member to do is go with the flow. (Greenfield, 2013, Chapter 14, kl. 1367)

According to Greenfield, through this process a "preemptive consensus" on the appeal of these projects is built; a consensus that seems to span across a range of urban actors who are all exposed to the same smart city discourse (Chapter 14, kl. 1377). And, within this consensus, the discourse oversimplifies the city, disregards hard lessons learned from the past, mutes critique through positivist messaging, infers neutrality of these endeavors, and details future risks to get city officials to seek smart city solutions now (Greenfield, 2013, Chapter 13, kl. 436-448, 1280; White, 2015). Yet, as my case study in Portland demonstrated, there is skepticism amongst local governments about the smart city trend as well; awareness that will grow as the trend ages and more city officials gain exposure. For those city officials however looking for a quick way to differentiate their city, smart solutions offer an attractive solution—as these initiatives can offer a brand fix for cities that may surpass technological gains.

4.3.3 Smart as a Symbolic Fix

The ways in which local governments present their city as being smart through narrative are often is linked to the symbolic associations they are trying to create to promote the city. Developing a strong brand for a company or specific product is a common practice within the private sector—as successful brands translate into sales (Hatch and Schultz, 2008). A city's brand—or the primary symbolic associations that local government aims to project that are conveyed via strategies to promote place—can accumulate 'sales' by helping to attract and retain talent, city residents, tourism, investment and business; all of which support revenue creation through taxes (Jansson and Power, 2006; Hall and Hubbard, 1996; Kotler et al., 1993). In this context, cities are products, used and experienced by the end user, or consumer—whether a business, tourist or resident (Harvey, 1989a). Cities become commodities; they are an asset class to the financial industry, where one can bet against the rise and fall of a city through the securities it issues based on its bond rating (Sevcik, 2011). Within this framing, local governments are concerned with how their city is marketed and 'sold' through rhetorical and symbolic associations that are meant to represent the city. How the city is 'packaged' is increasingly important, for a city in demand is able to attract the talent and resources it needs, while maintaining a solid bond rating—whereas undesirable cities have a hard time attracting and / or retaining residents, tourists, businesses, investment and other resources (Eger, 1997). Given increasing competition between cities, city brands are often created in ways that allude to positive change to attract resources (Wiig, 2015). According to IT providers, the adoption of smart technologies is an inexpensive way to enhance city brand and consequently attract resources (Buschner et al., 2010; Sevcik, 2011).

While there is not one city brand, local governments often attempt to create, through various place promotion and public relations strategies, one overarching city representation that helps attract resources and foster a sense of identity amongst city denizens (Harvey, 1989a). In this context, brand is a strategy to promote place rather than an evocation—for example, improving the built environment or implementing strategies to make the city 'green'[32]. Smart initiatives are a new option within municipal public relations strategy. They are portrayed by IT providers not just as a technical fix for the city, but also a symbolic one since it is assumed that they will boost city brand (Hollands, 2008). Smart project implementers seek to promote a particular brand of the city that results from becoming smart, differentiating it from other cities because the city is consequently more 'efficient', more 'effective', more 'technically-advanced', more 'sustainable', more 'competitive', more 'cutting-edge', and so on (Cisco, 2010; Elfrink, 2009; General Electric, 2011; IBM, 2009a; Lohr, 2009a, 2009b; MacManus, 2009; Siemens, 2010). Within smart endeavors, local governments may focus on portraying a smart city brand to help gain support for the large up-front investment; to coax city resident and stakeholder support, and in some cases participation; and to encourage any behavior change that the smart technology may require.

This notion of creating a city brand through strategy is not new. Place promotion has been around for centuries (Ward, 1998). Initial research on city brand and place promotion includes Ashworth and Voogd's (1990) *Selling the City,* which outlines general principles of place promotion and suggests that a marketing philosophy

[32] Cites that are green are those that are considered environmentally friendly (Rode and Burdett, 2011; Satterthwaite, 2008).

should be applied throughout all aspects of urban planning. *Marketing Places: Attracting Investment, Industry, and Tourism to Cities, States, and Nations* by Kotler et al. (1993), outlines issues around and approaches to place promotion and how it is becoming more challenging with globalization. More recently, there has been a wide range of literature developed on place promotion by marketing and public relations firms that specialize on urban environments (Avraham, 2004; Jansson and Power, 2006). Appendix 11.6 provides additional details on creating city brand and place promotion strategies.

Developing a strong brand metaphorically puts the city on a map—providing city residents with a sense of place and local identity. And for the PPPs and local government leaders who bring about projects that contribute to city brand by drawing in talent and resources, it boosts their political power and influence. The practice of branding by local governments focuses on strategies that will help create positive associations with the city and diminish or override negative associations that might adversely affect the ability to generate revenue (Zavattaro, 2010b). Even if there is too much spin, and brand does not align with how the city exists in reality, over-zealous branding can be deemed ‘successful’ if it makes the city seem more competitive, attracts resources and builds local identity. In this context, it begs the question if smart projects could be replaced with efforts to make a “Creative City” (Florida, 2002; Vanolo, 2008) and yield the same results—for each of these function as neoliberal policy experiments in urban environments, informing the way that the local government approaches governance while serving to reinforce and accentuate neoliberal processes and maintaining the capitalist status quo. Similar to smart, cities pursuing a ‘creative’ brand do so to gain a competitive edge to attract talent and resources that may help fuel economic growth (Creative Cities, 2010). Often, with these types of endeavors, “the triumph of image over substance is complete”, where symbolic associations fail to connect with reality (Harvey, 1989a, p. 14). Municipal public relations become pure marketing, similar to the corporate spin created to sell consumer goods.

In efforts to build or enhance city brand, Staci Zavattaro (2010b) notes that local governments “are practicing many of the same promotional and image-generation techniques as private-sector PR firms use with a desire for the same ends—increased consumption of (city) goods and services" (Zavattaro, 2010b, p. 1). Within this range of adopted techniques, there are traditional strategies that often accompany place promotion, such as media relations and in house publications. In her research examining how municipalities are increasingly adopting practices of public relations and marketing firms, Zavattaro (2010a) found other non-traditional methods frequently employed: using volunteers and outside organizations (i.e., third party actors) as public relations surrogates, investing in the built environment to improve how people view and experience the city, and focusing on environmental sustainability by going green (typically wrapped within built environment efforts). In my examination of smart projects, I found that in addition to the use of these non-traditional place promotion strategies (further elaborated in Appendix 11.6), local governments may combine their city brand with the tech providers for co-promotion.

Cross-brand Promotion with IBM

One of the reasons IBM's Smarter Cities has been broadly received within urban discourse is that the associated narratives and brand built upon IBM's long history as technology provider. IBM has developed technologies that have affected the world, including innovations such as the ATM, the floppy disk, the hard disk drive, the magnetic stripe card, the relational database, the Universal Product Code, the financial swap, the RDBMS and SQL, the SABRE airline system, DRAM and Watson artificial intelligence (Madrigal, 2011; Maney et al., 2011, pp. 3, 44, 47, 48, 78, 273).[33] Technological innovations such as these have helped contribute to the world becoming wired for transactions—with sensors and connectivity increasingly tracking the movement of people, goods and money in real time (Harrison in Townsend, 2013, p. 64), a natural precursor to smart city projects.

In the past 105 years of being in business, IBM has grown into a global, corporate behemoth. With over 435,000 employees (Fortune, 2012a), "Big Blue" is one of the

[33] IBM employees have been awarded five Nobel Prizes, six Turing Awards, ten National Medals of Technology, and five National Medals of Science (IBM, 2014h; Maney et al., 2011, pp. 122, 180, 301)—each of these awards have contributed to the company's brand strength.

largest, and most profitable companies in the world (Fortune, 2012b). In addition to tremendous size of staff and finances, it is seen as the number one green company worldwide by *Newsweek's* green ratings (K. Wong, 2012), the fourth best global brand (Interbrand, 2014), and the sixteenth most admired company (Fortune, 2014). None of this happened by accident—IBM has a dedicated and aggressive Marketing & Communications department that focuses on developing and protecting company brand. Customized marketing and communications are developed for each product and solution, which is shared across relevant marketing and communications staff via online and in-person training sessions, cadence calls, books, emails, newsletters and copious online materials and assets. This strong company brand, which has included Smarter Cities, makes IBM attractive to local governments seeking to enhance the way they represent their city. By partnering with IBM in smart projects, some local governments hope this will enable them to also gain the benefits associated with the IBM brand (Wiig, 2015). I explore how this strategy is applied in the Dubuque case study.

Conclusions

As smart projects are more frequently implemented, local governments will become increasingly exposed to IT provider processes, models and approaches. An example of this includes the tech provider emphasis on data centrality and the measurement and optimization of government services and operations that stem from this (Söderström et al., 2014; Vanolo, 2013). Within this emphasis, it is assumed that with the right data, solutions to every city challenge can be found (Mattern, 2013). As presented by most IT providers, this data centricity and solutionism comes with a degree of naiveté, for the limitations of this approach are frequently overlooked or not mentioned, while the complexity of cities and city operations are drastically reduced (McNeil, 2014). These limitations and risks include an assumed data neutrality, data unreliability and messiness, lack of indicator standardization, perverse incentives for data manipulation, and myopia resulting in solutionism and managing only what can be measured (Kitchin, 2014b; Mattern, 2013; Shelton et al, 2014; Townsend, 2013, p. 210). Cascading from this approach, is a subsequent need to add or adapt city leadership skillsets and roles outside of the IT department, especially within smaller-sized cities, to help deal with the growing complexity of big data and analytics within and across city systems (Shelton et al., 2014).

Linked to this notion of data centrality, tech providers also aspire to having their organizations (and their technologies) act as intermediaries between governments and the citizens they serve (Shelton et al., 2014). As a result, the engagement arrangements and expectations between and among these actors are changing. Local governments are increasingly looking to collaborate or partner with outside organizations to manage urban affairs and deliver city services through arrangements like PPPs (Agranoff, 2003; Stoker, 1998). And, progressively more responsibilities are being pushed down to citizens (Rose, 1999, pp. 15-16; Rose and Miller 1992), who are simultaneously being construed as citizen consumers, where civic participation is equated with choices around consumption (Beck, 2005; Needham, 2003), and customer consumers, where citizens are viewed as consumers of the city and its services as a product (Cohen, 2001). But the tech provider vision for change in urban governance, does not stop there.

Deepening this transformation, IT providers also envision a new role for urban government as well as a shift in the surrounding governance arrangements (Buschner et al, 2010; Kanter and Litow, 2009). In the interests of business expansion, tech giants are promoting a vision of government that is entirely IT provider and data reliant by encouraging local governments to increasingly become consumer-centric, flexible, responsive and adaptable in real time. In the IT provider ideal, the local government becomes a facilitator for other private sector or nongovernment organizations to manage and deliver government services (Buschner et al., 2010; IBM, 2014b). This outsourcing of 'traditional' local government function would make government services market-driven, further driving neoliberal principles into urban governance practices (Kettl, 2009; O'Reilly, 2010).

Since smart projects have been portrayed by IT providers as a relatively 'easy' and 'quick' city brand fix, this has led to increased interest in and adoption of smart endeavors (Coe et al., 2000; Hollands, 2008). And, as IT providers begin to inform smart project strategy and engagement, they also shape associated representation.

Smart initiatives are portrayed as the panacea to future urban woes (White, 2015)—and the ways in which these challenges are described and addressed within project narratives is informing agendas, projects and policies (Jessop, 1997; Smith, 2009, p. 462). I explore this relationship between reimagining and how it has influenced the redesign of urban governance mechanisms in my case study on Dubuque, where the local government fully embraced the concept of smart. The case study of Portland offers an example of how IBM's vision for a smart city did not take hold or lead to significant changes within strategy, governance arrangements or narrative. Before I discuss my case study cities however, I provide an in-depth look at the tech giant involved in all of the smart projects I examined, IBM.

5 IBM as a Smart City Actor

IBM is, and has been, a significant actor in the making and shaping of the smart cities market. Its size, breadth and scope all contribute to why it is an important actor worth close examination when seeking to understand the smart city trend. In part, IBM's significance in this market comes from the actor's sheer size—it is one of the largest and most profitable companies in the world (Fortune, 2012a, 2012b) and has made huge investments in relevant research and development, mergers and acquisitions (IBM, 2012d, 2014h; Maney et al., 2011, pp. 190-191, 193). As of the close of 2014, IBM had completed over 10,000 Smarter Cities projects in countries all over the world—ranging from the United States, France and Singapore to Kenya, Brazil, India and China. Its solutions and offerings target multiple service areas, including transportation, water, public safety, emergency management, healthcare, energy, asset management, education and social services, while engagement has ranged from strategy to implementation, across a mix software, hardware, maintenance and consultancy services (IBM, 2014b). Not only does IBM operate across diverse city systems, within some it is a critical actor in the provision of services. For example, in the transportation industry, eighty percent of the world's travel reservations are processed on IBM systems. All of the world's top five ocean container companies, seven of the top ten freight service providers, ten of the top ten rail companies, and ten of the top ten global airlines use IBM services and solutions (IBM, 2014b).

On top of this, in the smart city market, IBM has partnered with other large organizations such as ESRI, Veolia, Motorola and AECOM (IBM, 2014b), further extending its perspectives, approach, frameworks and processes for applying smart technologies across city systems and services. Given this context, IBM has formidable potential to shape and inform urban governance processes around the world through smart projects, not only in terms of the projects it implements, but through other actors involved in this market that it may partner with or influence, including local governments, businesses, community organizations, and even competing tech firms (McNeill, 2014). Below I discuss IBM's Smarter Cities campaign—how and why it emerged, how it has evolved over time and initial signs of its influence, the latter of which is explored further in my case study chapters. Through this exploration, I shed light on the smart city from IBM's perspective and how it is spreading as the tech giant sells, designs, implements and replicates these endeavors in cities around the world—for this perspective shapes the way that IBM interacts with local policy and planning processes.

5.1 Smarter Cities Campaign

"IBM is estimated to have spent hundreds of millions of dollars alone, educating mayors and concerned citizens about how to upgrade cities" (Townsend, 2013, p. 31). According to Söderström et al. (2014), IBM's Smarter Cities campaign[34] is "the most developed attempt by a private company to define a smart model of urban development" (p. 3). By creating and maintaining the overarching story around what it means to be a smart city, and what local governments need to do to make their city smart, IBM seeks to secure and strengthen its position in this market (Söderström et al., 2014; McNeill, 2014). Given that IBM is a key actor involved in the reimagining of cities through the lens of smart, and that this reimagining is linked to redesign in urban governance, it is important to understand: (a) how and why IBM narratives have emerged and evolved over time and within and across the organization; (b) what key messages these narratives contain; (c) how these messages are spread; and consequently (d) what the consequences for the redesign of urban governance might be based on these narratives.

5.1.1 Story Origins

As businesses and national governments struggled with the growing recession of 2008-2009, and IBM sought to find solid ground after floundering financial performance in the 1990s and 2000s, the company turned to new targets made

[34] In my interview with the IBM communications executive who created the vision for IBM's Smarter Planet and Smarter Cities campaigns, he noted that he was very intentional in choosing the term smarter over smart; for the former infers improvement without necessarily disparaging the pre-existing state, while the latter implies that what existed before was by default inefficient, ignorant and unsound.

increasingly visible by its Smarter Planet rubric,[35] which represented yet another significant turning point in the company's program and marketing (McNeill, 2014; Söderström et al., 2014). The Smarter Planet campaign was launched by former CEO Samuel Palmisano on November 6, 2008 in a speech to the Council on Foreign Relations, where he outlined how ways of doing business are globally transforming due to three technological shifts—increasing instrumentation, growing interconnectivity, and enhanced intelligence. (I elaborate on the development of the Smarter Planet Campaign in Appendix 11.7). According to Palmisano, these shifts, through data and analytics and the new insights they help glean, are making the planet 'smarter' across all industries and sectors… including government (Palmisano 2008). Hence with this speech, Palmisano sought to expand IBM's reach across all industries and sectors, moving operations from focusing and existing merely upon the IT department and within the Chief Information Officer line of business. As encapsulated by IBM Senior Vice President for Marketing & Communications Jon Iwata, "Smarter Planet is a collection of markets we're making" (Iwata in Watson, 2010). Once Palmisano outlined this framework of global transformation, teams within IBM soon began to apply it to urban environments. To help solidify its presence in the smart city market, IBM officially registered the Smarter Cities trademark in November 2011 (Söderström et al., 2014).

Within this market-making effort that focuses on cities is a plea for local governments to take action, action that involves the technologies sold by IBM and is influenced by a highly neoliberal strategy. As understood within the neoliberal tradition, the notion of a city existing as a market runs contrary to how cities have been traditionally understood. A century ago cities were perceived to support markets, not serve as a market in and of itself. Large parts of city operations were publicly owned, controlled and managed. This marks a shift to thinking about urban services and systems as market opportunities in a neoliberal mode (Boas and Gans-Morse, 2009; Brenner and Theodore, 2002; Peck and Tickell, 2002)—and is reflected throughout IBM's Smarter Cities narratives.

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[35] Smarter Planet is trademarked by IBM and refers to a wide range of solutions that tap into the "power of data and analytics, mobile technology, social business and the cloud" (IBM, 2015c).

5.1.2 Evolving Tales

Building on the Smarter Planet narratives, IBM has created a range of stories around Smarter Cities to sell its related offerings and solutions. Within these narratives, the city is seen through a business lens, with the goal of getting city leaders to think more like private sector executives. For, it behooves IBM that their targeted city buyers see their city as IBM describes and defines it—where cities compete against each other for resources, where the primary goal is economic development (and the purported boosts in standards of living that go along with it), where efficiency and optimization of resources is a key objective, where technology and data are neutral, and where data and analytics can unlock change heretofore not possible without them.

IBM narratives around Smarter Cities are shared through point of view (POV) documents that outline the organization's overall perspective of smart cities, white papers that outline IBM solutions and expertise, technical "Redbooks", advertising, communications, internal education and enablement, go-to-market strategy, and the Smarter Cities landing page and associated webpages, among others. Each of these materials have been constructed by different people and teams across the company, at different times, and with different purposes and audiences in mind—thus, there is not one Smarter Cities narrative. To an extent, this mosaic of smart city stories reflects the various divisions within IBM seeking entrée and capture within the smart city market. For example, Software may create narratives about Smarter Cities that specifically promote the sales of a particular software solution; while Global Business Services may create documents that instead promote not only software sales but also associated consulting services. Before I examine some of these Smarter Cities narratives, it is important to break down which various actors, or divisions, within IBM are creating and telling the stories—for understanding who is telling the story will shed light not only on the complexity associated with IBM Smarter Cities narratives, but also the purpose of narratives and the varied intended audiences.

Storytellers

There is no one central team across all of IBM that focuses on its Smarter Cities campaign—or the initiative created to develop, support and expand IBM's work in the smart city market. Instead, individuals and sub-teams from across IBM have been assigned to support this effort as the opportunity has grown. Research, Software Group (SWG), Marketing & Communications (M&C) and Sales & Development (S&D) were some of the first few divisions within IBM that helped develop the Smarter Cities campaign. Research and SWG have explored offerings by either adapting existing or creating new products and solutions. Marketing & Communications and S&D have focused on understanding the market and potential 'buyers', raising awareness of IBM's involvement in this market, conditioning and developing the market, and creating materials that outline IBM's relevant expertise and position on what it means to be a smart city and how cities can become smart.

Figure 11. Examples of efforts to support the IBM Smarter Cities campaign

IBM business unit	What it does for the Smarter Cities campaign	Purpose of materials/ assets created	Intended audience
Marketing	Organize events and generate / support all content activities around events; internal messaging and knowledge management; external communication—blogs and social media; support white paper and POV development; develop client decks	Raise awareness of IBM presence / expertise / solutions in this market; Connect IBM experts to clients; Educate IBMers on Smarter Cities thinking, messaging and solutions	Internal education and enablement; External
Communications	Press releases, analyst relationships	Raise awareness of IBM's presence / expertise / solutions in this market	External
Sales & Development	Go-to-market strategy; Ibm.com website and landing pages; sales activation kits; toolkits for sales person client customization	Sales	Internal enablement; External
Research	Technical Redbooks	Educate in-depth on a technical solution	Internal and external education
Corporate Marketing & Communications (Philanthropic)	Smarter Cities Challenge	Gain insight from cities work; Raise awareness of IBM's presence / expertise in this market	Internal and external

Source: Senior IBM Staff from Smarter Cities Sales & Development and Marketing & Communication.

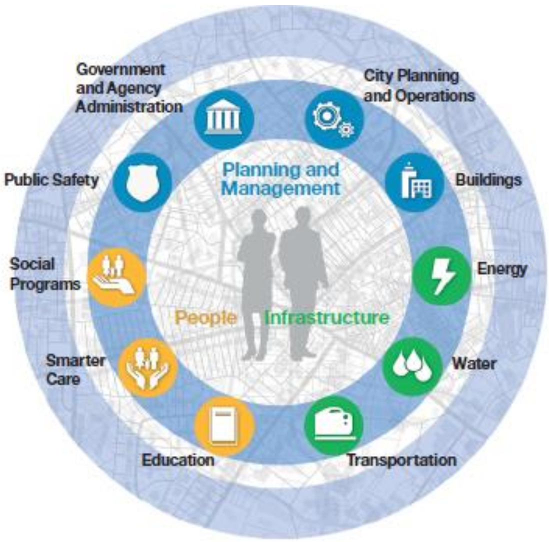
Figure 11 provides illustrative examples of the divisions within IBM that support the Smarter Cities campaign, in particular those relevant to the narratives and brand associated with this endeavor. As noted by McNeill (2014), those who work on smart cities have experience with marketing, communications, sales, software development, research, etc., but are not necessarily global smart city specialists, or even those with professional experience in the urban environment. Rather, IBM's initial approach to its Smarter Cities campaign stemmed from its core competencies, not input or guidance from urban experts like city planners, architects or property developers (McNeill, 2014); though as IBM staff learned from these individuals along the way, solutions and services were adapted accordingly.

Within IBM, the narratives that are considered to be the most representative of the company's overall thinking around smart cities and the challenges and opportunities they face are the point of view documents. To date, there have been three, two external and one internal (IBM, 2012e, 2014b, 2014j). These documents are created by IBM Marketing, and informed by top Smarter Cities leadership. IBM's white papers on Smarter Cities expound on the ideas conveyed in the POV documents. These white papers outline a specific issue within a city system, and may or may not refer to a product or solution to 'fix' this issue. Recognizing that city buyers exploring smart technologies will primarily not come from the IT Department, these white paper documents focus on what technology can do for the city and the outcomes it can bring. White papers are well-researched documents, and any claims within them must be substantiated. As one author of many of the Smarter Cities white papers noted in my interview with her, these works must be "'evidenced-based'". These documents are usually produced by IBM Marketing, though various divisions across IBM can draft them. These two foundational documents—the POVs and white papers—are supposed to be the basis upon which all other materials and messaging, or narrative themes, are built. However, this does not always happen in practice.

In addition, IBM Research creates Redbooks that highlight technical aspects of IBM Smarter Cities solutions, products and offerings. These documents are generally for those more involved with technical aspects of the projects. The Communications department is responsible primarily for all external communications around Smarter Cities like press releases. And finally, the Smarter Cities Challenge (described in

Chapter 2) has provided internal learning and helped raise market awareness of IBM and its capabilities around smart cities. Each of these groups create and disseminate materials related to Smarter Cities for various purposes and intended audiences. Appendix 11.8 provides examples of these various narratives and the different divisions within IBM that create them.

Figure 12. IBM Smarter Cities wheel



Source: IBM, 2014d.

Given that IBM sees itself as a master of systems integration (Harrison, 2010; Harrison et al., 2009), it has translated the concept of IT system integration across the urban landscape, classifying the city as a system of systems (Palmisano, 2010a, 2010b). Accordingly, the IBM S&D identified ten city systems across which offerings are mapped, and to which Redbooks and white papers typically align. These city systems, reflected in IBM's Smarter Cities wheel (see Figure 12), are a part of IBM's go-to-market strategy, and hence reflect their emergence from S&D. This taxonomy is primarily built upon internal IBM structure and the way that IBM organizes its products and solutions, not necessarily what exists within cities or how local governments view cities and city operations. These city systems have been grouped into three categories and include:

- Infrastructure: water, transportation, energy;
- Planning and Management: public safety, law enforcement, government and agency administration, city planning and operations, buildings; and
- People: social programs, smarter care and education (IBM, 2014d).

Before internal changes were made in January 2015, IBM's six divisions responsible for supporting the Smarter Cities Campaign each had their own marketing and communications, further diversifying messaging around Smarter Cities. With the re-organization of 2015, smart city solutions are now distributed across a range of divisions now organized by industry. Behind the scenes there have been many shifts in global leadership for this endeavor as well, each of which have involved changes in Smarter Cities narratives. Since the launch of the campaign, there have been two different General Managers for Smarter Cities, and within the marketing department, there have been four changes in leadership since the campaign's launch in 2009. Like many other large multi-national corporations, the internal landscape within IBM is always shifting, similar to a kaleidoscope of moving divisions, staff, mandates and best practices.

Adding additional complexity to Smarter Cities narratives is that fact that countries often customize their own narratives, for example Ireland and Thailand have their own country Smarter Cities landing pages (IBM, 2014k, 2014l). Countries also create their own customized white papers, such as those authored by teams within the United Kingdom (IBM, 2011i). It is clear that, given this complex matrix of divisions, roles, geography, management structures and leadership, there is not one author of a Smarter Cities narrative, nor one department or division that drives all messaging. Rather a wide range of IBMers have created, and continue to create, varying Smarter Cities stories. That said, these stories do tend to have common underlying themes, which unsurprisingly link directly to the assumptions of smart and characteristics of urban entrepreneurialism that I outlined in Chapter 2. I explore this alignment with narratives from six Smarter Cities documents below.

Early Messaging

As outlined above, IBM Smarter Cities' narratives frame cities and the challenges they face through a business lens in an attempt to get city leaders to think like business executives and see cities as described and defined by IBM. Through this lens, IBMs narratives integrate various assumptions of smart and characteristics of urban entrepreneurialism, including an increased emphasis on cities competing against each other over scarce resources (such as talent, business, investment) and hence the need to boost city brand, economic development, efficiency / optimization and community participation—each of which can be purportedly improved by tapping into the potential of the data and analytics enabled by Smarter Cities projects. While not all assumptions appear within each Smarter Cities material, several are usually referenced. Together, they serve to reinforce selective messaging around the smart city "preemptive consensus" (Greenfield, 2013) and shape the smart city imaginary (Shelton et al., 2014)

IBM's first key document to outline its views of a smart city, "A vision of smarter cities: How cities can lead the way into a prosperous and sustainable future", describes from IBM's perspective how a city's well-being can be enhanced and protected by adopting smart technologies (Dirks and Keeling, 2009). The narrative opens with IBM's viewpoint on why "power and responsibility" are moving cities to "center stage", with national level issues being moved to the local level (Dirks and Keeling, 2009, p. 3)—delineating trends instituted by neoliberal principles (Brenner and Theodore, 2002; Eisinger, 1997; Greenblatt, 2011). Due to this shift, IBM describes how cities currently face increasing threats, demands and dwindling resources; while they are concurrently met with great possibilities—potential that seemingly can only be unleashed through the power of smart technologies:

> …cities face a range of challenges and threats to their sustainability—across their business and people systems and core infrastructures such as transport, water, energy and communication—that they need to address holistically. To seize opportunities and build sustainable prosperity, cities need to become 'smarter'. (Dirks and Keeling, 2009, p. 1)

Thus, in the first external document created to share IBM's vision of the smart city, the authors underscore neoliberal influence on the devolution of state power while conveying assumptions associated with the concept of smart and outlining the necessity for smart technology adoption. To spur more immediate action, they list the imminent threats that can be mitigated and describe the sustainable prosperity that can be delivered if these Smarter Cities solutions are employed (Dirks and Keeling, 2009). Technology is portrayed as an enabler of this transformation, where change can be made that heretofore was not possible.

The document goes on to set the stage for what it will take to become a smart city, stating that it is a "journey… not an overnight transformation" (Dirks and Keeling, 2009, p. 2). In other words, it is a progression of many smart city projects that make a city smarter, not just one project that magically makes a city smart—i.e., a continuing relationship with IBM will be required. And, the authors note, to get to this destination of smart, there will many different paths, for smart city solutions vary across city systems and services. Transformation will be required: "cities must prepare for change that will be revolutionary, rather than evolutionary, as they put in place next-generation systems that work in entirely new ways" (Dirks and Keeling, 2009, p. 2). Hence, the narrative alludes to changes that must take place within the ways that local governments do their work, changes that are enabled by smart technologies and that will purportedly help city leaders to "better understand and control their operations and development" (Dirks and Keeling, 2009, p. 4). Changes that purportedly cannot be made or sustained without IBM and its Smarter Cities solutions. Finally, it is important to note that within this first narrative document IBM describes the city as a system of systems (Dirks and Keeling, 2009, p. 9). For it is this statement that provides IBM with a strong platform upon which it can enter the smart city market, for it is considered a master of systems integration (Harrison, 2010; Harrison et al. 2009).

This initial narrative was soon followed by another white paper that outlined how cities could assess their level of smartness. Soon after, numerous other narratives emerged from varied divisions and geographies, in speeches, white papers, presentations, social media, websites, etc.—each developed from an iterative process of trying to cater Smarter Cities narratives to a specific purpose, audience and need. This flurry of narrative activity led Smarter Cities management in 2012 to seek to clarify IBM's perspective on smart cities and update the overall messaging based on technological advances, market changes and learning since the launch, leading the company to create its first point of view on this topic: "Smarter, More Competitive Cities. Forward-thinking cities are investing in insight today" (IBM, 2012e). This POV document reinforces numerous assumptions associated with the concept of smart—an emphasis on the use of technology for the perceived benefits that this brings; a local government focus on economic development, city competitiveness, and economic and political efficiency; and a pro-business bias. It opens with generalized challenges that cities supposedly face, and infers that if local governments are not using smart technologies to help address these challenges, they are not "forward-thinking". For example, it notes that "cities today are facing significant challenges including increasing populations, aging infrastructures, and declining budgets" (IBM, 2012e, p. 1); despite the fact that there are numerous cities around the world, especially in Europe, that face decreasing populations for instance. It goes on to state that "forward-thinking cities are addressing these challenges and taking action now—focused on staying competitive, maximizing the resources at their disposal and laying the groundwork for transformation" (IBM, 2012e, p. 1). Accentuating this point of being "forward-thinking" it notes that IBM is "seeing the most advanced cities focus on three areas of expertise: leveraging information to make better decisions; anticipating and resolving problems proactively; coordinating resources to operate more efficiently" (IBM, 2012e, p. 2). Hence, 'advanced', "forward-thinking" local governments are using smart technologies and developing these three areas of expertise. Cities not doing these things are, by default, backwards and stagnant.

The messaging within this document serves various purposes. In part, it responds to the awkward position of IBM—where it is telling cities how they must deal with growing financial austerity while also asking for scarce funding to implement Smarter Cities projects (White, 2015). Thus, in addition to noting increased efficiency, it also lists a myriad of proposed gains that can be attained by implementing smart technologies, including a boost in city brand and attractiveness. This enhanced city brand, as described in the document, will help defer costs associated with Smarter Cities projects because the new smart city image will entice new resources, including business, talent and investment. The title conveys it all—smart cities will be more competitive, and those local governments aiming for a brighter future are investing in smart technologies today.

Additionally in 2012, the narratives around smart projects evolved to reflect new growth plays for IBM: cloud, analytics, mobile and social (IBM, 2012f, 2014j). For example, IBM S&D changed the IBM Smarter Cities landing page to include these areas of focus and how they relate to cities becoming 'smarter':

> Smarter cities of all sizes are capitalizing on new technologies and insights to transform their systems, operations and service delivery. Competition among cities to engage and attract new residents, businesses and visitors means constant attention to providing a high quality of life and vibrant economic climate. Forward-thinking leaders recognize that although tight budgets, scarce resources and legacy systems frequently challenge their goals, new and innovative technologies can help turn challenges into opportunities. These leaders see transformative possibilities in using big data and analytics for deeper insights. Cloud for collaboration among disparate agencies. Mobile to gather data and address problems directly at the source. Social technologies for better engagement with citizens. Being smarter can change the way their cities work and help deliver on their potential as never before. (IBM, 2014d)

Hence cloud, analytics, mobile and social were integrated into the process of cities becoming smart. An important part of this messaging to note is that these four areas are also seen by IBM as being key for businesses to maintain their competitive edge and grow their market share. Within this messaging, cities are analogous to businesses, city leaders to CEOs, and citizens to consumers.

<u>Story Refresh</u>

In 2013, IBM released a white paper entitled: "Improving economic competitiveness and vitality. A smarter approach to economic development" (Dencik, 2013), which also emphasizes economic growth, city competitiveness and how smart projects—through data and analytics—can contribute to both of these

> Creating attractive and competitive business environments is key to the success of cities… whether a mature or emerging economy, locations that manage to create positive business environments stand to gain tremendously from increased economic growth, job creation and prosperity. (Dencik, 2013, p. 1)

It goes on to elucidate how cities can make this happen:

> cities… with agile economies achieve a successful balance between business and talent that leverages the development and adoption of

> technology and innovation to achieve sustainable economic growth. They are able to attract, develop and retain indigenous talent while leveraging the potential of technology. (Dencik, 2013, p. 2)

In other words, through technology adoption and pursuing smart technologies, local governments are able to help secure a better future for their constituents by attracting the business, investment and talent required for economic growth. Within this narrative, Dencik restates many of the assumptions associated with smart—for example, that smart projects spur economic growth and attract resources, and that smart projects make a city more competitive. Another important aspect of this document outlines the growing emphasis on the importance of data, reinforcing a push toward data centrality and viewing problems through a solutionistic lens. Here IBM is conveying its desire for local governments to become more data-centric. But, it also alludes to something more complex than data gathering—the potential services that may be associated with the accompanying analytics, thereby yet again seeking to expand IBM's reach into the smart city market. It goes on to state that local governments cannot just gather data and expect gains; rather local government actors must be able to analyze these data in ways that enable "actionable insight", and the types of advanced analytics to generate this 'insight' is usually only available through tech providers like IBM (Dencik, 2013, p. 8-11).

In 2014, IBM's point of view document was updated (IBM, 2014j) to: "Smarter, More Competitive Cities. Cultivating charisma, resiliency and vitality"—a work that basically emphasizes the same assumptions of smart from the previous POV. However, this POV broadened its narrative to include more citizen-centric messaging—tapping into another assumption of smart around community participation; again looking to broaden the market. For example, within the document's narrative, the key to becoming 'smarter' is rooted in taking fundamental actions: "leading with vision and deep insight, building resilient, sustainable infrastructure, and *enabling individuals' health and productivity*" (IBM, 2014j, p. 1, emphasis mine); thus opening up the door for smart solutions and services related to employment, labor skills, education and healthcare / social services. It also goes on to state that: "leaders are innovating across services to meet the increasing needs and expectations of citizens and businesses" (IBM, 2014j, p. 2), acknowledging outright that city residents are a key part of the equation. This change can be traced in part to an attempt to better target messaging for local governments, and to help broaden applicability of IBM services and solutions to grow potential market share. Within this narrative, intralocal competition, ‘evidenced-based’ decision making, efficiency and network governance are also emphasized in the directive that IBM provides for local governments: “to build the strong, differentiating identities that attract new citizens and businesses, visionary cities are looking for ways to better integrate across functions, capitalize on new insights, create system-wide efficiencies and collaborate in new ways” (IBM, 2014j, p. 1).

The underlying story throughout these IBM documents is clear—cities are increasingly competing against each other and face a wide range of imminent threats; to deal with these challenges and secure a prosperous future, city leaders need to turn to smart technologies. With the consequent enhanced abilities for data gathering and analytics, the story continues, leaders will be able to enhance city efficiencies and brand, thus extending and attracting resources that contribute to economic growth. While keeping true to this underlying story, Smarter Cities Marketing and S&D staff note that they have made iterative changes within these narratives to account for market realities and evolving technology and understanding, with customization for various audiences and intents, and revisions as the company has learned from its clients and business partners and as technological advancements have been made. Hence, as noted by one IBM Smarter Cities S&D Executive, IBM’s Smarter Cities narratives are in “constant renewal”, continually being “refreshed” as markets, needs, purposes and conditions fluctuate. Despite this, or perhaps because of this, most IBM narratives around Smarter Cities strive to remain simplistic in the way that they describe cities and city systems, infrastructure and services. This “technocratic reductionism” is, as described above, accompanied by smart assumptions and characteristics of urban entrepreneurialism, and in turn, shapes project design and implementation (Söderström et al., 2014).

5.2 *Diffusion through Reductionism*

To make its Smarter Cities campaign globally applicable, IBM staff have had to reduce the complexity of cities both discursively and in terms of product (McNeill, 2014). Generic descriptions of urban challenges are replete within IBM literature in an attempt to create narratives to which a wide range of city leaders from around the world can relate (IBM, 2009a, 2010a, 2010b, 2011a, 2011i, 2012e, 2014a, 2014d, 2014j). To address these 'universal' problems, IBM offers a set of standardized solutions that are easily replicated, scaled and implemented akin to 'plug and play' (McNeill, 2014). As described in a report providing an overview of the Smarter Cities Challenge projects, "one of the biggest surprises for the IBMers is how much cities have in common. Whether they're overgrown towns or giant metropolises, fast-growing or mature, the problems cities face are amazingly similar. And so are the potential solutions" (IBM, 2013d, p. 8).

This oversimplification of cities and their ills has affected how IBM staff have understood and approached their work. IBM staff try to broadly apply Smarter Cities solutions regardless of city size, socio-economic status, context and location—with some local governments rejecting this one-size-fits-all mentality. As noted by McNeill (2014), "both the 'problem-solving' epistemology and the flat ontology of how cities are understood are part of a process of reducing difference despite the global distribution and political heterogeneity of client cities" (p. 17). While this is not the first instance of reductionist approaches to urban challenges, given that most large tech providers seem to also espouse this notion, as smart projects spread this could potentially serve as an obfuscating force within urban discourse for city leaders seeking to genuinely understand the issues that their cities face. As the city is simplified in urban discourse through the growing discursive activity of tech giants pushing their messages, it is also reduced through the implementation of smart endeavors, one project at a time. For, through each Smarter Cities solution implemented, IBM serves as a potential conduit for the diffusion of its associated knowledge, practices and processes that are required to implement it.

As an example, IBM's Management Centers are being heavily promoted by IBM given the purported relative ease and associated cost-effectiveness to replicate and scale these solutions (IBM, 2014b). These “cloud-based management centers help municipalities capture the potential of data, analytics and new modes of engagement via digital services” by combining “Intelligent Operations software, IBM Global Business Services expertise, and IBM’s broad analytics capabilities”, with the aim of delivering immediate value, “often getting insight from data in as little as a week” (IBM, 2014b, p. 2). These Management Center solutions enable IBM to vertically integrate across various internal brand silos—for instance consulting and software services—while also emphasizing its analytic capabilities. To date, IBM has created these Centers for emergency management, transportation and water, and plans on scaling them to other areas such buildings, healthcare and employment (IBM, 2014b). The vision is that these Centers be applied universally across cities, and systems within a city. “For example, Miami started with just one water project, and now they have 19 projects helping to improve everything from bus routes to terror alerts” (IBM, 2014b, p. 2).

As the application of these Management Centers spreads, there will be a standardization of the way that city challenges are viewed, understood and addressed, which will stem from the uniform way that information about these challenges is gathered, analyzed, presented and disseminated. By installing this software, city leaders are committing to understanding and engaging around city events in the fixed manner that is presented by the software’s programming, algorithms and data configuration. Thus, through the purchase of Smarter Cities solutions and the features of the associated software, local governments are implicitly agreeing to this corporately-motivated simplification of urban life and functioning (McNeill, 2014). This type of transfer however is not unique to IBM or its Smarter Cities endeavors.

The global diffusion of corporate knowledge, practices and processes stems from the way that multinational corporations, including large tech firms, organize their information and are internally structured—which together affect how “knowledge is commodified, packaged, mediated, or transmitted, and how this plays out in different spatial locations” (McNeill, 2014, p. 5). As Faulconbridge puts it:

> The ‘network management strategies’ used by global PSFs [professional services firms] to exploit, configure and construct global practice-based and relational spaces of learning are central to the success of the global production of new knowledge through social practice. As a result, both the ‘cognitive’ (practice based) spaces and the ‘social’ (relational) spaces needed for learning…creates communities or constellations of learning that stretch beyond scale-defined boundaries… (Faulconbridge, 2006, p. 537 in McNeill, 2014, p. 6)

In the case of IBM, it uses various different information sharing channels to disseminate information about its Smarter Cities solutions and narrative themes to its offices around the world. As cities gravitate to this type of standardization of city challenges through smart project solutions, it raises various questions about the implications of these software, hardware and consulting service purchases, and how they may be contributing to the view that cities are the same, with interchangeable systems, challenges and solutions. This standardization occurs through implementation, as well as through those who implement these endeavors.

5.3 Smart “Traveling Technocrats”

As tech giants grow the smart city market and implement their solutions around the world, they spread their perspectives, processes and models with other involved actors—stakeholders that, more often than not, willingly accept these approaches under the assumption that these firms are rational and informed (Ariely, 2009). In the case of IBM, as centralized IBM staff in various countries receive this information and begin to implement the associated practices and processes, they interact with other local actors outside of IBM. And, the more that IBM staff intermingle with external actors—whether local government, other tech providers, or various third party actors—around Smarter Cities, the more channels that are created for diffusing the company’s viewpoints, approaches and frameworks within this space. Wendy Larner and Nina Laurie (2010) note this phenomenon through their examination of how through networks of “travelling technocrats” of water and telecommunication engineers, privatization knowledge travels and begins to inform place. Further, as cities integrate this knowledge and the associated practices and processes transferred by IBM, they begin to share it with each other, also acting as agents for knowledge transfer through consultants brought in to help integrate smart technologies across city systems (Hoffman, 2011 and McCann, 2011 in McNeill, 2014). In cases where the solutions did not work well, this information is also shared amongst city leaders as cautionary tales. This pertains to the solutions and offerings as well as the consulting services around them.

As a provider of smart city technologies, IBM offers the associated hardware, software and potentially middleware required for implementation, as well as IT related consulting services. Historically, IT consulting has stemmed from the field of management consulting, which has helped open the door to the types of services frequently provided as part and parcel of smart projects. In his book The *World's Newest Profession: Management Consulting in the Twentieth Century*, Christopher McKenna (2006) outlines the history of management consulting and how it has shaped organizations and business practices around the world, and what risks have emerged as a result of the growth of this profession. In the United States, management consulting emerged as a discipline in the 1930s, where ‘qualified’ professionals advised corporate executives on strategy or financial structure under the assumption that these external experts were more qualified to deliver this advice than the people who actually ran the organizations (McKenna, 2006, p. 2-3, 8). While the idea of seeking external counsel was not new, in the past it was traditionally done for political versus commercial reasons (McKenna, 2006, p. 10). Facilitated by 1930s antimonopoly legislation in the United States, the profession grew over the next seven decades and spread internationally; and, “for better or worse, government officials, nonprofit managers and corporate executives came to depend on this new ‘mandarin’ elite, and although suspicious of the advisors’ motives, grudgingly accepted the utility of these experts” (McKenna, 2006 p. 11).

In IBM’s case, the organization was prohibited to provide IT consulting services due to post-World War II antitrust regulations that sought to limit the power of monopolies and the containment of organization knowledge. Thus in 1956, IBM had to withdraw from the up and coming field of IT consulting, which was soon dominated by the large accounting firms that provided management consulting services (McKenna, 2006, p. 21). In addition, within this U.S. Department of Justice decree, IBM was required to sell and not lease its machines, as well as make its proprietary technology available to the company's competitors, thus limiting its competitive ability for the next thirty-five years (McKenna, 2006, p. 22).[36] This antitrust case was dropped in 1982, and the consent decree expired in 1991. By 1992, IBM entered into the field of management consulting by inaugurating its consulting subsidiary, the IBM Consulting Group. By 1996, this group delivered an annual revenue of $11 billion, nearly one-fourth of the company's total revenue at the time (McKenna, 2006, p. 23). The ability for IBM to offer these types of consulting services has contributed greatly to the firm's strong presence in the smart city market.

While there may be gains from bringing in external advisors for strategic and financial managerial decisions, there are also risks associated with using management consultants (McKenna 2006)—risks that also apply to services around smart initiatives. While the gains derived from the specialization of knowledge dates back to Adam Smith's *Wealth of Nations* (1776), the question remains as to why within the field of management consulting do organizations, institutions and government units feel the need to pull in external professionals rather than bring this type of knowledge into the firm (McKenna, 2006, p. 12). Certainly, while some local governments have, and will continue to, create roles that support cities increasingly adopting and integrating smart technologies into city systems and services, and the management all of the related data and analytics that this will entail, external consulting services and solutions will still be utilized.

This points to a crucial flaw within the reasoning presented by IT providers behind their pitch for smart city solutions. As posited by IT providers, increasing competition amongst cities necessitates "forward-thinking" local governments to differentiate their city from its competitors. And, as positioned by tech giants, smart city solutions are an affordable and effective way to do so (IBM, 2012e). To implement smart city solutions successfully, local governments must turn to IT

[36] With IBM's strategy focusing on cloud computing, the firm is trying, in part, to go back to the leasing model, where clients 'rent' versus own solutions (IBM, 2014b).

providers, who will provide the required hardware, software and middleware, as needed, as well as the adjoining consulting services. Yet, as these same IT providers work with numerous local governments, differentiating smart city approaches and techniques learned within one city will soon be transferred to other cities around the world. Thus, the 'competitive advantage' created by one city is quickly diminished as IT provider spread their wares (McKenna, 2006, p. 14).

Even IBM has been fleeced through this type of experience. In the late 1950s, the then President of IBM, Tom Watson Jr., brought in an external management consultant, John Burns, who was allowed access to sensitive data, including detailed knowledge about the firm's organization and methods. Within three months of completing the consulting assignment, Burns became head of the Radio Corporation of America (RCA), a direct competitor at the time (McKenna, 2006, p. 250). "For years afterwards, the standing joke around IBM was that if you allowed a consultant inside the company, your competitors would know your secrets within 6 months" (McKenna, 2006, p. 250). Thus, IBM itself knows that if you use consultants to gain a competitive edge, what they learn by assisting your firm will be transferred to your competitors when they seek out consulting services. And, as this is true within management consulting around strategy and finance, the same applies around smart city projects. While making a city 'smart' may differentiate it from its competitors for a time, before long this edge will be lost as smart solutions and their associated packaging spread. This draws into question the notation that, while the technological advances associated with smart initiatives are real and have the potential for beneficial outcomes, perhaps the smart urban labelling phenomenon associated with these advances offer more fad than substance (Albino et al., 2015; Kitchin, 2014b).

5.3.1 A Fleeting Fad?

Within business management literature, various academics have been exploring innovation diffusion to better understand how and why technological innovations spread within private sector firms. In some cases, technological innovative "fads" have proved to be harmful to organizations and yet continue to spread regardless (Abrahamson, 1991). For example in the United States, in the face of growing international competition—not unlike what cities are facing amongst each other—businesses have easily fallen “prey to every new management fad promising a painless solution, especially when it [has been] presented in a neat, bright package” (Mitroff and Johrman, 1987, p. 69 in Abrahamson, 1991, p. 588). But, simple formulas are bound to fail: “by definition, simple formulas cannot cope with complexity, and complexity is what today’s world is about” (ibid.). In this manner, questions arise about smart endeavors, where complex urban challenges are reduced to matters that can be solved with algorithms and data; where growing intralocal competition makes local governments feel increasingly compelled to jump to the newest urban “fad” to give their city a competitive edge. And, as innovation fads “fulfill symbolic functions such as signaling innovativeness, but do little to boost organizations’ economic performances” (Abrahamson, 1991, p. 588), one wonders if the same applies to smart cities (Wiig, 2015).

Innovation fads have also been found harmful to organizations when firms rapidly leap from one technology to the next, so that skills required do not have time to develop, nor the technology have enough time to work (Lawler and Johrman, 1985 in Abrahamson, 1991). Similarly, innovative fads can lead organization leaders to rapidly jump from one problem to the next, so that problems are not resolved because not enough time or attention is focused on them for the chosen technology to work (March and Olsen, 1976 and Schon, 1971 in Abrahamson, 1991). By extension, it is easy to see how this could apply to smart projects, where due to increasing between cities, city leaders feel compelled to jump too rapidly from technology to technology, and problem to problem, so that whichever smart city innovation is chosen ends up not working since it is not given enough time to be effective. Where pressure for being viewed as, for example, the ‘smartest’, ‘greenest’ (“Eco-city”, see Register, 2006) or ‘most creative’ (“Creative City”, see Florida, 2002; Vanolo, 2008) means that local government effort becomes slave to image over substance.

5.3.2 Examining IBM

Since the emergence of academic investigation into the smart city trend, there have been a range of explorations that have focused on IBM, including the work of:

Donald McNeill (2014); Ola Söderström, Till Paasche and Francisco Klauser (2014); Anthony Townsend (2013); and Alan Wiig (2015), among others. These accounts of IBM as a smart city actor have been advanced from positions external to the firm. My positioning allows me to bring new insights, and certain correctives, to these debates. Ola Söderström, Till Paasche and Francisco Klauser (2014) look at IBM's Smarter Cities campaign through the lens of Actor-Network-Theory and critical planning theory to describe how the company has constructed its narratives to build smart city market share by making IBM an "obligatory passage point" (Callon, 1986) in the application of smart city technologies (Söderström et al., 2014). In a sense, they argue that IBM's attempt to own 'the' smart city story is a ploy to own the smart city market—by controlling the narrative, IBM controls the ways in which these projects expand, develop and unfold. And while this is correct, for the very purpose of marketing is to win and secure market share, they oversimplify IBM, its narratives around Smarter Cities, and the purposes for which these stories are created. For example, Söderström et al. (2014) mistakenly refer to IBM as a cohesive unit that tells 'the' IBM story. They assume that the same story is told across the corporation, and make no mention of other types of actors who tell the story. As demonstrated in this chapter, there is a mosaic of IBM's Smarter Cities narratives emanating from this organization around smart cities. In addition, through my analysis I have found that local government partners can become even more vocal and boosterish than the corporation in storytelling, as evidenced below in my Dubuque case study.

While the works of Townsend (2013, pp. 8-9, 15, 31-32), McNeill (2014), Wiig (2015) and Söderström et al. (2014) provide interesting insight into IBM and its role in shaping smart city rhetoric and the associated processes involved with implementation. However, each of these authors overemphasize the importance of IBM's Smarter Cities Challenge when it comes to sales and the organization's Smarter Cities strategy. The SCC is a grant facility that dedicates IBM staff services and time to develop specific project recommendations for a challenge city leadership has identified (the scope does not include actual project implementation). To put it simply, the SCC is a mechanism to provide city leadership with free, solicited technical advice. While the SCC has been instrumental in furthering the education of

IBMers, raising awareness of IBM's expertise in this market, and 'conditioning' the smart city market by helping to 'sell' IBM's smart city vision, according to two IBM staff who work with the SCC, it is part of IBM's philanthropic arm and has tangential ties to sales. And, while the Smarter Cities strategy may inform the SCC, key IBM staff who helped derive the Smarter Cities strategy state that the SCC is not a central strategic focus.

Wiig's (2015) analysis of IBM smart city efforts conflates Smarter Cities Challenge endeavors with IBM Smart City projects. The former are very short-term pilots designed to deliver suggested recommendations to city leadership; the later are initiatives implemented for a paying client. It should be noted that many SCC recommendations are not implemented by city leadership after the grant expires. Thus within Wiig's analysis, there is a blurring between suggested recommendations around a specific challenge with policies that may be transferred during actual project recommendation. While there may be policy mobility within both, it is much more likely to occur within paying projects that are implemented than three week technical advisory pilots. Further, Townsend (2013, pp. 82-87) and Söderström et al. (2014) overemphasize the importance of the Systems Dynamics for Smarter Cities project—which was a one-year, pro bono research endeavor that did not yield a durable solution. Thus, to indicate it as a keystone project within IBM's Smarter Cities campaign, as both do, demonstrates a lack of clarity around the smart city solutions and offerings that IBM actually offers. With the cacophony of narrative themes that has emerged from IBM around Smarter Cities, it is easy to understand how certain aspects of the Campaign can be misunderstood. Despite this potential for confusion, other tech providers have joined IBM in promoting the smart city.

5.4 Spreading the Message

Since 2009, IBM's narrative content around its Smarter Cities campaign has been pushed through paid and owned media[37]—in press releases, commercials, ads,

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[37] Paid media consists of things like traditional radio commercials or newspaper advertisements, where the organization doing the marketing pays another firm to host their content. Owned media is

videos, social media, websites, PowerPoint presentations, events, interactive gaming websites, white papers, Redbooks, POVs and assessment tools, among others. And, earned media has contributed to creating and recreating smart narratives. These narrative efforts have been regarded as quite ‘successful’ by those within the marketing industry. IBM’s Smarter Planet campaign, of which Smarter Cities is part, has been nominated by Advertising Age[38] as one of the top ad campaigns of the century—that said, it is only 2016 (AdAge, 2014a).

Figure 13. Images of People for Smarter Cities ads

Source: FL Headlines, 2013.

The story around smart projects has been purposively crafted by IBM to be compelling and to relate to all those who read it. Visual imagery, including functional ads (shown in Figure 13), have also been used to raise awareness of IBM’s work in the smarter cities space. These ads serve a purpose—as a bike ramp, a seat, or cover from the rain—while also selling IBM and its Smarter Cities brand. Numerous of these ads were placed across Paris and London in 2013 to promote the launch of IBM’s People for Smarter Cities, a social website IBM created to encourage city resident discussions around making cities ‘smarter’. These ads have won a wide range of awards, including the Grand Prize at the 2013 Cannes Lions International Festival for Creativity for outdoor advertising, further demonstrating

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where the organization doing the marketing creates and publishes / releases its own content (videos posted on free channels such as YouTube, self-published books). Earned media is organic and includes things like chatter on Facebook or Twitter, and / or the viral spread of videos or content through YouTube, email, etc. as well as news coverage (Owyang, 2012).

[38] “Advertising Age is recognized as the leading global source of news, analysis and inspiration for the marketing and media community. Advertising Age includes ongoing coverage of strategic topics for marketers from mid to large companies complemented by breaking news and a database of the world's best creative” (AdAge, 2014b).

the strength of IBM’s brand and marketing efforts around Smarter Cities (FL Headlines, 2013).

While the term smart city predates IBM’s usage, the company’s Smarter Cities narratives are considered so ‘successful’ and ‘effective’ that other companies have started adopting Smarter Cities messaging and making it their own—such as Cisco’s Smart+Connected Communities. In fact, when looking at narrative themes around smart projects created by other IT providers, there are many similarities to those promoted by IBM. For example, Cisco, General Electric and Siemens all note how, in their opinion, through the gathering and analysis of city data, smart technologies enable a better understanding of city systems and how they relate to each other, enabling more effective systems management, and hence, a more sustainable and prosperous future (Cisco, 2010; General Electric, 2011; Siemens, 2010). These providers, along with IBM, claim the same smarter cities gains, which align with the assumptions associated with smart, including among others, increased city efficiencies, improved city brand, talent and resource retention / attraction, local economic development, enhanced city resident participation and sustainability. Each of these actors also attribute these gains to capabilities enabled by smart technologies, such as an enhanced ability to measure and therefore manage—reinforcing the preemptive consensus around these endeavors (Cisco, 2010; General Electric, 2011; Siemens, 2010). Concurrent to this external influence IBM has had on the smart city market, the Smarter Cities campaign and its associated market externalities have also had impact on the organization.

5.5 Sparking Internal Change

While the role and involvement of IBM in the smart city market has implications for smart city reimagining and the redesign of urban governance, there have also been internal effects resulting in the organization’s transformation—where the smart city market is changing IBM. In the early days of this campaign, IBM Marketing & Communications and Sales & Development teams quickly learned that targeting cities for business meant understanding new types of buyers. Instead of focusing solely on the IT department and the Chief Information Officer, these units recognized that IT decisions were increasingly being made within various city departments by a range of different types of city leaders: chiefs of police, transportation managers, traffic planners, utility representatives, security directors, health care officials, heads of social programs and city managers, among others (IBM, 2014c). So, to better understand this new market and these new buyers, the teams began creating "blueprints" and "journey maps" that would help local government clients understand IBM's vision of a smart city and what needed to be done to implement these types of projects. At the same time, the development of these materials helped educate involved IBM staff at a basic level on local government structure, needs and functioning.

Before internal changes were made in January 2015 and January 2016,[39] IBM had six divisions primarily responsible for implementing Smarter Cities engagements—Software Group (SWG), Global Business Services (GBS), Systems & Technology Group (STG), Global Technology Services (GTS), Cloud, and Research. During the first few years of the Smarter Cities campaign, as these teams began to better understand how cities operated, they realized that, in the words of one senior M&C executive who I interviewed, "real transformation is not just IT but building the competence of how to do it". In other words, a smart project involves more than just adding IT to city systems—it is more than just a software or hardware sale. Additional training and consulting are often required to stand up these projects. Local government staff responsible for running these projects have to know where and how to find relevant data, how to check to for data accuracy and address inaccuracy, how to run analytics, and how to put in context what the analysis is telling you, among others. In effect, as IBM implemented these projects, involved staff learned that smart projects require expertise from across IBM brands—research, software, hardware and consulting—divisions that, until January 2015, operated

[39] On January 6, 2015, Ginni Rometty, the company's President and CEO, noted major changes for the company which included breaking down old divisions (or internal brands) and creating new divisions organized by industry, such as: IBM Analytics, IBM Commerce, IBM Security, IBM Watson, IBM Cloud, IBM Healthcare, and IBM Systems, among others (Rometty, 2015). Note that these changes affected all IBM operations, not just those that supported the Smarter Cities campaign. In January 2016, Rometty announced a new strategy for IBM, a focus on cognitive and cloud (Hiner, 2016), which resulted in another round of internal reorganization.

independently of each other within IBM, and at times, even competed with each other. So, for Smarter Cities (and Smarter Planet) projects to be effectively implemented, significant internal changes would have to take place within IBM to encourage staff to work across divisional boundaries. These changes became reality in January 2015, effectively transforming the way IBM works internally,[40] with the main impetus being a desire to speed the time taken to go to market and diminish hindrances from working within internal brand silos (Rometty, 2015). In this sense, the launch of IBM's Smarter Cities and Smarter Planet campaigns created a "stable discursive signifier(s)" that enabled the orientation of "several vertically integrated elements of the firm's core businesses" (McNeill, 2014, p. 4).

With an increased focus on Smarter Cites, IBM management also recognized that given local governments were a new type of client, the company would quickly have to build expertise in this realm. So in 2010, IBM launched the Smarter Cities Challenge, a philanthropic program that stemmed from an existing leadership-development program, the Corporate Service Corps. The SCC, which is still operating, functions like a mini "consulting Peace Corps for smart cities" (Townsend, 2013, p. 65), brings together a team of six IBMers from around the world, and across IBM divisions, for three weeks to work pro bono on a challenge identified by a local government that had been awarded an SCC grant, which basically covers the services in kind. IBM staff chosen to serve on a SCC team may, or may not, be involved with the teams directly responsible for implementing the Smarter Cities endeavors designed for paying clients. Each team is responsible for delivering project recommendations to a specific challenge that the city leadership had identified. It is then up to city leaders to act upon these recommendations or not (funding was not provided for implementation).

According to two SCC project staff members who I interviewed, while strengthening IBMer leadership skills, the heuristic program has also helped IBM staff learn from city clients and showcase its expertise in this market. This experience has been

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[40] IBM's work with Smarter Cities / Smarter Planet was just one data point of many that gave insight on the need for internal restructuring so that IBM brands, or divisions, would better be able to work together versus compete with each other.

tremendously valuable to IBM—as it has helped ramp up skills across the company related to local government consulting in a matter of years. According to the SCC landing page, over 100 cities have received US$50 million of pro bono services within the first three years of program operations. It is IBM's largest philanthropic initiative, and has targeted cities such as Abuja, Nigeria; Accra, Ghana; Ahmedabad, India; Antofagasta, Chile; Belfast, Northern Ireland; Birmingham, United Kingdom; Bucharest, Romania; Cebu, Philippines; Cheongju, Korea; Chonburi, Thailand; Curitiba, Brazil; Da Nang, Vietnam; Durban, South Africa; Faro, Portugal; Nairobi, Kenya; and Sendai, Japan, among others. The SCC programs have varied in city size, challenge faced, socio-economic status and geography in an attempt to help build knowledge that spans global city experiences (IBM, 2014a).

Yet, while the focus of the SCC engagements may be informed by IBM Smarter Cities strategy in terms of geographic areas to target or types of projects to fund, two SCC project staff state that the program is not tied to sales or part of a pre-sales effort (meaning that any leads generated are not tied back to individuals for follow-up). As noted by one Smarter Cities Sales S&D lead, "some of my sales colleagues don't even know what Smarter Cities Challenge means". However, the program does play an important role in 'conditioning' the smarter cities market—it raises awareness of new ways that smart technologies can be applied within cities, helps city leaders understand Smarter Cities solution applicability and potential gains, and opens the door for future relationships with IBM to develop. And, as discussed in Chapter 2, it also has served as a means for recipient city leaders to use the initiatives to promote their cities as smart—primarily in an attempt to spur economic growth and attract new resources due to the boost in city image (Wiig, 2015).

In addition to changes in organizational structure and evolution in learning and leadership development skills, over the past six years IBM has also developed new business models to help cater to local government clients. This has required shifts in pricing, typical project size and approach. Smaller projects have been created for more quick fixes and rapid returns, for both IBM and the local government. To help drive down costs, IBM now offers a slew of solutions that local governments can buy and have delivered online through the cloud. IBM has also devoted extensive research to see how big data, mobile and social can be further integrated into their solutions to help make them more accessible and palatable to local governments (IBM, 2014b, 2014c).

Conclusions

In the second quarter of 2012, IBM reported that its revenue from Smarter Planet projects, of which Smarter Cities is a part, grew by more than 20%. At the end of 2013's first quarter, it reported that Smarter Planet revenue grew by more than 25%; and when combined with its expansion to include big data analytics, cloud computing and growth in emerging markets, together these opportunities would account for $20 billion in incremental revenue from 2011 through 2015 (Deagon, 2013 and Lohr, 2013 in Paroutis et al., 2014). This data indicates that IBM has had at least some success in its efforts to create and capture the smart city market. Part of IBM's strategy to make and shape this market has included creating a range of stories to sell its Smarter Cities offerings and solutions. These narratives reflect the various divisions within IBM seeking entrée and capture within the smart city market—for IBM's approach has been so entrepreneurial that even within the company there is competition between and amongst different divisions to gain market share.

Within IBM's Smarter Cities narratives, the city is portrayed through a business lens so that city leaders are more apt to think like private sector executives and to see their city as IBM describes and defines it. In this effort of market creation, there is not one IBM Smarter Cities narrative; rather, stories around Smarter Cities have been created across divisions, roles, geography, management structures and leadership, for various audiences and with varied intent. Despite this variation, IBM Smarter Cities narratives have reinforced assumptions of smart and characteristics of urban entrepreneurialism by emphasizing: intralocal competition over scarce resources, the need to boost city brand, and how smart city solutions can spur economic development, enable optimization and facilitate community participation (Dencik, 2013; Dirks and Keeling, 2009; IBM, 2012e, 2012f, 2014j). In this fashion, these narratives reinforce selective messaging around the smart city “preemptive consensus” (Greenfield, 2013).

To improve global applicability, IBM has reduced the complexity of cities both discursively and in terms of product. Generic descriptions of urban challenges are common within IBM literature so that they relate to a wider audience. This oversimplification of cities and the challenges they face has informed how IBM staff have understood and approached their work (McNeill, 2014; Söderström et al., 2014). And, given that PPPs are frequently common for smart city project implementation, this reductionism spreads through associated partnering arrangements. The more that IBM staff work and deal with external actors on these projects, the more channels are created for diffusing the company’s viewpoints, approaches and frameworks (Wiig, 2015). And, as cities integrate this knowledge and the associated practices and processes transferred by IBM, they begin to share it with each other, also acting as agents for knowledge transfer through consultants brought in to help integrate smart technologies across city systems (Hoffman, 2011 and McCann, 2011 in McNeill, 2014). Even IBM’s competitors have adopted the smart city nomenclature and integrated this into similar narrative themes as they attempt to build and gain shares within the marketplace. In this manner, IBM’s role and involvement in the smart city trend has had implications for how cities are being reimagined as smart and how this may inform the redesign of urban governance mechanisms.

The permanency and character of this potential redesign however is unclear. While branding a city smart may, purportedly, differentiate one city from another, as smart solutions spread this perceived competitive edge will be diminished. For while the technological advances associated with smart projects do have the potential for city gains (for the local government and city residents), the attractiveness of selling a city as smart will be reduced over time as the market becomes saturated. That does not mean that the solutions / technologies now deemed smart will not persist; rather, the emphasis on them being smart may change.

In the next four chapters below, I further explore this notion of the redesign of urban governance through IT provider interactions by examining smart projects in situ. I begin with the case study of Dubuque, and look specifically at: (a) how interactions with IBM have informed city objectives, priorities and approaches and what might be the implications of this interaction; (b) how smart projects have changed the roles and expectations of local government and city residents, and what IBM's role in this transformation has been; and (c) how smart project narratives and brand, informed by that promoted by IBM, have potentially informed the redesign of urban governance mechanisms.

6 Dubuque: Redesigning Urban Governance through Smart

In the mid-1980s, the City of Dubuque, Iowa faced its potential death—bleak economic prospects, high levels of unemployment, and a mass exodus of residents hung heavy over the city. Despite these dire conditions, within the last two decades the economy and population levels have recovered and perceptions of Dubuque have shifted from a dying, small town to a flourishing city among Midwestern states (Acohido, 2009; BBC News, 2011; Dillow, 2011; Greater Dubuque Development Corporation, 2006, 2011a). A local government focus on sustainability, and later smart, have been factors perceived by the local government as integral to this revival. Both factors are encapsulated in the city's Sustainable Dubuque (SD) and Smarter Sustainable Dubuque (SSD) initiatives, which were created to promote sustainability and sustainable outcomes. This compelling backdrop has made Dubuque an interesting case study to explore, with rich data around how the IT provider, IBM, has interacted with local government policy and planning processes around the smart projects being implemented.

Figure 14. Images of Dubuque

Source: Images are from the City of Dubuque's website: http://www.cityofdubuque.org/ (accessed December 9, 2011).

In many ways, the City of Dubuque provided an insightful example of how smart projects can be construed as an extension of neoliberal policy experiments within urban environments given the way that these endeavors, under the auspices of IBM, directly or indirectly emphasized place marketing, intralocal competition, public-private partnerships, boosterism, business innovation and social control, among others (Peck and Tickell, 2002). Further, each of the smart projects examined exhibited the assumptions that often go along with the concept of smart and align with characteristics of urban entrepreneurialism. It is with this conceptual lens that I examine Dubuque's path to smart in Chapters 6 and 7.

In this chapter, I examine urban governance interactions with IBM through smart projects around strategy and engagement arrangements. I begin by looking at how the concept of smart has been integrated into the city's existing sustainability strategy to form Smarter Sustainable Dubuque, an initiative created to help make the city more sustainable through the use of technologies (M. Van Milligen, 2013). In this manner, I explore how the local government and involved actors in this small city have pursued, engaged around and assigned meaning to smart technologies and their applications across specific city services and systems. I examine the practices employed by the local government and IBM to help achieve SSD project objectives and priorities, and how these approaches may reinforce undercurrents of privatization, commodification and marketization of public provision. I then look at the engagement arrangements around SSD, expressed through PPPs, and how these partnerships contribute to the mobility of policy and practices amongst involved actors (Wiig, 2015).[41] I discuss how smart projects seem to be informing local government-city resident relationships and expectations between and amongst each other. I conclude that it is not yet clear if the longer-term impact will be negligible or something more fundamental that raises questions related to what smart projects may mean for civic life, government perceptions of citizens, and the relationship that exists between city residents and local government.

Observations and findings in sections 6.1-6.3 were primarily derived by examining materials—such as websites, documents, video interviews and presentations, among others—created by the local government to describe their sustainability strategy and program (Sustainable Dubuque), their overall smart city program (Smarter Sustainable Dubuque) and individual smart city projects (such as the Smarter Water and Electricity Pilot Studies). These materials reflect the meanings and understandings that these actors have assigned to SSD projects, and helped identify

[41] Given the scope of my work, I focus on how perspectives, approaches, frameworks and models employed within IBM may be transferred to actors involved in smart initiatives, primarily focusing on the local government. I do not focus on the possible transference of local government approaches or models to IBM.

the objectives and priorities that these actors have been pursuing and their approaches to achieving them. In addition, I examined materials related to the smart city projects in Dubuque created by IBM and other involved actors, as well as media coverage, to help understand other perspectives toward these efforts. Section 6.4 was informed by these same materials as well as case study interviews that I conducted for this research. Figures 8 and 9, and Appendix 11.5 provide further details on these sources. The purpose of this chapter is to understand how, through the application of concepts and theories outlined in Chapters 2 and 4, IBM has interacted with urban governance processes around strategy and engagement in Dubuque. I follow this discussion with an exploration of interactions around representation in Chapter 7.

6.1 "Masterpiece on the Mississippi"

Spanning less than 72 square kilometers, the City of Dubuque, Iowa has a population of about 60,000, with roughly 90,000 in the greater metropolitan area (United States Census Bureau, 2009). Thus, similar in population to cities such as Inverness, Scotland (Office for National Statistics, 2001), Wagga Wagga, New South Wales, Australia (Australian Bureau of Statistics, 2014) and Benevento, Campania, Italy (Istat, 2015). The city serves as the commercial, educational, industrial and cultural center for the surrounding tristate area of Iowa, Illinois and Wisconsin. While the city has had a long history of manufacturing, in the past two decades there has been a diversification of its economy to include healthcare, tourism, publishing, financial service, high technology and education. Dubuque has a gross domestic product of about $4307 million (EconPost, 2010), and despite its rocky history in the 1980s, was rated by Moody's Analytics as one of the fastest-growing economies in the United States in 2010 (Greater Dubuque Development Corporation, 2011b).

The city is situated in the American Great Plains, amongst the U.S. Corn and Grain Belts. Surrounded by small rolling hills of agricultural land, Dubuque's central business district sits along the Mississippi River—a prominent factor in the city's identity and evolution. After Dubuque was chartered in 1837, it attracted large numbers of German and Irish immigrants due to its location on the river and its abundance of land and resources. Over time, the city's manufacturing base grew and it became a booming industrial town in the late nineteenth and early twentieth centuries. The city began to stagnate after the Second World War and was hit hard during the economic crisis of the 1980s (Chaichian, 1989; Dubuque Public Information Officer, 2010; The City of Dubuque, 2009a, 2010a). In 1983, the John Deere Company, which manufactures farm equipment and in peak times provided about sixty percent of the industrial jobs in the city, laid off roughly half of its employees (Chaichian, 1989). City conditions worsened, becoming quite dire. As the 1980s continued, and the effects of the Midwest Farm Crisis spread, unemployment went up to twenty-three percent, the highest in the nation (BBC News, 2011; Dubuque Public Information Officer, 2010). As a reflection of the dismal conditions, t-shirts and a prominent billboard in the city bleakly jested: “Will the last person to leave Dubuque please turn off the lights” (National Civic League, 2009; The City of Dubuque, 2006).

Figure 15. Dubuque’s Grand River Center

Source: This image is from the City of Dubuque’s website: http://www.cityofdubuque.org/ (accessed March 10, 2016).

Narratives about the city’s recovery from this drastic decline explain how city leaders and residents came together to save the city by investing their personal funds in a dog-racing track. Their hope was to attract gambling revenue from tourists visiting a neighboring historic town in the State of Illinois just across the river. As this venture began to pay off, efforts were expanded into a gaming riverboat that was later opened in Dubuque’s Ice Harbor. As these projects grew, revenues were used to improve city infrastructure. Slowly, Dubuque began to recover (Enzler, 2010). One recovery project—such as the Grand River Center featured in Figure 15—turned into several and the city began to thrive, prompting the local government to nickname it "Masterpiece on the Mississippi" (Dubuque Main Street, 2012; Enzler, 2010; The City of Dubuque, 2010a).

The city uses the council-manager-ward form of government. Within this weak mayor structure, the City Manager runs the day-to-day operations and serves as the city's executive leader, though the Mayor still serves as a visible political head (The City of Dubuque, 2009c, 2014). In addition to the City Manager, there is a part-time City Council, which makes policy and financial decisions and serves as the city's legislative body (The City of Dubuque, 2009b). The Council is comprised of the Mayor, who serves as its chairman, four ward-elected members and two at-large members. Dubuque's Mayor, Roy D. Buol, was first elected to a four-year term in November 2005, and re-elected for another four-year term in November 2009 and again November 2013 (The City of Dubuque, 2009c, 2014). Buol feels that his pursuit of a sustainability agenda has helped secure his re-elections—for sustainability has served as a key part of his political platform in each of his three elections, and he, along with the City Council, have kept this at the forefront of city strategy over his years in office. According to Buol in an IBM Social Media video on YouTube, "sustainability is good politics" (IBM, 2009b). He and his two assistant city managers, as noted in my interviews with them for this research, feel that a sustainability focus has contributed to the city's revival in the last decade—a renewal that, in their opinions, also has been bolstered by the concept of smart.

6.2 Sustainable Dubuque

Religious and environmental groups within Dubuque have emphasized environmental aspects of sustainability since the 1990s.[42] Building on these early sustainability endeavors, the then mayoral candidate Buol promoted a sustainability platform in the 2005 elections, framing sustainability as a means to help differentiate

[42] According to the city's Natural Resource Manager, examples of these groups include the Catholic Church, Green Dubuque, the Sierra Club, and the League of Women Voters.

the city and give it a competitive edge (Sustainable Dubuque, 2010b, p. 5). As stated by Buol in an IBM Smarter Planet Leadership Series video on YouTube:

> When I was elected mayor in 2005 part of my platform was I believe that… we needed to create a sustainable community. I told my city council colleagues after I was elected that cities that commit to sustainability now… will have a decided advantage over those that don't in the near future. (Buol in IBM, 2012a)

In 2007, under the aegis of Buol's lead, a community task force—consisting of representatives from local government, civic associations, utility companies, religious organizations, environmental groups and local schools—was established to develop a sustainability plan to move this priority forward. Through stakeholder consultations and surveys to engage citizens, this Sustainability Task Force developed a sustainability model that was formally adopted by City Council in early 2010 (The City of Dubuque, 2009d; Sustainable Dubuque, 2010b). The Dubuque sustainability model, represented in Figure 16, consists of twelve sustainability principles[43] categorized into three buckets: economic prosperity (e.g., green jobs, expanding markets and saving money), environmental and ecological integrity (e.g., reduced emissions, clean air and water, healthy living), and social and cultural vibrancy to make the community more viable, livable and equitable (Sustainable Dubuque, 2010b, pp. 7-8, 10, 12).

Figure 16. Dubuque's sustainability model

Economic Prosperity	**Environmental Integrity**	**Social / Cultural Vibrancy**
Regional Economy	Healthy Air	Green Buildings
Smart Energy Use	Clean Water	Healthy Local Food
Smart Resource Use	Native Plants & Animals	Community Knowledge
Community Design	Reasonable Mobility	Community Health & Safety

Source: The City of Dubuque, 2015b.

[43] The Sustainable Dubuque Task Force identified eleven Principles in 2008. In 2013, a twelfth principle, Community Health & Safety, was added (The City of Dubuque, 2015b).

Once the local government adopted this model, it established Sustainable Dubuque,[44] a public-private partnership created to develop programs and projects that support this sustainability agenda (Sustainable Dubuque, 2010b, p. 19; The City of Dubuque, 2009d). The City of Dubuque's "Mission Statement" and "2026 Vision Statement" also outline the local government's focus on sustainability (The City of Dubuque, 2009d) and their aim of "meeting present needs in a way that does not compromise the ability of future generations to meet their own needs" (Dubuque2.0, 2010c, p. 2).

Unsurprisingly, given the broad consensus used to develop this sustainability model, it mirrors the "Three E's"—environment, economy and equity—or the key interacting elements frequently emphasized in urban sustainability frameworks that are considered to be more 'mainstream' and / or neutral (Campbell, 1996; McDonough and Braungart, 2002; Wheeler, 2002; Yaro and Hiss, 1996 in Mayer and Provo, 2004). Of the local government staff who I interviewed, four of the sixteen noted that the model was purposively constructed with this wide scope to enable broad appeal and include something that would speak to everyone. This broadened approach to sustainability is an attempt to neutralize any controversy around the term and what these types of initiatives hope to achieve. Within such conceptualizations, policy officials and city leaders have sought to develop strategies around sustainability that are broadly consensual and non-contentious, thus not threatening the current status quo. Rather, sustainability in these terms usually refers to the economic benefits of better resource management, where capitalism is made greener (Swyngedouw, 2010, p. 215). I discuss this depoliticization of sustainability and how this has been applied to smart projects in Chapter 7.

Further, these four city leaders noted that there also was strategic thinking behind involving a wide range of stakeholders to create this model—for it was thought that this would help contribute to community ownership of the model while also aiding in

[44] Sustainable Dubuque's local partners include the Dubuque Convention and Visitors Bureau, the Greater Dubuque Development Corporation, the Community Foundation of Greater Dubuque, Dubuque Main Street, Dubuque2.0, the East Central Intergovernmental Association, envision, and Four Mounds, while national partners include the National Trust Historic Preservation, the American Institute of Architect's Communities by Design, Climate Communities, and Local Governments for Sustainability (Sustainable Dubuque 2010b: 19).

the viral spread of messaging around the sustainability agenda as those involved discussed this work within their social circles. As discussed in Chapter 4, third party organizations like citizen-based steering committees or boards are increasingly being recruited to assist in spreading awareness and narratives around local government endeavors, with the thought that their involvement will help cut costs. Local governments look to these organizations to serve as channels for communication, with outgoing messaging and incoming input from the diverse actors involved as a means to help represent input from a range of constituencies (Zavattaro, 2010a, p. 81). This same type of approach used with Sustainable Dubuque was continued and expanded with Smarter Sustainable Dubuque as the city's sustainability agenda was expanded to include the application of smart technologies.

6.2.1 Smarter Sustainable Dubuque Projects

In many ways, the local government's pre-existing focus on sustainability set a solid foundation upon which smart projects could build. As the local government continued its emphasis on recovery and economic growth, and looked for ways to strengthen its 'competitive edge', it expanded its sustainability agenda in 2009 by forming a public-private partnership with IBM Research and other local, state and regional organizations[45] to form Smarter Sustainable Dubuque, a program that focuses on ways to make the city more sustainable through the use of smart technologies (The City of Dubuque, 2009e). Greater Dubuque Development Corporation (GDDC) provided the first $30,000 in seed money. Since its launch, SSD has grown into a collaboration that includes over two dozen industries, eight state and federal agencies, and a range of smart city projects across five city systems and services (The City of Dubuque, 2009e). The City of Dubuque's webpage entitled "How is Dubuque Getting Smarter" sums up the SSD endeavor from the local government's perspective:

> In its quest to become a more sustainable city, Dubuque is exploring and using new 'smarter' technologies and strategies to deliver or better utilize

[45] At launch, Smarter Sustainable Dubuque partners included IBM, the City of Dubuque, the East Central Intergovernmental Association, the Greater Dubuque Development Corporation, the Dubuque Area Chamber of Commerce, and the Community Foundation of Greater Dubuque (IBM, 2011c).

> vital services such as water, energy, and transportation to its citizens while reducing the community's impact on the environment. These new technologies digitize and connect city systems, sense, analyze and integrate data, and allow Dubuque to respond intelligently to the needs of citizens. (The City of Dubuque, 2011g)

Within this statement, and the SD and SSD agendas, it is evident that the local government's understanding and perceptions of smart align with the numerous assumptions that often accompany this concept: that there will be an emphasis on the use of technologies to achieve set city outcomes and that desired goals of smart projects include economic development, improvements in city competitiveness, and increased efficiency that contributes to sustainability (as locally defined). As explained by the City Manager Michael Van Milligen at an IBM Software Vision event in 2013, SSD is the "research function" or "technology driver" of SD, which exists to help achieve SD goals (M. Van Milligen, 2013).

By pursuing SSD, the local government hopes to attract resources such as talent, business and investment to the city. IBM sees SSD as an opportunity to test smart city solutions and refine go-to-market strategies to help better create and capture the smart city market—demonstrated by IBM deeming Dubuque as its first living lab in the world for Smarter Cities experiments. Both of these actors are also pursuing SSD to raise their perceived competitiveness and brand by making Dubuque one of the first smarter sustainable cities in North America. Additionally through this partnership, these two actors are hoping to benefit from the development of new smart technologies and a sustainability model that can be scaled and replicated globally in communities of 200,000 and under—a model that hinges upon data and analytics primarily enabled by IT providers like IBM. In effect, both actors seek to export the SSD model as a 'product' (IBM, 2009b, 2011c; PR Newswire, 2011a). To date, elements of this model have been shared with cities in Australia and Turkey. As the former IBM Research Manager in charge of IBM programs in Dubuque joked: "What happens in Dubuque doesn't stay in Dubuque" (Naphade in Greenblatt, 2014, p. 4). This notion of creating a smart sustainability model for export reflects in part the rising marketization and commodification of cities, while also underscoring the local government's entrepreneurial management style and the transfer of private sector practices to the public sector realm—topics that I discuss further below.

As part and parcel of the SSD initiative, the local government also offered tax incentives to IBM to open a Global Delivery Facility (GDF) office within downtown Dubuque, with the hope that opening the facility would help create jobs, lure new talent and attract other businesses to the area (IBM, 2009d, 2010a, 2010c, 2011c; The City of Dubuque 2009e, 2010b, 2010e). This type of tax abatement is associated with what Brenner and Theodore (2002) call "roll-back" neoliberalism, where, they posit, local governments focus on creating good business climates within their city as a means to accelerate external investment (Brenner and Theodore, 2002, p. 373). The GDF is one of IBM's more than 80 delivery centers worldwide, where staff maintain, monitor and support computer software and hardware, and manage IT services for IBM clients. According to a senior executive with the GDDC and a senior city leader, as a result of opening this facility, IBM has created about 1,300 jobs in the city, while job growth deemed to be associated with IBM's presence has been estimated to be about 2,400 jobs. However, there has been controversy around these numbers, with critics noting that the jobs created in reality were far less than what was promised. I discuss this further in section 6.4.

With this type of partnership between IBM and the local government, one must consider scale. As of 2012, IBM had about 435,000 employees (Fortune, 2012a), while the population of Dubuque was roughly 60,000 (United States Census Bureau, 2009), making IBM at that time over seven times larger than the city. It would seem that IBM by default of size would have much more clout that the local government within smart projects pursued in Dubuque. However, as noted by McNeil (2014), the power of IT providers in these types of relationships is sometimes overestimated—especially by the IT providers themselves. Not only does the IT provider grapple with technical challenges associated with smart projects and the ability to win contracts, there's also a mistaken assumption that these large firms operate as a single actor, when in reality they are more akin to a kaleidoscope of moving divisions, missions, best practices, and staff, in constant churn and renewal. Their perceived strength, size, is actually their weakness. I discuss this issue of scale and mutuality further in section 6.4.

Figure 17. Smarter Sustainable Dubuque projects

	Smarter Water Pilot Study[46]	Smarter Electricity Pilot Study[47]	Smarter Travel Pilot Studies / Experiments[48]	Smarter Discards Pilot Study[49]	Smarter Health and Wellness Pilot Studies[50]
Overview	Online portal that enables participating HHs to view water consumption patterns and trends	Online portal that enables participating HHs to view electricity consumption patterns and trends	Smartphone app that uses RFID technology to collect data on volunteer participants travel in the community	Online portal that enables participating HHs to view discard patterns	Smartphone apps that senses movement, and another that provides data on goals
Aim	To provide residents with the data they need to cut costs, save resources, and decrease their environmental impact	To provide residents with the data they need to cut costs, save resources, and decrease their environmental impact	To provide residents with the data they need to cut costs, save resources, and decrease their environmental impact	To assist and incentivize participants to improve diversion toward curbside recycling and composting	To give residents the information they need to make smarter choices about their health and wellness
# of participants	303 households	765 households	Over 1,000 volunteers	300 households	Requested up to 250 volunteers
Pilot duration	3 months, then expanded to 12 months (2011)	5 months (2011)	2012; with a 2016 solicitation for more volunteers for another pilot	9 months (2013)	6 months (2013)
Involved partners	City of Dubuque, IBM Research, Dubuque2.0, Neptune Technology Group, ESRI ArcGIS, Verity Three, Northern water Works Supply	City of Dubuque, IBM Research, Dubuque2.0, Alliant Energy, Interstate Power and Light Company	City of Dubuque, IBM Research, The Jule, East Central Intergovernmental Association	City of Dubuque, IBM Research, vendors from discard collection, materials management and tracking industries, state and federal agencies	City of Dubuque, IBM Research, University of Iowa's College of Public Health, Element Blue
Finance	Overall project costs of $850,000; funded by a mix of local, state and national funding sources	Funded by a $1.4 million grant from the Iowa Office of Energy Independence	Funded in part by grants from the Climate Showcase Communities Program and the Iowa Department of Transportation's Iowa Clean Air Attainment Program	Total cost for Proof of Concept paid by city $39,960	Proof of Concept cost of $50,000, paid through a Federal Climate Communities Showcase grant

Within Smarter Sustainable Dubuque there have been several pilot studies and experiments applying smart technologies across a range of city systems, including water, electricity, transportation, waste management and health and wellness—outlined further in Figure 17. As noted above, the broad scope of the city's sustainability model has facilitated the ability to overlay these smart projects and priorities onto the existing sustainability framework. For example, one of the primary overarching aims of the city's sustainability model and of the SSD agenda is to help

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46 For more information see The City of Dubuque, 2010b; Erickson et al., 2012; and Naphade 2011.
47 For more information see The City of Dubuque, 2010c; Naphade, 2012.
48 For more information see The City of Dubuque, 2011f.
49 For more information see The City of Dubuque, 2013e.
50 For more information see The City of Dubuque, 2013f.

improve the regional economy and spur business growth and development; and a common assumption associated with smart city projects is that these endeavors help spur economic growth and urban revival. Another assumption commonly associated with smart projects is that they help optimize resources, thereby having the potential to contribute to sustainability efforts. The Smarter Water and Electricity Pilot Studies both had the aim of helping participating households make better decisions about resource conservation, resulting in lower consumption rates. The Smarter Travel experiments, which aim to provide data on traffic flows throughout the city and how city residents use public transportation, could conceivably contribute to both the sustainability aims of mobility and air quality while helping to optimize resources associated with travel. Additionally, the Smarter Discard project supports goals set around improved resource use. For the purposes of my research I only examined the Smarter Water and Smarter Electricity Pilot Studies in detail; these are elaborated below. Additional information on the other pilots within SSD can be found in Appendix 11.9.

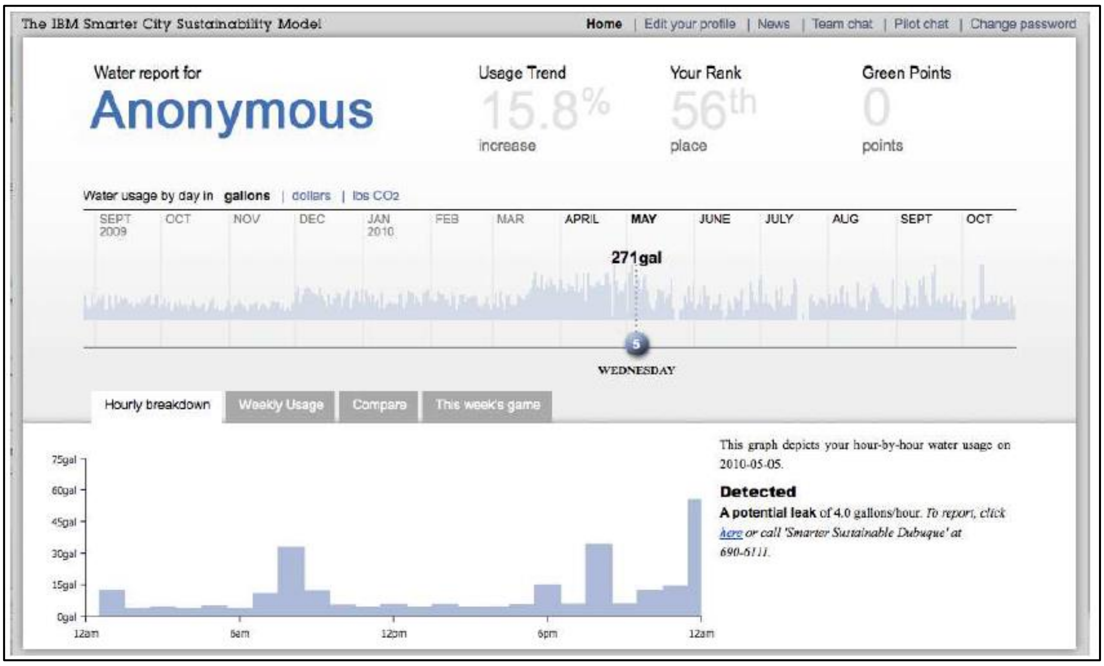
<u>The Smarter Water Pilot Study</u>

Though water is not a scarce resource in Dubuque, it was selected by city leaders and IBM Research as the focus for the first SSD pilot since it dovetailed with a citywide installation of advanced metering infrastructure.[51] Additionally, relevant actors chose it because they felt that it was the least controversial of the utilities for smart technology adoption. This new advanced metering infrastructure (AMI) enables data to be generated in near real-time and collected remotely, both necessary components for the pilot, which was comprised of a web-based portal system that was made accessible to 303 volunteer households for 15 weeks in 2011 (Erickson et al., 2012; The City of Dubuque, 2010b). The system collected data on participating households' water usage every 15 minutes, and was transmitted every four hours to a cloud-based repository where it was then analyzed and used to produce feedback to these households via a private portal. Households could see their water usage by the

[51] The technologies involved in this smart effort included, among others, R900 and R450 water meters, wireless and internet technologies and access, GIS technologies, server access, cloud computing, advanced algorithms and computers. These technologies, and others, functioned together as an AMI system (Naphade, 2010, 2011).

hour, day, week, month or year, in gallons, U.S. dollars or by carbon footprint (Naphade, 2011). In Spain, the city of Cáceres is also implementing a similar type of project aimed at resource conservation, where smart technologies are being applied to help better manage drinking water networks. Like the water portal project in Dubuque, this project "will introduce remote meter-reading and will be able to detect unusual consumption patterns", enabling leak detection (Berst, 2013).

Figure 18. Smarter Water Pilot Study portal



Source: Naphade, 2011.

The portal, shown in Figure 18, was designed to encourage conservation among pilot participants by tapping into the power of visual communication and concepts from behavioral economics, both techniques frequently used by the private sector when targeting consumers (who use products) as well as customers (who buy products). The portals used charts, alerts, social comparisons, weekly contests, incentives and a chat function (Erickson et al., 2012) to attempt to nudge household behavior in desired directions (Ariely, 2008, 2010; Cialdini, 2007; Thaler and Sunstein, 2008). Additionally, information was provided on the portal on how to make households more efficient. And, if a leak was detected, a notification would appear along with details on whom to contact from the local government for assistance (Erickson et al., 2012; Naphade, 2011).

IBM Research designed the portal with feedback from the local government and participating households. Before the pilot began, participants were trained on sustainability issues, conservation and how to use the portal by Dubuque2.0, a quasi-governmental organization created to support SSD endeavors (which I discuss further below). Participants were asked to record any changes in their behavior as a result of this training and record methods that they had found useful in water conservation. Feedback from these records, and from the local government staff fielding participant emails and calls, was used to make revisions in portal design during initial stages of implementation. For example, problems with associated logins and algorithms were found during the initial stages of pilot testing and thus able to be subsequently fixed (Erickson et al., 2012; Naphade, 2011). This learning was also transferred to inform design of the Smart Electricity Pilot Study.

Actors involved in implementing the pilot included the local government, local technology providers, IBM Research, Dubuque2.0 and participating households. The local government funded the project and was responsible for rounding up volunteering households to participate in the pilot and training them on portal usage. To further entice households to volunteer for the pilot, the local government offered participating households priority access to free water audits, matching grants to fix water leaks, and an opportunity to participate in future projects for electricity and solid waste management (PR Newswire, 2011a; The City of Dubuque, 2010b). Local private sector companies were responsible for data gathering and issues related to the smart meters, while IBM Research was responsible for data analytics, portal operations and functioning, and project evaluation. The third party organization Dubuque2.0 was responsible for narrative creation and public relations around the project and its overarching goal, sustainability. Volunteer households provided their time and data (Naphade, 2011; The City of Dubuque, 2010b).

At the pilot's completion, IBM Research evaluated the effectiveness and outcomes of the system. Findings from the evaluation revealed that the portal helped: (a) enable water conservation (at least temporarily), with 6.6 percent reduction in usage amongst participants; (b) improve rates of leak reporting by eightfold; and (c) facilitate behavior change (again, at least temporarily) (PR Newswire, 2011a).

According to IBM research findings, this demonstrated, to an extent, the 'success' of portal design in helping to steer behavior. At the time of my research, the pilot had been expanded to over 4,000 households and businesses in the city as a result of interest and demand (The City of Dubuque, 2010b). As of the end of 2012, the pilot had saved the city US$ 290,000 in costs associated with water treatment and delivery (Flansburg, 2012).

The Smarter Electricity Pilot Study

The Smarter Electricity Pilot Study served as a follow-up pilot of portal system experimentation in Dubuque. This project, undertaken to "demonstrate that informed and engaged citizens could save money, conserve electricity, and make their community more sustainable", was implemented in 2011 by the local government in partnership with Alliant Energy, Interstate Power and Light Company and IBM Research, and was funded by a $1.4 million grant from the Iowa Office of Energy Independence (Naphade, 2012, p. 4). More than 1,000 households initially volunteered to participate in the pilot, with over 700 households signing on to the portal once it was functioning (The City of Dubuque, 2010c). Over a five month period, the pilot combined incremental data, read every 15 minutes, with other data—such as data on household electricity profiles, weather, demographics, and household characteristics—to help volunteer households better understand their consumption patterns. The private portal system used cloud computing to deliver this web-based service (Naphade, 2012).

The pilot's design was informed by the Smarter Water Pilot Study and the result of negotiations between IBM Research, the local government, Alliant Energy and the Interstate Power and Light Company. Responsibilities for the actors involved varied. New AMI meters were installed in select volunteer households to enable Alliant Energy the ability to anonymize customer electricity usage data and to provide these data at regular intervals to the city and IBM Research for analysis. IBM Research provided data analytics, portal management and operations, and project evaluation (Naphade, 2012; The City of Dubuque, 2010c). The local government was responsible for securing funding, recruiting volunteer households, training volunteers and trouble-shooting problems with the portal and its usage. Dubuque2.0 provided sustainability narratives and awareness-raising through weekly newsletters, training sessions and town hall and informal sustainability meetings. Participating households provided their data and time (Naphade, 2012; The City of Dubuque, 2010c).

Similar to the Smarter Water Pilot Study, IBM Research developed a consumer interface system, or web-based portal, that enabled pilot participants to see their usage on an hourly, daily, weekly, monthly or annual basis. Charts, graphs and conservation tips were provided to help portal users better understand their electricity use. Behavioral economics techniques like social comparisons, alerts and contests for various prizes were used to get participants to consider changes in their behavior to save energy, reduce costs and lower their carbon footprint (Erickson et al., 2012; The City of Dubuque, 2010c). To also help drive behavior change, the portal suggested customized electricity-saving activities to each household based on their consumption patterns and usage trends and forecasts. As activities were undertaken, the portal provided users with feedback on their usage, tracked their progress, and enabled them to see the effects of the changes they made over time (Naphade, 2012).

To understand the effects of the portal system and its design on behavior change, the savings were reported by IBM Research in three groups: all users who logged in at least once, and two sub-groups, those who signed up for electricity saving activities and those who did not. In all, the portal had an active participation rate of thirty-five percent (266 of 765 users). As a group, the active portal users (266 households) saw an average monthly savings of 3.7 percent. The ninety-seven users who signed up for electricity saving activities accounted for fifty-five percent of the total savings achieved from the pilot—which saved 17,595 kWh, worth U.S. $2,111 (Naphade 2012a). In a similar type of experiment in the United Kingdom, the Energy Demand Project which ran from 2007-2011, a large-scale trial of 18,000 households also showed savings for households with smart meters with in-home displays, with an average savings of around three percent, with levels going up to eleven percent (Giordano et al., 2013, p. 57). This dashboard approach to management of resources has also been applied at the city level. For example, in London real-time data are provided to city residents through “city dashboards”, sharing information about the weather, public transport delays, air pollution and river levels, among others (Kitchin, 2014b, p. 7).

6.3 Shaping Strategy

Throughout IBM's interactions with the local government around these two pilot studies, as well as other SSD endeavors, city leaders have become increasingly exposed to the tech giant's perspectives, practices and approaches. This in turn has had various implications for the city's strategy. As discussed in Chapter 2, increasing neoliberal tendencies in advanced capitalist localities have affected not only institutions but also influenced competition between cities and the metrics by which cities compete (Peck and Tickell, 2002, p. 387). Within this shift, which has established a conducive environment for smart projects, local governments have increasingly adopted private sector characteristics, such as "risk-taking, inventiveness, promotion and profit motivation" (Hall and Hubbard, 1996, p. 153). In Dubuque, I saw evidence of such behavior, which seemed to be accentuated through smart project implementation and the consequent interactions with IBM.

During the primary years of my field research in Dubuque, when the Smarter Water and Electricity Pilot Studies were implemented, IBM was still applying considerable resources to create and grow the smart city market. IBM Research was responsible for experimenting, piloting and testing various types of solutions and go-to-market strategies during this time. IBM's main aim during these early years was to better understand cities and local governments and their needs, and to refine solutions, messaging and strategies that would enable the firm to create, grow and dominate this market space. After the announcement of partnership around SSD and the establishment of the GDF in Dubuque, there was a relatively small team of IBMers who consistently interacted with the local government and smart project staff and actors to develop and implement these projects. Almost all IBM actors were from IBM Research, typically staff who do not have sales quotas or sales responsibilities. Primary interactions were around developing, designing and implementing new types of smart city projects that interested the local government, with an emphasis on the involved data collection, aggregation, management, analysis and presentation, as well as the end user experience.

Various other IBM staff—such as senior management and staff from marketing and communications—also interacted with the local government in terms of how to best promote these projects on IBM's behalf. The local government was welcome to use promotional materials created, but the main purpose was to benefit IBM. In my interviews with IBM Research, the SSD Project Manager, senior city staff, smart project staff and third party actors involved with smart projects, each noted that there was a good working relationship between involved actors; they respected and saw value in the partners and partnership that formed SSD. That said, given my role with IBM, which I made clear during all of my research interviews, I doubt that these actors would have voiced anything to the contrary.

While IBM Research staff were not involved in identifying the twelve sustainability principles or the overarching sustainability model in Dubuque, they did have a seat at the table with the local government when it came to conceptualizing projects to support SSD and acted as the lead in design and implementation of these initiatives, with support from other local technical actors, such as utility companies and metering firms. Once overarching ideas for the projects were identified by IBM staff and the local government, IBM often then set the SSD project objectives and priorities and the approaches undertaken to achieve these—in effect, defining SSD project strategy details. Project evaluations were undertaken by IBM Research, meaning that the defined or assigned 'success' of a project was ascertained by the tech provider, the actor most interested in seeing projects being well received since the growth of the SSD project portfolio was contingent upon projects continually being found 'effective.' Yet, as important as it was for IBM to see these projects as a 'win' to help keep smart projects going, it was also important for the local government to be able to point to SSD project 'wins' to justify tax dollar spend and strategy focus. As noted by the former IBM Research Project Manager Milind Naphade in the Smart Water Pilot Study Report:

> As cities evolve, they are increasingly being instrumented with sensors that enable them to collect data, conduct billing, and manage operations and

> resources as optimally as possible. Cities need to act on the information sensors provide, and *they need to show improvement on key performance indicators (KPIs) to justify the return on investment for this sensing infrastructure*. (Naphade, 2011, p. 8, emphasis mine)

Consequently, project outcomes deemed ‘successful’ by IBM and the local government were promoted by both actors through press releases, project materials, marketing and public relations materials and social media channels. Continued project ‘wins’ kept IBM staff at the SSD strategy table. Each new project has helped ingrain tech provider perspectives into the thinking of involved local government actors, reinforcing the need for real-time data and analytics—and hence an IT provider—in attaining city goals. Anecdotal data hinting to this shift in thinking can already be seen. For example in an online interview with IBM, according to the city’s Information Services Manager Chris Kohlmann, her role and the role of her department are changing, shifts that she states have resulted from SSD:

> People no longer see our IT Department as solely a resource for fixing what’s broken or assistance with obtaining data with the defined parameters of a system. Rather, I’m now consulted for expertise on how to assist in making smart technology projects happen, while also being expected to act as a liaison between involved departments during project design and implementation. (Kohlmann, 2014)

Hence, the role of the IT Department is being elevated. It is seen as central to new emerging technology projects (whether they fall under SSD or not). In addition, Kohlmann’s role has been elevated to serve as a liaison, or unofficial lead, who convenes the required groups together to get projects done. While subjective, I believe this points to an increased emphasis on the role that real-time data and analytics play within the city’s strategy and the centrality these play in achieving strategy ends, which is also evidenced by the formation of SSD itself. While the use of data and computing have informed city system management and operations for decades, the rising emphasis placed on the need for using and integrating real-time data with longitudinal data is novel, as is the way that analytics are conducted and results presented due to the real-time nature and volume of data being collected. In this regard, Kohlmann noted that it is through SSD endeavors that she and her colleagues have begun to better understand how data and analytics can be used to not only provide better services for city residents, but also more frequently engage them around these more immediate types of data (Kohlmann, 2014).

Whether or not real-time data and analytics actually do help provide better services and / or aid in more frequent citizen engagement is irrelevant—what is important is that the local government believes this to be the case, and thus have placed greater responsibility on the IT Department and its lead to this end. This ‘promotion’ of the department and the role of its head only serve to elevate the interests of IBM, potentially creating more avenues for business development as the IT office continues to expand in scope and importance. On top of this, Kohlmann added that there’s a second shift occurring with her role—moving focus from data to information. As elucidated by Kohlmann in the same online IBM interview:

> I often say that in this world, we are drowning in a sea of data, but are in a desert of information. In this regard, my current role heavily focuses on how to deliver—whether to a city official or citizen—relevant, timely and meaningful information in a way that fits the end user’s needs and interests. And this view-oriented approach will only be more important as more and more data is being gathered and analyzed every day. (Kohlmann, 2014)

Kohlmann’s shift in language to refer to what her office produces—from data to information—is significant. It reflects the growing importance that is being placed on the ability to not only collect but also analyze data, both longitudinal and real time, as well as perhaps a growing mindset that within all the data being collected are answers—solutions that can be purportedly unearthed with the right analysis. These shifts have been facilitated by the fact that the existing leadership and sustainability strategy had already set a ripe environment for smart projects, and the assumptions that go along with them, to take root. Approaches on how to achieve strategic goals are also changing.

6.3.1 Approaches and Perspectives

Along with these subtle shifts informing SSD strategy, IBM also has had influence with the local government in terms of the approaches and perspectives adopted to achieve the objectives and priorities identified for SSD endeavors. Below I explore three of these IT provider / private sector approaches and perspectives: viewing the city as a living lab, employing the agile method in project implementation and using behavioral economics techniques. In many ways, the policy mobility around these ideas—moving from the private to the public sector—reflects the belief that "the private sector is more efficient, productive and cost-effective than the public sector in providing and managing the economy and society" (Hearne, 2009, p. 8).

Living Lab

As discussed in Chapter 2, the array of pressures, challenges and responsibilities that local governments increasingly face create a growing willingness by local governments to explore more 'risky' and 'innovative' projects (Shelton et al., 2014). In response to this, there has been a rising trend of viewing cities as a place for testing and experimentation to help better address these challenges and responsibilities (Glaeser, 2011). This living lab concept typically involves public-private partnerships pursuing what is deemed as 'innovative' research in regional areas where user communities are considered observed subjects as well as sources of innovation. While the idea of cities being used as demonstration projects is not new, living lab approaches to smart projects do create new opportunities for IT providers to influence and inform problematics around urban issues and how these challenged are perceived, conceptualized and addressed through the way that these experiments are designed (Schaffers et al., 2011; Shelton et al., 2014).

The concept of a living lab stems from engineering and product life-cycle development—in other words, a model initially created for business purposes and ends (Bilgram et al., 2008). The reasoning provided for pursuing the living lab model within cities typically includes the assumptions that they help enhance perceptions of innovation, drive economic growth and provide a competitive edge (American Institutes of Architects, 2013). As applied to smart cities, the living lab concept integrates open business models of collaboration between citizens, enterprises and local governments (Schaffers et al., 2011), as well as open governance models in terms of the roles and responsibilities each actor has within the experiment. This living lab approach within cities has been employed globally. In Europe for example, the European Network of Living Labs works to benchmark and grow living labs in Europe and worldwide, as illustrated in Figure 19 (European Network of Living Labs, 2016).

Figure 19. World Map of the European Network of Living Labs

Source: European Network of Living Labs, 2016.

In the case of Dubuque, SSD project implementers (IBM Research staff, local tech providers, utility companies and local government staff) consider involved private sector actors and city residents as subjects and drivers of innovation. For example, in the Smarter Water and Electricity Pilot Studies, the local government and IBM staff worked with city residents in the pilot studies to gather feedback on portal understanding, effectiveness and impact, which in turn informed portal and project design (Erickson et al., 2012). At the same time, these residents were the objects of the experiments, for changing their behavior was key to the ‘success’ of these projects. While these two projects enabled the local government to test its approach to sustainability, they also allowed IBM to test smart city solutions under real city circumstances. This living lab model creates opportunities for IBM to explore the market potential of the solutions that they are testing, and ideally, develop more work to pursue within the city. In a Smarter Cities promotional video by IBM Social Media on YouTube, IBM Research Vice President Robert Morris described IBM’s interest in Dubuque: “Dubuque was the kind of laboratory, a living lab, with which we could experiment with our future, the future of our business, which is about the Smarter Planet” (Morris in IBM, 2009b). Hence, the city becomes a corporate laboratory, and in the view of IBM, for the gain of its future business—not necessarily the gain of the local government, nor the city residents.

Similar to more entrepreneurial projects, endeavors that employ the living lab approach are more speculative, have less accountability, and the risks fall primarily upon the local government, not the private sector (Agranoff, 2003). The private sector can attempt to make a city smart and fail, moving on to the next city to try again. On the other hand, the public sector, if part of a failed smart initiative, faces political consequences such as losing elections and / or harming the public's trust in the local government (Grossman, 2011). Yet, at the same time, living lab projects provide local governments with the space to fail. In general, there is no room for failure within government endeavors. Given that government projects and programs are funded by taxpayers' dollars, political leaders often feel that they have no room to experiment or test new and innovative types of projects. The living lab nomenclature however, implies that the project is experimental, and most likely implemented on a smaller scale, thereby attempting to lower expectations associated with outcomes (Schaffers et al., 2011).

In Dubuque, this living lab nomenclature associated with SSD projects automatically provided the local government with a disclaimer that these projects were speculative and may not achieve desired results. And, SSD projects were clearly run as tests—they were small, typically ranging from 300-1000 volunteers for each project, while usually lasting only a few months (Erickson et al., 2012). They were also very narrow in scope and focused on a specific application of technology. This small scale enabled the government, and IBM, to experiment with new types of projects with less concern for failure. For example, several of the Smarter Travel Pilot projects did not work. Yet, follow-on projects were able to continue and other smart projects emerged. There were no dire consequences from these failed efforts, other than a few unhappy city residents with dead cell phone batteries (Kohlmann, 2014). This small scale also minimized risk for IBM. It could quickly test what did and did not work within SSD. This type of rapid iteration is reflective of the second approach pushed through SSD by IBM—an implicit promotion of the agile method that historically has been used by developers to create software (IBM, 2015b).

Agile Method

In Chapter 4, I highlighted the various visions that IT providers have for new forms of urban governance, which unsurprisingly hinge upon data and analytics, where local governments: (a) are consumer-centric, flexible, responsive and adaptable in real time, mimicking the managerial style of internet businesses like Amazon (Buschner et al., 2010); (b) use smart technologies to optimize for resource and process efficiency (Kanter and Litow, 2009); and (c) function as a platform, or Government 2.0, to enable competition over the goods and services provided to citizens (O'Reilly, 2010). Behind each of these IT provider visions (which are not necessarily mutually exclusive), is a way of managing, coined "agile", that aligns with the way that IT and tech providers develop and build technology products. In an internal document used to train IBMers on this method, agile is described as "a new way of working. It was originally created to improve software development by shifting its focus to end-user requirements using rapid iterative development and prototyping" (IBM, 2015b, p. 1). IBM has adapted this way of working so that it applies "across all industries and business", and therefore is easily integrated into the way that IBM designs and implements projects (IBM, 2015b, p. 1). According to IBM in this training document, the need for becoming agile is clear:

> The convergence of data, cloud and engagement has enabled our clients and their customers to demand responsiveness and speed in every interaction, and to expect regular improvement to their experience. To stay competitive—to deliver greater client value with speed, simplicity and continuous improvement—IBM needs to be agile. (IBM, 2015b, p. 1)

Thus in order to be client-centric, quickly respond and adapt continuously, organizations must become agile. A key idea behind agile thinking is to test and iterate quickly, and when failure is encountered, fail quickly, learn and move on (IBM, 2015b). Yet, what is glaringly clear is that while this form of management may work well for software development, where there are clear path contingencies and an almost linear progression, that does not mean that this approach will be effective or appropriate for cities; or for that matter, projects outside of IT. Application of this methodology to fields outside of its original intent reflects a naiveté about city systems and their complexity, as well as how cities and local governments function. Just as IBM narratives have over simplified the city (McNeill, 2014), so too does this approach applied to smart projects design and implementation.

Figure 20. Waterfall versus agile method

	Waterfall	Agile
Delivers →	once, at the end	many versions, frequently
Develops →	only after design is complete	at the same time as design
Follows →	the established plan	the changes as they come
Understands →	through shared documentation	through collaboration

Source: IBM, 2015b.

Figure 20 helps shed light on the agile method by providing a comparison between traditional or “waterfall” methods of software development, which leave testing and user engagement until the end of the process, with agile, which includes these during development (IBM, 2015b). Many of the narratives around smart projects and IT provider visions of urban governance employ the same notions as stressed with the agile way of working: rapid iteration and response to clients / city residents, collaboration throughout the design and implementation process, and continually improving and iterating based on feedback loops to help enable a better client / city resident experience (Erickson et al., 2012). For example, on its webpage “How is Dubuque Getting Smarter?”, the local government described SSD as follows:

> In its quest to become a more sustainable city, Dubuque is exploring and using new ‘smarter’ technologies and strategies to deliver or better utilize vital services such as water, energy, and transportation to its citizens while reducing the community’s impact on the environment. These new technologies digitize and connect city systems, sense, analyze and integrate data, and allow Dubuque to respond intelligently to the needs of citizens. (The City of Dubuque, 2011g)

While SSD is comprised of a range of projects, IBM and the local government’s vision is that the end result will be an overarching dashboard that the local government can access to enable a bird’s eye view of the city’s operations. Purportedly, this dashboard will enable faster and better targeted response. As discussed in Chapter 2, this type of approach to smart projects, where the city is perceived as "visualized facts", shapes how managers and citizens understand and engage with cities (Kitchin, 2015, p. 6). It is assumed that the city can be known and controlled through data and analytics, thereby leading to improved performance of city services and increased participation (Kitchin, 2014b, p. 2).

While the smart projects in Dubuque to date have functioned at the household or individual level, the desired effect on sustainability is at the aggregate. The local government's overall vision is to develop a web-portal that enables relevant city departments and resident households to see various resource consumption across the city, and to have this combined data with historical data on utility consumption, vehicle-miles traveled, weather patterns and demographics—all with the aim of enabling the better management of these resources (Lyons, 2010b; Naphade, 2010; Steinhauser, 2010a). With each endeavor, the local government works with IBM and other local partners to design, implement, monitor and evaluate these pilots, enabling them to revise and redesign as necessary as they are implemented. This, in theory, enables the local government to be more agile, to change the way that services are being provided as problems or issues emerge, thus enhancing residents' experiences of the city. And, as more and more SSD projects are implemented, the local government hopes to be able to increasingly glean insight from the resulting data to help inform urban planning and policy formation. Through this narrow aperture, smart city projects are viewed as a means to help monitor, measure and manage city flows and processes, within both citizens and city leaders benefiting from the data created (Kitchin, 2014b). And, as portrayed by IT providers, feedback through the types of envisioned dashboards can enable the iterative process for continual enhancement and improvement.

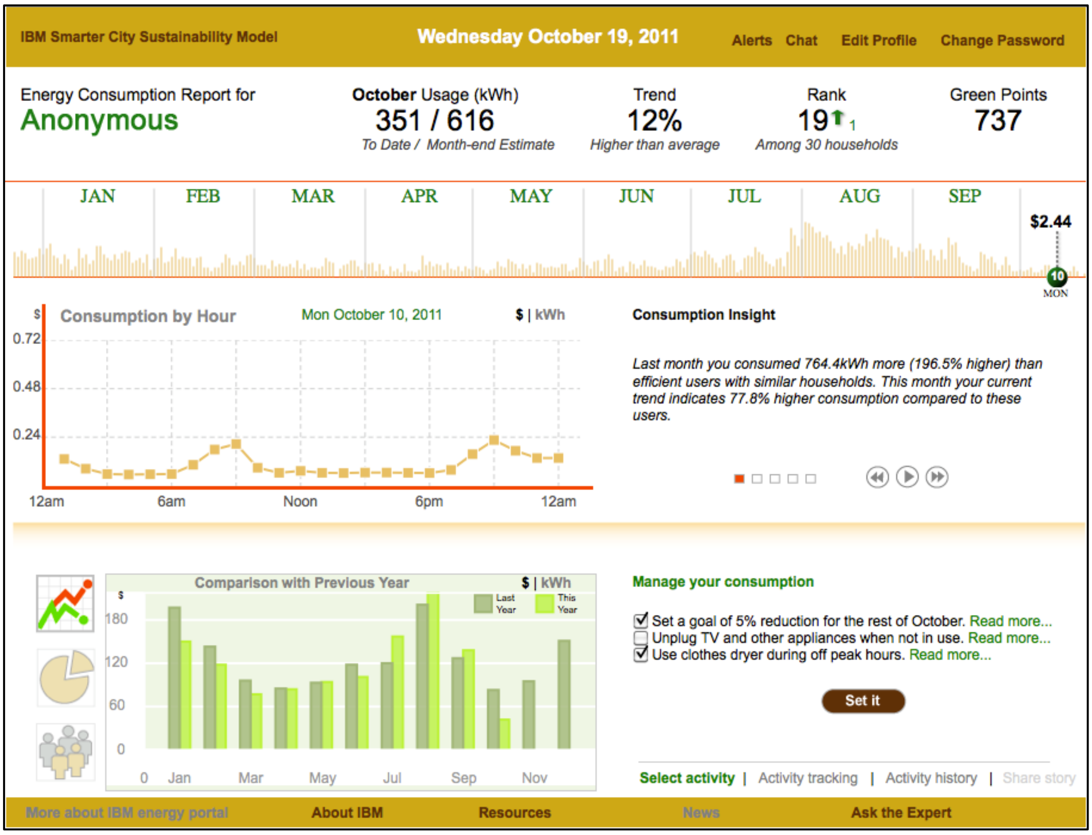
Enable and Nudge

As highlighted in Chapter 4, the task of government is perceived to be shifting—no longer is it primarily focused on traditional planning, but rather it is increasingly becoming more involved in supporting citizens so that they can take on responsibility for social problems in their communities and formulate the appropriate solutions to address them (Ilcan and Basok, 2004, p. 132). In this vein, the design of the SSD projects reflects this perspective, for the SSD umbrella program was informed by the local government's belief that the key to long-term sustainability is to give city residents the information that they need to make informed decisions about how they consume resources like electricity and water (The City of Dubuque, 2009e, 2010a; Sustainable Dubuque, 2010b): "The overarching idea is that if you give citizens tools to find the inefficiencies in their lives, they'll tighten the screws themselves" (Dillow, 2011).

In this context, city residents become critical actors in smart projects, with the local government viewing them as citizen consumers who are active agents in helping to address sustainability. In SSD endeavors, responsibility for sustainability outcomes has been passed on to city residents, who are expected to provide their data and time—and ideally change their behavior. As part of this responsibilization (Livingstone et al., 2007; Rose, 1999, p. 174), where city residents can affect change through their consumption patterns, the local government in Dubuque has tested new ways to engage and relate to citizens to facilitate and further these processes through the SSD projects. Both the Smarter Water and Electricity Pilot Studies serve as examples of where the local government and IBM designed the portal to not only enable behavior change, but also guide decision making about behavior; in other words, to game the system to get their desired results.

Both the Smarter Water and Electricity Pilot Study portals used techniques such as charts, alerts, social comparisons, weekly contests, incentives and a chat function (Erickson et al., 2012) to attempt to nudge household behavior in desired directions (Ariely, 2010; Cialdini, 2008; Thaler et al., 2010). The Smarter Electricity Pilot Study portal shown in Figure 21 illustrates some of these techniques, such as comparing households with each other (rank), using visualizations to denote spikes, and gaming to inspire reduced usage and bigger conservation decisions such as buying a new appliance (green points). Thus, while providing citizens the tools to help 'address' sustainability issues while making better choices about resource consumption, the local government was attempting to guide this process.

Figure 21. Smarter Electricity Pilot Study portal



Source: Naphade, 2012.

Yet the notion of guiding behavior change is not unique to portal-type projects. Inherent within the scope of many smart projects is the implicit goal of behavior change on the part of the system user. This type of implicit social control and potential surveillance within portal projects reinforces the notion that smart projects can be seen as an extension of neoliberal policy experiments taking place at the local level (Peck and Tickell, 2002), with the local government monitoring and attempting to guide citizen behavior in specific directions. Whether it be less driving (e.g., congestion charge), using more public transportation (e.g., integrated fare management) or reducing resource consumption (e.g., smart water or electricity meters and accompanying portals), smart efforts are frequently designed in ways to nudge citizen consumers to make certain decisions about the smart system and how they interact with it (Barr et al., 2011; Department for Environment, Food and Rural Affairs, 2007; Thaler et al., 2010; Thaler and Sunstein, 2008). As described by former IBM CEO Sam Palmisano in a speech at the GridWise Global Forum 2010:

> Yes, the progress of technology is accelerating. Yes, the consciousness of key professions and institutions has been raised. But the crucial change—the one that will have a truly transformative impact—is activating the consumer. And doing that isn't a matter of dashboards, or advertising, or advocacy. It means designing a system that is optimized for them. (Palmisano, 2010c)

Often, this goes hand in hand with narratives touting the importance of citizen engagement. As noted by Mayor Buol in an interview with IBM for the Smarter Planet Leadership Series, “when citizens feel like they’re a part of a solution, they’re much more willing to accept the outcomes of whatever it is” (Buol, 2010). In other words, Buol believes that citizens need to feel like they are a part of the process in developing projects, especially when they will be given increased responsibility or costs as a result of their engagement. In some smart projects, city residents can decide not to accept the costs or behavior change, such as congestion charging, but then they may lose access to that infrastructure or service. From this discussion one can deduce that the way that smart projects are designed will inform who is involved, how involved actors engage with each other and what expectations involved actors have for each other.

6.4 Transforming Engagement

As highlighted above, city leaders invested in various entrepreneurial-type ventures to pull the city out of its downward spiral in the 1980s. This included bringing together a range of actors from both the public and private sectors to reclaim and reinvent the area along the city’s waterfront. Once an epicenter of the city, decades of neglect led the riverfront area to be plagued by environmental issues, undervalued property, and a mix of heavy industrial uses. In the late 1990s, the Dubuque County Historical Society created the America’s River project to redevelop the area. Within a few years, this grew from a $25 million America’s River Project into a $188 million revitalization effort due to collaboration amongst several riverfront projects and across various sectors. In the end, 90 acres of underutilized, industrial, brownfield property were transformed into a center that highlights the educational, recreational, historical and environmental facets of the Mississippi River (BBC News 2011; Dubuque Main Street 2012; The City of Dubuque 2010a). At the center of each of these revitalization endeavors was a public-private partnership—which has since become the city's dominant model for urban development.

In a similar fashion, in the City of Baltimore, Maryland in 1978, after a highly-contentious referendum narrowly passed to enable city land to be used for private development, the local government, through a PPP effort, turned neglected land into the Baltimore Harborplace. Due to the perceived success of the development, there arose a consensus around the use of public-private partnerships in almost all urban governance matters (see Berkowitz, 1984; Lyall, 1982; Stoker, 1986 in Harvey, 1989a). And this has been no different for Dubuque. Public-private partnerships have been used to implement sustainability and smart projects, leading to, among others, an increased private sector role to facilitate government function and services, a pro-business bias, and a blurring of the line between these actors (see Agranoff, 2003). I explore stated reasons for partnering around smart projects below, and then discuss how these partnership arrangements seem to be affecting roles and expectations between involved actors.

6.4.1 Legitimacy, Risk Aversion and Expertise

In a series of interviews with IBM for the Smarter Planet Leadership Series, Dubuque city leaders repeatedly stated that PPPs are "the way of doing business" in the city, most notably around large, complex (and speculative) urban development and renewal efforts (Burbach, 2010b; Dickinson, 2010; N. Van Milligen, 2010). This viewpoint was well summarized in these IBM interviews by the head of the city's Chamber of Commerce, Molly Grover: "You can look out any window in Dubuque to see the evidence of public and private partnerships" (Grover, 2010). In the case of implementing SSD endeavors, the roles and responsibilities of actors involved in the associated PPPs have been dispersed. The provision of resources have varied across each smart project, but in general IBM and other local tech providers have provided the means by which to enable data gathering and analysis, the local government has provided organizational support for implementation and funding (or sought for funding sources), while third party organizations have assisted with the requisite community training and awareness-raising (Lyons, 2010b). According to those who I interviewed from the local government, smart project staff, and other involved actors, this dispersion of responsibilities around SSD projects has served several purposes, including: enhancing perceptions of legitimacy, helping to defer accountability and gaining technical expertise that the local government itself cannot provide.

One example of this dispersion of responsibility is the involvement of Dubuque2.0, a community engagement arm of the Community Foundation of Greater Dubuque (CFGD), a tax-exempt public charity that serves to benefit people in the local area. As a partnership between CFGD and the Dubuque Area Chamber of Commerce, Dubuque2.0 was funded by businesses, utility companies, local nonprofits, and state and national foundations—including, among others, Alliant Energy, Mystique Casino, the Dubuque Racing Association, the Knight Foundation Community Information Challenge, the Telegraph Herald (the local paper), and the Iowa Office of Energy Independence (FSG and Network Impact, 2013, p. 6). Created in late 2009, Dubuque2.0 had the primary aims of (a) raising awareness of the sustainability, and later smarter sustainability, agendas by engaging businesses, schools, neighborhoods, and nonprofits; and (b) helping to guide community-wide behavior change toward SD and SSD ends (Dubuque2.0, 2010a).

As smart efforts developed, this scope expanded to include: (a) hosting community cafés and trainings for the smart pilots that would help encourage participation and ensure participants understood the online electricity and water portals; and (b) encouraging reductions in resource consumption by offering weekly prizes and conservation tips through the portal, its website and blogs (Dubuque2.0, 2010b, 2010c). Though Dubuque2.0 funding ran out at the end of 2012, it served several key functions for SD and SSD endeavors. Nancy Van Milligen, President and CEO of the Community Foundation of Greater Dubuque, explained how she saw the benefits of this government-third party relationship in an interview with IBM for the Smarter Planet Leadership Series:

> I think the advantages of having a third party build this initiative or build this vision for the future is—number one, you bring in citizen trust... we have no agenda except engaging the community around this sustainability initiative. Compared to the utility companies or the government, they have

> built in agendas. So by having that third party you immediately, if done well, can build in citizen trust. You also share the workload. There are some activities that a non-profit for instance can do that government or the utility companies couldn't. They couldn't be using tax dollars or their shareholders' dollars to maybe have a game on the internet or do some of the other things, the guerilla marketing, that we can engage in that is maybe a little bit more cutting edge or risky that taxpayers might not appreciate. (N. Van Milligen, 2010)

Thus, according to Van Milligen, because Dubuque2.0 was a third party actor, it was perceived by citizens as being an objective actor, adding legitimacy to the projects—despite the fact that the organization was created with the primary aim of helping promote the local government's SD and SSD endeavors. In her mind, since Dubuque2.0 was an 'outside' actor, its interests could be perceived as separate from its supporting organizations, i.e., the local government, utility companies and other involved local private sectors actors. Implicit within this quote is the assumption that a third party organization can better represent and / or capture the interests of citizens, thereby gaining their trust, more so that the local government. Additionally, Van Milligen believed that the local government could assign certain activities to Dubuque2.0 that perhaps the local government could not do itself. For in part, the formation of this third party organization created a loophole for the local government where it could engage in more risky tasks—such as guerilla marketing for SD and SSD—through third party channels so as to absolve the government of blame if these risks did not pay off. It also reduced government accountability because Dubuque2.0's efforts were not funded by local taxpayer dollars.

In literature research and several other interviews with representatives from Dubuque2.0, the local government and the business community, I found similar sentiments. In general, by collaborating with Dubuque2.0, it was portrayed that the government was able to: (a) provide an air of independence or objectivity to the sustainability and smart efforts so that they are not perceived as entirely government projects (Dregne, 2010a); (b) complete activities for which the local government might be criticized (e.g. marketing of smart projects) by getting funding and implementing through third party channels (Dregne, 2010a; Steinhauser, 2010a); (c) share the workload of complex smart projects across various sectors (Dregne, 2010a); (d) add a sense of legitimacy to a project due to the broad spectrum of the various groups involved (Dregne, 2010a; Steinhauser, 2010a); and (e) further spread narratives through the city residents involved in Dubuque2.0 activities, with the residents becoming agents of public relations through their involvement (Dregne, 2010a; Steinhauser, 2010a).

Additionally, by running communications through Dubuque2.0, the local government was able to begin to frame sustainability and smart agendas beyond technology and politics, thereby limiting viewpoints that deem these agendas as representations of government or corporate interests. In interviews with pilot participants, they often were not aware of IBM's or the utility companies' involvement in these projects—though, they did recognize that the local government was affiliated, often resulting in improved perceptions of city leaders (Erickson et al., 2012; Naphade, 2011, 2012a). This outsourcing of public functions like messaging and public engagement to an extent masked the local government's involvement. If SSD failed, there were many other organizations involved that could be blamed or associated with its failure. If it succeeded, the government could still claim its involvement in the project. This also meant that the government was no longer controlling these functions—that messaging and the way that citizens were being engaged around a 'government' project were now being decided upon by a third party actor. While the government did have influence in the overall direction of Dubuque2.0, day-to-day operations were still independent.

The local government also partnered to gain technical knowledge within SSD projects due to the complexity involved with these endeavors and the small size of the local government staff. For instance, in addition to IBM and the City of Dubuque's local government working together on SSD, partners who assisted with technical aspects of the Smarter Water Pilot Study included: (a) the Neptune Technology Group, which produced R900 and R450 Smart meters; (b) ESRI ArcGIS, which provided geospatial services and maps for viewing the aggregate data for the City; (c) Verity Three, which post-processed smart meter data received hourly from wireless gateway; and (d) Northern Water Works Supply, which installed the meters for the City of Dubuque (Naphade, 2011). Similarly, there was a range of partners for the Smarter Electricity Pilot Study. In addition to the local government and IBM, the project received technical support from: (a) The Interstate Power and Light Company and the Alliant Energy Company, the two utility companies that provided the smart electricity meters and relevant data; and (b) Verity Three, which, through a wireless gateway, post-processed smart meter data and sent it to the IBM cloud (Naphade, 2012).

What becomes clear when reviewing these lists of partners is that they bring services and resources to the table that the local government could not provide on its own—whereas in much larger cities, this dearth of in-house technical expertise may not be the same. In this case, and most likely in similar cases with smaller to medium-sized cities, the complexity of smart projects may necessitate the involvement of experts from the private sector for design and implementation, especially in the areas of IT, infrastructure, architecture and engineering. Further, as noted in my interview with Dubuque's Information Services Manager, these private sector actors will most likely be needed for training, maintenance and operations as SSD moves forward. For local governments that increasingly pursue smart projects, and that need to bring in external IT provider expertise, more and more government tasks will become privatized in this regard. In Dubuque, this move to increasingly bring in the private sector for city services delivery was not seen as negative by the local government since more than half of the local government staff that I interviewed perceived their interests squarely in line with those of IBM. However, this type of perceived alignment may be unique—for corporate actor and local government interests frequently conflict (Monbiot, 2000, pp. 5-17), and even within organizations there can be a lack of alignment around interests.

6.4.2 Expected Relationship Gains

According to narratives created by smart project supporters, both IBM and the local government will gain from the Smarter Sustainable Dubuque endeavor (IBM, 2009d, 2010a, 2010c, 2011c; The City of Dubuque 2009e, 2010b, 2010e). Expected benefits to the city include job creation resulting from the opening of IBM's Global Delivery Facility, new talent lured to the city by the technologies and sustainability focus, new businesses attracted by IBM's presence (i.e., due to a boost city brand), and increased efficiency in service delivery from the data and insight gained—each of which are potential contributors to economic gain and development (IBM, 2009d, 2010a, 2010c, 2011c; The City of Dubuque 2009e, 2010b, 2010e). Expected benefits to IBM include being able to test smarter city solutions in an actual city environment and a resulting enhanced understanding of urban environments and the smarter cities space—both of which IBM staff hope will enable the company to expand further and dominate the Smarter Cities market (IBM, 2009d, 2010c). Both actors have hoped that this initiative would lead to a sustainability model enabled by smart technologies that they could scale and replicate around the world in communities of 200,000 and under (IBM, 2009b, 2011c; PR Newswire, 2011a). In actuality, to date, the benefits of SSD have not aligned with what was expected for either partner.

When discussing urban development in Dubuque, local officials and government materials portray IBM as an actor integral to the city's continued economic growth, in part justified by the perceived similarities between the organizations' goals. As described by the Mayor in an IBM Social Media video on YouTube: "It was almost like a natural marriage of the two to come up with this Smarter Sustainable Dubuque research project…" (Buol in IBM, 2009b). Here Buol is referring to both the local government and IBM's interests in applying smart technologies to sustainability to see how the resulting solutions can be used to improve city operations, functioning and competitiveness.

IBM narratives also stress the import of SD and SSD to the city's economic future. In same IBM video, "Dubuque—Smarter City", the narrator notes that the local government made sustainability a priority in 2006, realizing that, for the city, "it was crucial to being economically competitive" (IBM, 2009b). The narrator goes on to state that the addition of smart technologies toward the city's sustainability ends provides Dubuque with an additional competitive edge that can contribute to, among other things, economic gain (IBM, 2009b). There have been many other stories generated by IBM telling this story of partnership and how the city will benefit from it—in press releases (IBM, 2010c, 2011c, 2011e), videos on YouTube (IBM, 2009b, 2011d, 2012a), documented case studies (IBM, 2010a, 2012b), Smarter Cities events and webcasts (Forward & Onward, 2009; IBM, 2010d, 2012c), project evaluations

(Erickson et al., 2012; Naphade, 2011, 2012a), and numerous PowerPoint presentations created by employees around the world describing this work (Harrison, 2010; Naphade, 2010). Each reiterates this theme that through this partnership, and the SSD endeavors, the city will experience economic growth, draw in new business and talent, and become more competitive, among others.

In this fashion, IBM is, to an extent, portrayed as the city's new John Deere, where the tech provider is seen as an influential part of economic development in the city—somehow despite the fact that IBM employs a mere fraction of the number of Dubuquers that John Deere employed. In narratives about SSD, IBM's presence in and partnership with the city are often portrayed as key to the city's future. As noted by the President and CEO of the Dubuque Area Chamber of Commerce Molly Grover in an IBM video created for the Smarter Planet Leadership Series: "Having IBM here as a partner in the city and working with us to solve some of the issues and some of the priorities that we… work on in our community are imperative to our growth and continued success as a city and as a community" (Grover in IBM, 2012a). This sentiment is echoed by the SSD Project Manager David Lyons in an IBM client reference video on YouTube:

> For a community like Dubuque, this type of partnership is critical. The beauty of using cloud computing in [Smarter] Sustainable Dubuque is to give us access to the world's finest technology and the world's finest technicians without having to make the upfront investment as a community. IBM is a wonderful partner for Dubuque in this [Smarter] Sustainable Dubuque project because there is an organization alignment on sustainability and the ability to use data more smartly in the future. (Lyons in IBM, 2011d)

Here, Lyons reinforces the notion that perhaps IBM is the city's new John Deere by deeming the partnership as critical to the city and its future. Building on the momentum initiated by the arrival of IBM, according to local government leaders in interviews conducted with IBM for the Smarter Planet Leadership Series, the local private sector has seen a rise in emphasis on green and green technology (Burbach, 2010b; Lyons, 2010a). A few local businesses have adapted their operations, services and / or products to fall in line with this sustainability focus, while a few new small business ventures around green have also been launched (Burbach, 2010b; Lyons, 2010a). In fact, it was one of these new, small green venture companies that ended up taking over for IBM when the pilot portal projects were expanded, as IBM was not awarded the continuation contract for data collection and analysis. The emergence of these types of small venture companies, to some extent, is facilitated by the innovative and creative partnerships that are formed around smart projects. For the learning, knowledge transfer and capacity building associated with smart city projects enables innovative and creative exchange that otherwise may not have taken place (Deakin and Al Waer, 2012, p. 8). Other examples of this type of urban regeneration programs linked to the smart city can be found in Edinburgh, Helsinki, Glasgow and Dublin (Deakin et al., 2005 in Deakin and Al Waer, 2012, p. 14).

6.4.3 Actual Relationship Outcomes

Yet not all actors view IBM's presence in Dubuque as a boon to the city. Criticism has emerged within local and national media, as well as within IBM employee forums. One recurring theme in this pushback critiques the amount of incentives IBM received from state and local government actors, estimated to be in the tens of millions, to minimize IBM's cost for establishing an office in the city (Cringely, 2012; Telegraph Herald, 2014). This included a grant to refurbish the downtown Roshek Building for its office (Mozinski, 2009c). These types of tax incentives / abatements are linked to neoliberal strategies to "lower the costs of state administration, capitalist production, and social reproduction within their jurisdictions and thereby to accelerate external investment" (Brenner and Theodore, 2002, p. 373). These incentives were part of the local government's efforts to make the city an attractive business climate for IBM. Critics feel that these incentives overcompensated for what the city gained in the end.

Another frequent criticism lobbied against IBM is around local job creation, or the lack thereof. At the onset in 2009, IBM promised that it would deliver 1,300 well-paying jobs to the city with the opening of the Global Delivery Facility (Telegraph Herald, 2014). However, according to some IT analyst articles and IBM employee forums, most jobs are low wage positions offered to recent college grads and / or 'trainees' from India who stay in Dubuque for an unspecified amount of time and then are sent home (Alliance@IBM, 2015; Cringely, 2012). It is unclear how many permanent hires have been awarded to local Dubuquers, nor how many IBMers spend less than a year working at this site (Cringely, 2012). Countering this criticism, by some narrative accounts, IBM's presence has quadrupled employment in the city's historic downtown core (Greenblatt, 2014). In my interviews with a senior executive with the GDDC and a senior city leader, they stated that IBM has created about 1,300 jobs in the city, while job growth purportedly associated with IBM's presence has been estimated to be about 2,400 jobs—though each would hardly state otherwise due to their respective roles. Similarly, the local paper, *The Telegraph Herald*, ran an Op-ed from its Editorial Board that contradicted some perspectives of the foreign workforce in the IBM office—instead of portraying them as outsiders taking local jobs and then leaving with knowledge gained, their article noted that this practice has "expanded the community's cultural diversity", and though "there have been a few bumps along the way", local inclusiveness programs have been launched to address these issues (Telegraph Herald, 2014). It should be noted however that *The Telegraph Herald* provided funds to Dubuque2.0, so it cannot necessarily be seen as an objective source. Through my research I was unable to ascertain exactly how many jobs were created directly or indirectly due to the opening of the GDF and IBM's presence in the city.

Just as local government gains fell short of what was expected, so did those for IBM. With the launch of SSD, IBM hoped that this endeavor would enable the firm to learn more about the smart city market and the applicability and viability of its Smarter Cities solutions, with the end goal of commodifying end results. While it was able to test various smart city solutions and learn during implementation, none of these to date have resulted in being commoditized into a replicable solution, though IBM has employed some of these solutions in other one-off projects. In addition, based on my inquiries to relevant IBM staff, it seems that the smart technologies and sustainability model shared with communities in Australia and Turkey did not get replicated elsewhere. However, that is not to say that the knowledge gained from this effort was not beneficial for it has been transferred to other projects and solutions through the work of involved IBM staff.

Despite these shortcomings, IBM did gain by being able to use Dubuque as a client reference. By adding the Dubuque case study to its arsenal of Smarter Cities stories, IBM aims to make its story about smart technologies and the potential they offer more compelling. For example, in “City of Dubuque: IBM Smarter Planet Client Success Video”, several city leaders, like Mayor Buol and SSD Project Manager David Lyons, are interviewed to share their perspectives on IBM’s Smarter Cities (IBM, 2011d). Both Buol and Lyons extol the value of the work and having IBM as a partner, thus helping to create useful client references for IBM to use to secure other Smarter Cities wins. This is unsurprising given the perceived need for and benefit of IBM’s presence within the city, and its role within the SSD endeavor. Other IBM smart city clients have declined to serve as references where the projects have not gone well, or where they have not felt the need to openly support or praise the work of this tech firm.

It is interesting to note that when describing the Smarter Sustainable Dubuque initiative, both the local government and IBM portray the partnership as being equally mutually beneficial despite the fact that IBM is an organization over seven times the size of Dubuque in terms of people. Yet, the power of tech giants in these types of relationships is sometimes overestimated, especially by companies and their public relations machines. As noted by McNeil, “how global firms provide smart city policy and technology will be an incredibly challenging field, both logistically and competitively” (McNeil, 2014, p. 3). Internal knowledge management, in terms of best practices and lessons learned, the nature of the urban problem, and development of scalable, replicable and profitable models that work in various environments are amongst some of the challenges that tech giants will face while working within the smart city market, thereby weakening their positioning.

In the case of Dubuque, while IBM does carry a lot of clout given its size, the local government has also demonstrated its power within this relationship, primarily by expanding SSD pilot projects with local technology firms as partners instead of continuing contracts with IBM. Chris Kohlmann, Information Services Manager for Dubuque, explained IBM’s Achilles Heel in this relationship: “A challenge for IBM is making these tools affordable when they go to market with cities of our size”

(Kohlmann in Greenblatt, 2014, p. 4). Large corporations like IBM, due to their size, frequently need to charge higher rates for various services and solutions than smaller, more nimble tech provider counterparts. This has given IBM a distinct disadvantage once they have established working smart city systems within urban environments. While in some cases smaller, local companies may not have the manpower, scope and / or expertise to fully integrate smart technologies across or within city systems, once these systems are established, they may very well have the capacity to take over managing and operating them. And, this is exactly what happened in Dubuque for both the Smarter Water Pilot Study as the experiment was expanded (Kohlmann, 2014).

As this discussion demonstrates, while both actors did experience gains from the SSD endeavors, benefits fell short of what was anticipated for each actor. In general I found that for both IBM and the local government the most prominent gain was a boost in brand. I explore this further in section 7.2.

6.4.4 Rising Expectations

In Chapter 4 I discussed how governments are progressively focusing on how to enable and assist citizens in tackling community problems (Ilcan and Basok, 2004). Along with this has come a change in the interrelations between politics, civic organizations and the economy, dissolving the distinction between citizen and consumer—making citizenship tied to a consumer's right to participate in the marketplace, where through choices around consumption, citizens can affect positive social change (Beck, 2005, p. 170; Glickman, 1999, pp. 1-16; McGovern, 1998). Citizen participation in civic affairs is increasingly shifting towards contributions through purchasing power as consumers (Needham, 2003; Livingstone et al., 2007). This is most commonly seen in government campaigns and programs related to sustainability where there is an emphasis on changing individual behavior to reach sustainability goals (Hinchcliffe, 1996). Along with this shift, public engagement moves beyond the informed citizen, who keeps aware of pertinent issues, to engagement that seeks action on the part of individuals through the act of consumption. These shifts are reinforced and accentuated by smart projects, which by design require delegating more and more responsibility to city residents in terms of their behavior and financial obligations. Both the Smarter Water and Electricity Portal Studies provided good examples of these changes.

The local government in Dubuque has viewed SSD as a way to enable city residents to become more involved in the community's sustainability efforts, most notably in terms of how they made choices about resource consumption. In a keynote presentation for IBM Connect 2013, a large, global conference held by IBM's Software Group, City Manager Michael Van Milligen outlined this citizen responsibility clearly: "(we) are changing the way the city of Dubuque is servicing its residents… what we are doing is making our citizens the solution to our local challenges" (M. Van Milligen, 2013). In both of the pilot studies that I examined, participating Dubuquers became citizen consumers, who, by making choices about how they consumed electricity and water, affected progress toward the city's sustainability agenda and goals.

The local government knew that in order for the Smarter Water and Electricity Pilot Studies to be 'successful', they would also have to get participating households to agree to volunteer time, share data, and potentially change their behavior (and, eventually pay for the advanced meter through water rate increases). Part of the strategy to spur participants to action included purposive portal design that employed behavioral economic techniques to nudge participating households in certain directions, as discussed in section 6.3. In addition, the local government also engaged citizens to help instill feelings of ownership and responsibility. For example, the Community Sustainability Task Force assigned to define sustainability was established with broad representation, including representatives from businesses, schools, hospitals and environmental groups, as well as city residents. The Task Force reached out to individuals and groups within Dubuque by handing out surveys, posting information to the web, sending press releases to local newspapers, and fanning out into neighborhoods to get input from offices, schools, libraries and coffee shops. This was done not only to deepen the feelings of community engagement (whether significant or not), but also to aid in increasing a sense of ownership in SD (and later SSD) and to raise awareness of these endeavors by word of mouth. The third component of local government strategy to aid in this shift—in addition to portal design and citizen engagement—included the use of compelling narratives to encourage participation and change, a factor that I explore in depth in Chapter 7.

Conclusions

The Dubuque case study provided an interesting example of how, through interactions with IBM around smart initiatives, the local government became increasingly exposed to and accepting of IBM's business perspectives, frameworks and practices, and how this in turn informed strategy and engagement arrangements. From IBM's perspective, Dubuque provided an 'ideal' testing ground given the local government's embracing of smart technologies, which was encapsulated in the local government's partnership with IBM to make the city a living lab for smart city solution experimentation (IBM, 2009b, 2011c).

Several assumptions of smart (Hollands, 2008) were already present within the local government's strategies and practices before the creation of SSD, such as an emphasis on city competitiveness, economic growth, efficiency, citizen engagement and private sector approaches and models (The City of Dubuque, 2015b). Therefore, the establishment of SSD did not represent a huge departure from existing local government thinking (The City of Dubuque, 2009e). However, there have been changes that reflect influence from IBM, including: (a) integrating the use of smart technologies into the city's sustainability strategy, encapsulated in the creation of SSD; and (The City of Dubuque, 2009e), (b) the consequent elevated role of the city's Information Services Manager and her office in other non-SSD endeavors where data and analytics are seen to be critical elements (Kohlmann, 2014). Together these two changes demonstrate how the local government has prioritized "market-led and technological solutions to city governance and development" and data capture and analysis to inform decision making (Kitchin, 2014b, p. 2).

A review of SSD projects in Dubuque also shed light on the transference of private sector practices and frameworks to the public sector. In my analysis, I focused on three prevalent private sector approaches employed by IBM that I observed: the living lab, agile method and behavioral economics. Given that SSD projects were more speculative in nature since they involved testing new solutions and offerings, IBM and the local government deemed Dubuque a living lab, thereby creating space for innovation and failure within the local government (Schaffers et al., 2011). As smart city solutions were tested, the agile method was employed throughout design and implementation to allow for flexible, iterative and collaborative project development with the local government and city residents (IBM, 2015b). And, behavioral economics techniques, typical to consumer industries, were applied to nudge city resident behavior in certain directions that the local government and IBM deemed favorable (Erickson et al., 2012; Naphade, 2011). Each of these examples underscore policy mobility / transfer of private sector practices to the public sector (Wiig, 2015) through SSD projects.

In conjunction with these shifts related to strategy and approaches to achieve it, SSD projects have been designed, implemented and managed through PPPs, helping to elevate the private sector's role and perspectives (Hearne, 2009, p. 7). In the case of the PPPs formed around SSD projects, IBM was able to insert its technologies and viewpoints into urban conversation in Dubuque. Further, through the design of the Smarter Water and Electricity Pilot Studies, IBM introduced itself and its technologies into the relationships between local government and participating households. Portal user interfaces were designed by IBM, and while modified by feedback from the local government and participants, this still meant that IBM shaped the nature of this local government-city resident interaction (Erickson et al., 2012; Naphade, 2011, 2012). The portal also enabled the local government to indirectly pass responsibility, and increased expectations, on to city residents—for their decisions about resource consumption either contributed to or worked against the city's sustainability objectives (Dillow, 2011).

What can be seen in this case study in terms of IBM's interactions with urban governance through smart projects, is that IBM was able to influence project strategy and engagement arrangements, and through this interaction as the number of smart projects grew, changes within broader city strategy and engagement began to emerge. These changes reflect and accentuate a neoliberal ethos (Peck and Tickell,

2002) and the entrepreneurial management styles that are highlighted in the assumptions commonly associated with smart projects (Hollands, 2008). Even the aspirations for SSD reflected an entrepreneurial mindset—for both IBM and the local government hoped to scale and replicate this smart sustainability model in communities of 200,000 and under around the world (IBM, 2009b, 2011c; PR Newswire, 2011a). I continue to explore this case study by looking at IBM interactions around representation of smart projects in Dubuque below.

7 Dubuque: Reimagining Urban Governance through Smart

In Dubuque, narratives about smart initiatives have been woven into sustainability discourse with the creation of Smarter Sustainable Dubuque. The resulting tapestry has made Dubuque's story a compelling one, appealing to various audiences such as city residents, local governments within the United States and around the world, the U.S. Federal government, IBM and the media. This is evidenced by the number of city residents who requested to be volunteers for the Smarter Pilot Studies, which surpassed the number of needed households (Naphade, 2011; The City of Dubuque, 2010b, 2010c); the numerous invitations that local government leaders get to speak around the world on sustainability, branding and / or smart projects (ICMA, 2013; The City of Dubuque, 2013a, 2013b); the sizeable amounts of Federal funding the city has received for sustainability efforts (The City of Dubuque, 2011b); and the prominent use of Dubuque as a Smarter Cities reference case study to highlight 'best practices' of IBM's Smarter Cities work (IBM, 2011c, 2011d, 2012a, 2012b).

Figure 22. The City of Dubuque

Source: This image is from the City of Dubuque's website: http://www.cityofdubuque.org/ (accessed March 10, 2016).

Further, Dubuque has received both national and international media coverage for its smart efforts. Though smart projects in Dubuque are small-scaled and not the most advanced in terms of ICT, city leaders have been able to construct a story of SSD that has quickly garnered attention from media like the *BBC News*, *PBS*, *Forbes*, *The New York Times*, *USA Today*, *Popular Science*, *BusinessWeek*, *Bloomberg* and *Fast Company* (Acohido, 2009; BBC News, 2011; Dillow, 2011; Forbes, 2007; Hamm, 2009a; Hoffman, 2009; Lindsay, 2010; Lohr, 2009a; PBS Blueprint America, 2010a, 2010b; PBS Newshour, 2010). And, the enthusiasm shown by those involved in smart projects seems to be contagious—when an IBM film crew went to Dubuque to film video on the SSD effort, after only two days of recording interviews with some of the involved city leaders, a member of film crew stated emphatically: “I’m moving to Dubuque!”

Given the allure of the smart city—and its ability to “capture the minds of corporations, policymakers and average citizens” (Shelton et al., 2014, p. 9)—it has increasingly become an attractive option for local governments seeking to enhance their cities’ appeal (Brenner and Theodore, 2002). Eager to distance Dubuque from its near-death past, the local government turned to the concept of smart in an attempt to build and maintain a perceived competitive edge. To this end, city has emphasized redevelopment projects, PPPs, boosteristic narratives, place marketing, sustainability and smart technologies to repackage city brand—each of which aligns with various assumptions of smart. And, the measures seem to have been ‘successful’ given the attention the city has garnered. The U.S. city of Baltimore provides a good example of a similar type of rebranding, where narrative and place promotion created around a waterfront and inner-harbor development project were used to reconstruct the city’s brand, resulting in a change so radical that Time Magazine called it the “Renaissance City” on its front cover (Harvey, 1989a, p. 14).

In this chapter I examine IBM’s interactions with local government policy and planning processes related to representation via the smart projects examined. I look at oral and written narratives and brand strategies that the local government and involved actors have employed to promote smart projects, and the city itself as these efforts have expanded. Within these examples, I explore how IBM—through staff, Smarter Cities perspectives, messaging and / or approach—has interacted with the way that the local government represents both smart projects and the city. I discuss the stories that have emerged around smart projects, how these have been customized to the local context to build support and buy-in, and depoliticized to help ensure broader appeal. I see these oral and written narratives as examples of how the local government is: (a) reproducing the messaging of IBM around smart city projects; (b) adopting and / or reinforcing various assumptions of smart; and (c) adopting policies from the private sector.

I also explore Dubuque's brand as created through the local government's place promotion strategies, and these have evolved with the integration of smart. Through this analysis, I conclude that an emphasis on boosterism and place promotion around smart projects is another factor indicative of how smart projects are manifesting as neoliberal policy experiments. I end this chapter with a brief discussion on how this reimagining of Dubuque through the lens of smart has opened the door for the redesign of urban governance mechanisms to this end. In my research, I found that in Dubuque the story of smart has been conveyed not only through smart project promotion but also through the way that the local government has represented the city. The purpose of this chapter is to highlight how findings and observations from Chapters 2 and 4 applied to smart initiatives being pursued in Dubuque, and to outline interactions between the IT provider IBM and local government processes around representation.

7.1 Stories to Bring Smart to Dubuque

Dubuque's compelling story of revival draws in intended audiences—as described by the city's Sustainable Community Coordinator in a video interview with IBM:

> You know I came back to Dubuque after growing up about an hour from here and when I left I left… and said… that is not somewhere I want to live long term. That is not where I want to raise my kids. That is not where I see opportunities for young people. And a lot of that I think came out of the very hard place that they [Dubuquers] were in in the '80s. And after being here three years, I tell that story of the '80s [of Dubuque's revival] almost like it is my own. (Burbach, 2010b)

Narratives around the city's recovery tend to include a few key themes: collaboration across sectors (which exist primarily in the form of PPPs), citizen engagement and sustainability, with an emphasis on the latter as the local government's centerpiece for urban growth and development (Buol in IBM, 2012a; Burbach, 2010b; N. Van Milligen, 2010; The City of Dubuque, 2009d, 2010b). Together, these three narrative themes have influenced the local government's strategy, engagement practices and approach to representing the city. Within the last few years, the concept of smart has been added to this thematic mix.

In this section, 7.1, I discuss excerpts taken from: (a) the fifty-four materials I used to inform my narrative review (video and written content); and (b) the thirty-five interviews that I conducted with those involved in smart projects in Dubuque.[52] Within these, I focused primarily on the key materials created by those responsible for promoting the smart umbrella program in Dubuque (the local government, IBM and the third party organization Dubuque2.0) and on interviews with the senior government staff and third party actors most closely involved with smart project implementation (i.e., the heads of Dubuque2.0, the IBM Research Project Manager, the project manager for the smart umbrella program, key representatives from the GDDC and the city's Assistant City Managers, Sustainable Community Coordinator, City Manager and Resource Management Coordinator). I equally weighted narratives derived from written / video content and interviews that I conducted. I then compare these narratives with messaging from IBM's Smarter Cities campaign, the assumptions of smart, and IT provider perspectives and approaches to: (a) demonstrate how within Dubuque smart is being recreated around the local context; (b) shed light on how those involved in these initiatives are assigning meaning to them; and (c) ascertain how IBM may be informing these processes of recreation and meaning.

Most of the initial narratives about SSD (and the individual smart projects within this effort) were typically created by smart project implementers and supporters, including: (a) city leaders, such as the Mayor, City Manager, Assistant City Managers, Sustainable Community Coordinator and Resource Management Coordinator; (b) Smarter Sustainable Dubuque project staff; (c) involved leaders from the business community and civic associations, such as the Chamber of Commerce, the Greater Dubuque Development Corporation, and Dubuque2.0; and (d) involved staff from IBM. As time has progressed, IBM-sponsored SSD stories

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[52] See Figures 8 and 9 in section 3.3 for a breakdown of these materials, and Appendix 11.5 for a listing of the materials for the narrative review.

have been created for more global audiences and appeal, while local authors have worked to craft narratives in closer alignment with the Dubuque context. Intent behind SSD narratives varied, and generally included: (a) highlighting proposed stakeholder gains to 'sell' the endeavors (Buol, 2010; PR Newswire, 2011a; The City of Dubuque, 2010b; The City of Dubuque and IBM Social Media, 2011); (b) serving as an invitation to stakeholders to support and participate in smart projects, thereby attempting to secure engagement (The City of Dubuque, 2009e, 2010b, 2010c, 2011e); (c) outlining rules and expectations for this stakeholder engagement (Dickinson, 2010a; Dubuque Public Information Officer, 2008; Grover, 2010; Sustainable Dubuque, 2010b; The City of Dubuque and IBM Social Media, 2011; N. Van Milligen, 2010); and / or (d) sharing the local government's vision of smart technology adoption and the desired associated outcomes (IBM, 2011c; The City of Dubuque, 2010b, 2010c, 2011e, 2011f; The City of Dubuque and IBM Social Media, 2011).

In each of these uses of narrative, the stories were highly malleable and able to concurrently resonate with a wide range of individuals and stakeholder groups. Smart stories were made broadly applicable since various narrative aspects could easily be constructed to resonate with local concerns without changing the underlying concept of smart or its associated assumptions. In general, SSD narratives draw heavily on those created for Sustainable Dubuque and those created by IBM for its Smarter Cities campaign, yet are customized to fit local context, culture, history and socio-economic conditions. Through this process of narrative creation, the concept of smart has been opened up beyond things solely technical, aiding in promoting individual and community responsibility, household economies and the business case for resource conservation.

7.1.1 Creating a Fertile Ground

In my examination of sustainability narratives in Dubuque, including those associated with SD and SSD, I found three main storylines typically used to introduce sustainability and smart, gain support / buy-in and encourage participation;

these center around a protagonist with a mission, good versus evil and triumph over adversity. I begin with the 'hero', Dubuque's Mayor, as portrayed by IBM:

> Buol's own life story, steeped in Midwestern traditions, made him an able messenger. Raised in his grandparents' home, where he moved at a young age with his mother and six siblings, Buol planted, harvested and consumed his first corn crop—upon a few square feet in his grandparents' backyard—at the age of six. (IBM, 2012b)

This excerpt from IBM's City of Dubuque Smarter Planet Leadership Case Study provides an excellent example of how the story of SSD has been crafted by IBM to engage its intended audiences. The typical story of SSD, when told by IBM or city leaders, begins with an 'underdog' city beating all odds for economic recovery, with a folksy hero emerging at the helm. According to Buol, his interest in sustainability began when he became a grandfather, which spurred a growing concern about the world his generation is leaving behind. A concern that, Buol says, compelled him to get city actors in action to do something about it (Buol, 2010; Buol in IBM, 2012b). So, Buol started having conversations with the residents of Dubuque about sustainability. As a retiree from 30 years at John Deere and a former Director of Landscaping & Grounds at a local university, Buol had spent most of his professional career in roles that touched the environment (The City of Dubuque, 2012e).

Thus, during his campaign, when city residents voiced concerns about water quality, recycling, green space, public transit and downtown revitalization, Buol selected sustainability as a key focus for his political platform in the 2005 mayoral elections (The City of Dubuque, 2012e). In addition to citing environmental reasons as to why a sustainability focus was important for the city, Buol also highlighted that it would be a way to differentiate the city (Sustainable Dubuque, 2010b, p. 5). The creation of SSD and using smart technologies to further sustainability ends has been perceived by local government as a way to continue this city differentiation (Buol, 2010; Buol in IBM, 2012b; The City of Dubuque, 2009e). This assumption that smart city projects can help differentiate urban environments is replete within IBM messaging around smart cities, as discussed in Chapter 5 (see Dencik, 2013; Dirks and Keeling, 2009; IBM, 2009a, 2009b, 2009d, 2010a, 2010b, 2010c, 2011a, 2011d, 2011e, 2012a, 2012b, 2012e, 2014d, 2014j, 2015a). And while numerous smart city narratives around SSD in Dubuque noted that this differentiation would help attract talent and resources and spur economic growth (Buol, 2010; Dickinson, 2010a; Dregne, 2010b; Grover, 2010; Hawks-Goodmann, 2010; IBM, 2009d, 2010a, 2010c, 2011c, 2011d, 2012a; Lyons, 2010a; Telegraph Herald, 2014; The City of Dubuque 2009e, 2010b, 2010e), there was also effort within smart project narratives to customize stories for individuals and local businesses versus highlighting generic citywide gains. Within this customization, there were references to IBM Smarter Cities narrative themes and the assumptions of smart.

The River and Farm

To help ensure that smart narratives resonated with city residents, smart project supporters often played upon the city's physical landscape, location and rural and Midwestern roots. For example, many SSD narratives reference the Mississippi River—an integral element to the city's identity and brand. The Mississippi River has been at the heart of the city's evolution, including its settlement, early growth, economic revival, downtown revitalization and sustainability agenda (Enzler, 2010; Iowa Rivers, 2013; The City of Dubuque, 2010a). As a central feature of the city, the river is a physical reminder of place; and according to the city's Public Information Officer, in many ways, the city's image depends upon the river. It has been cited as a factor that has contributed to the city winning the designation of third most beautiful place in the United States by *USA Weekend Magazine* (Flansburg, 2012), the best place to raise a family by *Forbes* (Levy, 2010), and "River City of the Year" by *Iowa Rivers Revival* (2013).

As explained by a senior city leader in a video interview with IBM for the Smarter Planet Leadership Series, when city leaders realized they needed to create a vision for the future, it seemed to make sense to start with the river, which was perceived to tie the community together: "But in the visioning there was an opportunity to bring people together to share ideas, to share memories and stories about what the river meant to them… What did it mean to have a river that was healthy today and in the future?" (Hawks-Goodmann, 2010). According to five of the sixteen local government officials that I interviewed, they felt that the river's presence has helped to better connect city residents to the environment and sustainability, and so they highlight the river in their SD and SSD narratives. For example, one senior city leader noted in my interview with her that the river was a good way to unite people within the city, as it symbolized common experience: "We're all concerned about rivers. We're concerned about clean water. We're concerned about bio-diversity. We're concerned about commerce. There are many different attributes and aspects of rivers that are easy to grab onto and pull those threads together". In a similar fashion, a leader within the business community noted during my interview with him that: "the river… reminds us on a daily basis of how precious this resource is… the notion of sustainability, because of our environment, is…more a part of the everyday life of our citizens". Thus, by weaving the river into SSD narratives, local government staff involved in creating the initial stories around SSD felt that they were linking this initiative to a prominent aspect of the town to which all Dubuquers could relate.

Figure 23. Agricultural artwork and influence in Dubuque

Source: Images are from the City of Dubuque's website: http://www.cityofdubuque.org/ (accessed December 9, 2011).

This notion of location was extended within narratives to envelop aspects of cultural life assumed to be typical to the city's geographic space. As described by Dubuque's Sustainable Community Coordinator in a video interview with IBM, "By beginning to talk about particularly where we're at in the Midwest, there is a strong agricultural heritage" (Burbach, 2010b). Centrally located within the American Breadbasket, Dubuque sits within the state of Iowa, where eighty-nine percent of the land area is in farms, and one in six Iowans are employed because of agriculture. Consequently, agriculture is still a dominant force in the state's economy (National Association of States Department of Agriculture, 2007; Wilde, 2009). Even within urban environments in Iowa, there are agricultural nuances, influences that have been strengthened by an influx of people relocating from neighboring rural areas (United States Department of Agriculture, 2011; Wilde, 2009).

Several of primary actors involved in constructing Dubuque's early stories of smart—i.e., twenty percent of the local government actors that I interviewed and two head staff from Dubuque2.0—noted that they consciously referred to this agricultural heritage and their ancestors' involvement in it to illustrate to city residents that the concepts of sustainability—and hence smart—are not new to the area or its people. Reinforcing this point, a senior city leader shared her story of how smart and sustainability link to the community's past in an interview with IBM:

> I think about our ancestors… my grandmother who conserved everything; who recycled; who used the water from the cistern to water the garden and wash the dog. Grandpa's, you know, kind of ethic of conservation that is pervasive in a family over generations. And we're not that far in America from those people who knew how to live more sustainably. (Hawks-Goodmann, 2010)

In stories around sustainability, sustainable practices are portrayed as a resurgence of a way of living that the community's ancestors knew well, ways that emerged from the necessity and practicality of farming life. As stated by another senior city leader in the same IBM video:

> We looked back and our best practices were things that our grandparents and our great grandparents were doing and these are people who maybe didn't even have an eighth grade education but they knew what they were doing because they knew about managing their life, managing the environment around them… these were all things that our grandparents and great grandparents did and they're just best practices that are resurfacing. (Steinhauser, 2010b)

The city's Resource Management Coordinator further reinforced this point in my interview with him, stating that he felt Dubuquers placed an emphasis on conservation due to their German and Irish roots and their agricultural heritage.[53]

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[53] In the mid-1800s, large numbers of Germans and Irish migrated to the United States. By the late 1800s, both groups were settling throughout the U.S. Midwest to pursue opportunities in agriculture (Sisson et al., 2007, p. 210).

Here the narrators are emphasizing familiar practices over new technologies. As noted by Dubuque's Sustainable Community Coordinator in an IBM interview:

> You don't start out talking about wind turbines and solar panels. You start out talking about the garden that their grandma has that they always got the best tomatoes from and you say yeah, that is sustainability… When you start to talk about sustainability in that way, that it is not something new that is a catch phrase that is come about in the last five years, it is something we've been doing forever, we just didn't call it sustainability yet. (Burbach, 2010b)

Within these excerpts, while storytellers do not emphasize data or technology, they do focus on themes related to the assumptions of smart (Hollands, 2008), as well as optimization and efficiency and how these tie to sustainability. The latter of which are central to IBM Smarter Cities messaging, but expressed in a way that is more likely to resonate with Dubuquers. In Chapter 5, I discussed how IBM integrates these themes within several of its key works on Smarter Cities, where smart technologies are portrayed as critical to optimizing resources (Dencik, 2013; Dirks and Keeling, 2009; IBM 2012e, 2014j). As seen in these excerpts of SSD narratives, smart technologies were not the focus; rather, emphasis was placed on what they purportedly helped local governments and households enable… in the words of IBM, "maximizing resources at their disposal" (IBM, 2012e, p. 2)—a theme that was able to be closely aligned with familiar agricultural practices / culture.

In addition to this, smart project supporters also linked stories to what they considered to be Midwestern traits—namely, in this context, being frugal and wanting to conserve (Erickson et al., 2012), evoking again this notion of efficiency. As noted by a senior city leader in my interview with her: "We are a… traditional Midwest community… Our citizens are fairly modest, fairly conservative and frugal". Similarly in an IBM video interview, a leader from the business community stated that this Midwestern frugality and reluctance to waste money and resources contributed to city residents supporting the sustainability agenda in Dubuque and SSD projects:

> First of all, as mid-westerners, we don't like to waste stuff, okay? Especially something as precious as water... Another sell was the fact that water costs money; it costs the city money to pump it… We soften every

> drop of water that is taken out of the aquifer for our municipal water system and then provide it to our…our residents and our companies. There is expense to that, so the less we use, the less expense we have. So there is a savings to the taxpayers. And, of course, the water pilot allows savings to the individual homeowner too. (Dickinson, 2010)

In a video interview with IBM, the Mayor also emphasized this point, stating that he felt that the sustainability and smart agendas were able to connect with Dubuquers because the associated narratives emphasized savings: "When I think of what messages resonated the best… the one to save money, save resources. Midwesterners… we're pretty conservative in many ways and that whole idea of, you know, re-use, recycle, is a good message that people can grab on to" (Buol, 2010). Further, IBM staff found in their interviews with participating households in the Smarter Water Pilot Study that volunteers repeatedly emphasized the pragmatism and frugality of Dubuquers—labeling themselves as thrifty, people of common sense, and people who hate waste (Erickson et al., 2011). This desire to conserve seemed to be the primary driver to their involvement in the pilot study, reaffirming the approach that SSD narrative authors took to frame smart efforts along these lines. These are but a few examples of how local government staff and smart project supporters constructed SSD narratives to better relate to city residents by making them sound familiar—molding the narratives to the local landscape, culture and perceived traits, while still integrating some of the assumptions of smart that are reinforced in narratives created by IBM. On top of this, smart and sustainability narratives also often included references to supporting a greater good to help garner local support and buy-in; thus tying into IBM messaging around taking action now to secure a better future (Dencik, 2013; Dirks and Keeling, 2009; IBM, 2012e, 2014j).

Taking the High Road

Within Iowa, approximately forty-six percent of the population goes to church once a week or almost once a week (The Gallup Organization, 2006)—a trend also prevalent within Dubuque, where roughly sixty-five to eighty-five percent of the population is Catholic (Association of Religion Data Archives, 2000).[54] These strong

[54] In comparison, Catholics make up about 23% of the overall population in Iowa (Kosmin et. al., 2001).

religious tendencies within Dubuque have, in part, contributed to the spread and growth in popularity of sustainability within the city (Schultz, 2010). According to the Dubuque's Sustainable Community Coordinator in a video interview with IBM, the local government actors "didn't just set (sustainability) as a priority because that is what they thought. They had had numerous groups in the community… come to them and say hey, this needs to be at the forefront" (Burbach, 2010b). Religious groups played an important part of this lobbying before SD and SSD were created (Burbach, 2010b). A good example of this link between environmentalism and religion within the city is the work of Sister Francine Quillin, pastoral associate of Dubuque's Resurrection Catholic Parish. Sister Quillin feels that sustainability is a matter of stewardship and the responsibility of everyone: "God said we are to take care of the earth" (Sister Quillin in Flansburg, 2012, p. 4). Doing their part, her parish has launched several efforts to help improve the environment, such as installing recycling containers and implementing a Lenten fast from plastic bags in 2011. According to Quillin, this has helped to bring the parish together, creating purpose and shared identity through their combined efforts, which they wear as a badge of pride (Flansburg, 2012, p. 4).

While smart and sustainability narratives were not constructed by SSD supporters and local government to specifically emphasize religious aspects as reasons to support and participate in SSD efforts, these stories were designed to reference an 'intrinsic rightness' of sustainability—a belief that seems to stem from these religious groundings. Similar to the badge of pride worn by Sister Quillin's parish, schools across Dubuque have begun competing against each other to see who can do the most 'good', flying Green Vision Education flags as a mark of the number of environmental efforts they have pursued (Flansburg, 2012). In my interview with the city's Resource Management Coordinator, he summed up enthusiasm for sustainability along these lines, noting: "I think that part of this is that it is not a new thing. That it is a lot of basic values that we learned, you know, in our homes, in our churches, you know, in our schools. And that it makes good financial sense for us and it makes for a more livable environment".

In SSD narratives the 'intrinsic rightness' of sustainability was also often linked to Dubuque's futurity by story authors—reflecting back again to a common theme within IBM narratives around Smarter Cities. In IBM's messaging, it is portrayed as being imperative that local leaders (and implicitly citizens) take action now to avoid future threats and risks, with smart technologies being key to enable better decision making around these actions (Dirks and Keeling, 2009; IBM, 2012e; White, 2015). Citizens and their way of life can be protected, but only if they 'do the right thing' now (White, 2015). Over half of the local government staff who I interviewed stressed the importance of living more sustainably so that their grandchildren could enjoy the same high quality of life that is experienced by Dubuquers. In video interviews with IBM, both the Mayor and the Resource Management Coordinator stressed that future generations could experience dire consequences if city residents did not start to change their consumptions patterns now, using this message to try and drive community engagement and behavior change. As noted by the Mayor in this video:

> You know if you have children or grandchildren you don't have to be a, you know, real deep thinker to realize that unless we do something as individuals and businesses and governments you know future generations are going to suffer and suffer greatly. …For me that message seemed to resonate with everyone. (Buol, 2010)

In this statement, Buol overtly links the security and well-being of future Dubuquers to the community's participation in conservation efforts now—adding a message of urgency to this notion of doing the 'right' thing. And, showing how this mindset spreads, many of the Smart Water and Electricity Pilot participants interviewed by IBM repeatedly said that they were cutting back on resource consumption because it felt like the 'right thing to do', and that it was part of their responsibility to cut back now so that future generations could benefit (Erickson et al., 2011). So, not only was local government echoing this messaging, but so were participating households in the study. The notion of contributing to a greater good was also referenced alongside 'intrinsic rightness' in SSD narratives by another senior city leader in this same IBM video series:

> I think that the secret to Dubuque's success around collaboration is that we've always had the ability to vision something that would transcend our

> community. You know to find something that is bigger than we are and that captivates our imagination but it also captivates the imagination of elected officials and of people from around the country and around the world. (Hawks-Goodmann, 2010)

By design, Smarter Planet and Smarter Cities narratives have been crafted to spur intended audiences to want to be part of something larger than themselves—an intent that coincides with how the local government of Dubuque feels that narratives around local smart projects should be crafted. In fact, this type of messaging appears to have been so convincing that participants use the same narratives to describe the significance of this work. When surveyed about why they joined the Smarter Water Pilot Study, participants referenced saving money as the first reason, with a desire to be part of something larger than themselves as the second (Erickson et al., 2011). One senior city leader outlined participant reasoning in an email correspondence to me:

> …when we asked [participants] why they wanted Dubuque to be the first smart city in North America and endorse the IBM pilot there were two main responses, one was not a surprise and the other was. The top reason was to save money and resources. This was no surprise for our Irish German heritage. Midwesterners, and in particular Dubuque citizens, tend to pride themselves on things such as being modest, frugal and resilient. The second reason the citizens of Dubuque stated why they wanted to be in the pilot—they want Dubuque to be a leader in the nation for sustainability.

These survey results that she refers to demonstrate that participants viewed both household and community gains as important reasons for their involvement; in other words, contributing to a greater good was important to them. These results also show that participants bought into the SSD narratives which extolled the purported outcomes that these projects would deliver. Along these same lines, the city's Sustainable Community Coordinator found that while many Dubuquers volunteered for smart projects to save money, they also wanted to do their part for the city's well-being. As she stated in an IBM video interview:

> It is really about people understanding at the end of the day it is about more than the dollars you save on your utility bill and it is about more than the carbon that you're not emitting into the air. It is about the quality of life and… and the happiness that you feel as part of your community. (Burbach, 2010b)

Findings from IBM's evaluation of the Smarter Water Pilot Study substantiated these observations—"framings of resource conservation ranged from it being an intrinsic part of local (rural) values of frugality, to religiously-informed beliefs about stewardship, to good business sense, to civic minded promotion of the city's image" (Erickson et al., 2012, p. 10). Yet, while this type of narrative customization seems to have worked within Dubuque, given the small city size and the homogeneity of the population, I do not think that it would be as effective or easy to duplicate this type of approach in larger cities that are more complex and diversified. In addition to this local contextualization and framing, narratives were also customized by the local government and those responsible for promoting SSD by 'market segment' to reach key intended audiences: businesses and resident households—two groups whose increasing needs and expectations, according to IBM, can be met through the application of smart technologies (IBM, 2014j, p. 2).

7.1.2 Customizing Messaging

> Self-interest is a powerful motivator for change. (M. Van Milligen, 2013)

To speak to the specific interests of stakeholders, the local government and SSD project promoters created sub-stories that spoke specifically to two key groups—businesses and households. As reflected in the quote above made by the City Manager at an IBM event, these messages were constructed to focus on the interests deemed most important to these groups. An Assistant City Manager echoed this sentiment in an IBM video interview: "You have to understand… look through their lens and you have to reach out to their terms because that is how they'll own the solution and help you try to reach to others" (Steinhauser, 2010b). In other words, the narratives were constructed in ways to appeal to the targeted audiences so that they would buy-in and support SSD, but also help spread messaging about it.

Savings was a key theme that resonated across both targeted groups and thus was woven into SSD narratives by local government authors and SSD promoters—again a theme that reinforces smart assumptions and IBM messaging around the enhance efficiency that smart technologies purportedly enable. Information from the initial community survey implemented by Dubuque2.0, which queried residents on issues related to SSD, and from early feedback from pilot participants gathered by IBM showed that while customization might be necessary, narratives that emphasized savings would appeal to both businesses and households. As noted by the SSD Project Manager, “When we said, ‘If you make these three changes in your home, you can save $8.16 a month’, that worked” (Lyons in Flansburg, 2012, p. 3). And in an IBM video interview the Mayor agreed with this notion that money was a key driver to help get support for SSD projects: “When you talk about saving money you know everybody’s ears perk up, whether you’re an individual tax payer or you’re a business” (Buol, 2010). Efforts were also made by involved local government staff and SSD promoters to make sure that the narratives around SSD were made relevant to households, and explained in ways that they could readily understand and relate to their daily lives. Part of this tactic included adding stories that related benefits to individual experiences. For example, within an IBM Client success video on the Smarter Water Pilot Study, Information Services Manager Chris Kohlmann talked about the difference the portal made in her household: “The most exciting thing to me probably came the first time I saw the water portal. I had a four-gallon per hour leak in my household. I was astounded by that amount!” (IBM, 2011d).

In my interview with the SSD Project Manager, he said that he also talked to representatives from the business community to see if SSD made sense to them, and to encourage their support and buy-in. In general, it seemed that local businesses supported the effort but made it clear that those running SSD would need to be able to explain how businesses would be able to save money, conserve resources or be more competitive because of these efforts. President and CEO of the Dubuque Area Chamber of Commerce Molly Grover explained this sentiment in a video interview with IBM:

> …business wants to know what’s in it for me… It used to be that green was a taboo word in the business world… and now sustainability, because it deals with a comprehensive issues from the community… [businesses] want to know how they can better manage resources to impact their bottom line. (Grover, 2010)

Thus, similar to how narratives geared toward households were customized by those leading and promoting SSD efforts, messaging targeting the business community was tailored to outline how they would gain through savings or increased competitiveness. This conscious effort made by local government and SSD promoters to integrate the benefits of SSD across varied affected actors was done to: (a) facilitate project acceptance and buy-in (as defined by the local government in terms of the number of volunteers who came forward for each project) (The City of Dubuque, 2010b, 2010c); and (b) encourage the required behavior change to reap the promised 'benefit' (Naphade, 2011, 2012a). And, while narratives were customized for specific groups, there was a concurrent effort to keep discourse around smart and sustainability mainstream to ensure broader appeal.

7.1.3 Excluding to Depoliticize

Over the last few decades, "technocratic management and consensual policy-making" have depoliticized public discourse, a trend quite notable around the topic of sustainability (Swyngedouw, 2010, p. 214). As argued by Erik Swyngedouw (2010), the elevation "of climate change and its consequences onto the terrain of public concern and policy has evacuated dispute and disagreement from the spaces of public encounter to be replaced by a consensually established" or post-political frame that is based on the "inevitability of capitalism and a market economy as the basic organizational structure of the social and economic order" (p. 215). The consequent urban sustainability framework promotes the economic benefits of better resource management, touting the financial gains from efficiency. Approaches promoted in this framework are market-led and technocratic, and focus on greening capitalism, whilst glaringly lacking discussions around issues like social justice and inclusion that are often associated with urban environments and technological advancements (Cook and Swyngedouw, 2012). Thereby, according to Swyngedouw (2014), removing from these frameworks the ability to make real change that will allow more socio-economically egalitarian transformations. Moving beyond the "apocalyptic imaginaries" (Swyngedouw, 2010, p. 214) associated with climate change, current sustainability rhetoric is a common topic within cities—within town halls, environmental groups, public demonstrations, academia and even households

(Cook and Swyngedouw, 2012, p. 1960). This ‘neutralized’ framing of sustainability was apparent within Dubuque, as was the attempt to depoliticize city government in their work around SD and SSD.

When looking at smart narratives within Dubuque, this type of depoliticization can be seen by which messages are being included and which are being excluded within the promotion of SSD. To the extent possible, smart project supporters have consciously tried to depoliticize sustainability (and smart) so that it is framed in a way that supports the capitalistic structure of American society, and not associated with the “apocalyptic imaginaries” around climate change. While climate change and global warming are frequently listed as two driving reasons behind sustainability agendas within cities (Hammer, 2011), they have been left out of rhetoric around sustainability in Dubuque primarily since within the city these are seen as highly charged, controversial topics. Seven of the sixteen local government staff who I interviewed stated that the population is split over whether or not they believe these trends are happening, and even if city residents do believe they are, there is contention around what should be done about it. Hence, environmental issues within the city can quickly become charged.

For example, in an IBM video interview, the city’s Sustainable Community Coordinator explains the reactions that she sometimes gets when people hear her title: “There is certainly a group out there… that always thinks when they hear my title, Sustainable Community Coordinator, oh, she’s a tree hugger” (Burbach, 2010b). In support of Burbach’s sentiment, several Smarter Water Pilot Study participants interviewed expressed disdain for green and ‘tree-huggers’, using these terms in a derogatory fashion (Erickson et al., 2012, p. 10). When questioned about this adverse perception of climate change and global warming, interviewees felt that the city’s sustainability agenda was not directly related to these phenomena; rather it focused on conserving resources. Interestingly, several of these same pilot participants interviewed who articulated a dislike for green, also volunteered in groups and activities related to resource conservation—or one could argue, efforts to save the environment (Erickson et al., 2012).

During my interviews with smart project stakeholders from the local government and business community—i.e., the primary local parties responsible for creating and sustaining smart and sustainability narratives—over a third stated that closely associating the sustainability agenda with climate change and global warming would polarize debate and alienate some city residents from the agenda. City leaders also noted this concern in video interviews filmed by IBM. For example, as noted by an Assistant City Manager:

> It is no small thing to have elected officials quite honestly go out on a limb and say we are going to make sustainability a priority… most people would just interpret that as oh they just want to take care of the earth and they're just tree huggers and that is a very divisive conversation that happens across the country… that is the kind of vote that loses people in elections. (Steinhauser, 2010b)

For this reason, city leaders have done their best to couch sustainability and related smart endeavors in apolitical terms in both oral narratives and project materials (Sustainable Dubuque, 2010a, 2010b; The City of Dubuque, 2010d). For example, in an IBM video interview, the Mayor recognized that references to global warming and climate change were not resonating with city residents and thus he reframed his narratives to focus on conservation and sustainable behavior and practices, noting that he did not "use those terms anymore" (Buol, 2010). In the same video series a leader in the business community involved in both the smart and sustainability agendas, summarized the political positioning in Dubuque quite well:

> Concern about our global environment has been so politically polarizing and we understand that in Dubuque, and we've tried to trump that with… not having this be a…partisan issue and realizing that in order for us to have a buy-in, whether it is to the individual citizen or to the employer in our community, we need to be able to explain what's in it for them. (Dickinson, 2010)

To help separate global warming and climate change from sustainability in Dubuque, and to ground benefits in a way that mattered to city residents, the local government and its selected Sustainability Task Force were careful in how they defined sustainability for the city. Within environmental literature and practice, sustainability models often encompass aspects related to the natural and built environments, while also including social and economic aspects. This expanded view enables broader interpretation and variation around the social construction of the problem of global warming and climate change (Camagni et al., 1998). Yet, it is within this wider aperture, or ‘middle-of-the-road’ environmentalism, that Swyngedouw (2010) feels hope of truly addressing global warming and climate change dwindles. Within Dubuque, framing sustainability as such has enabled the depoliticization of discourse around sustainability and the smart agenda conceptualized within it. As described by a senior city leader in a video interview with IBM:

> Every single one of those principles, we could tie something to in this community, whether it is a safe place for a child after school, whether it is effective education, whether it is healthy local foods, whether it is quality of life issues, park, health issues, personal health issues, mental health issues—everything we do we can tie to one of our eleven sustainability principles. (Steinhauser, 2010b)

The perceived benefits of this broader framing of sustainability were summed up by a business community leader, who highlighted the appeal of a more expansive sustainability definition, basically stating that no matter what each Dubuquer is passionate about, he or she can find it within the way that sustainability has been framed within the agenda (Grover, 2010). The Mayor, when describing SSD efforts in IBM Smarter Planet Leadership Lessons series video, notes this broad appeal, but goes further to say that sustainability has been made sustainable within Dubuque by getting a wide range of city actors involved, not only in defining sustainability, but also in developing and implementing related projects (Buol, 2010). This observation of general acceptance of the sustainability agenda as framed around resource conservation was also made in evaluations of the pilot studies (Erickson et al., 2012; Naphade, 2012).

Critique

To the contrary however, according to the Dubuque’s Resource Management Coordinator, this leaning away from political debate, or “watering down” of sustainability, has led to the exclusion of certain groups from sustainability processes, namely those with what’s perceived as a more ‘aggressive’ environmental agenda who consider something other than the depoliticized, consensual framing of sustainability. From what I could gather during interviews with this interviewee, groups and individuals most closely associated with sustainability—coming from professional organizations, the hard sciences and / or environmental studies—have been marginalized from implementing the city's sustainability agenda and subsequent projects. While some individuals from these groups were involved in defining the city's sustainability model and its eleven principles, this interviewee noted that follow-up activities and projects to implement this agenda have often excluded these environmental groups. Based on this exclusion, critics have called the local government's distancing from more 'scientific' grounding a form of "green-washing" (Schultz, 2010b).

To an extent, some of this criticism rings true. From my interviews it became clear that local government, leaders within the private sector and the third party group Dubuque2.0, consciously decided to approach sustainability from a broader post-political perspective, mainly to avoid being seen as 'extremist' in approach. Thus, the exclusion of what were perceived to be 'aggressive' environmentalist groups, in my opinion, is a result of trying to appeal to the masses and building broad citizen consensus—especially given the negative connotations associated with green, climate change and global warming within the city. That said, a few representatives from the city government and local business community who I interviewed (three of the twenty-two) felt that environmental groups had worked well with their projects.

As the sustainability and smart agendas have grown within Dubuque, groups have emerged to counter these agendas and the rhetoric associated with them. There has been a small emergence of Tea Party activists[55] who have lashed out against a multitude of local government objectives, most notably sustainability (The Dubuque Town Crier, 2011a, 2011b). These Tea Party activists have denounced Dubuque's City Council as "socialist progressives" due to their support of smart growth principles, which are supposedly espoused in the city's sustainability agenda. These

[55] The Tea Party movement (TPM) describes itself as an American grassroots political movement that promotes fiscal responsibility, a constitutionally limited government and free market economics. It is recognized as a conservative and libertarian movement (as defined and perceived within the United States) and has sponsored protests and supported political candidates since 2009 (Tea Party Patriots, 2011).

activists link the local government to a United Nations "conspiracy" for restricting American freedom through the U.N.'s Agenda 21, and warn against smart growth being supported locally—"it is about protecting our own backyards against the home grown threat" (The Dubuque Town Crier, 2011a, 2011b). The local government, while aware of this criticism, has not responded to or acknowledged these viewpoints within SSD narratives. Despite criticism of green-washing and claims by Tea Party activists, from what I could gather during field research, the sustainability and smart agendas seem to be perceived in apolitical terms, at least among local media coverage and those interviewed for this research.[56]

Reinforcement

While there has been some pushback around smart projects within urban discourse in Dubuque, within the oral and written narratives that I reviewed I found that most reproduced IBM Smarter Cities narrative themes while also reinforcing several assumptions of smart. The most common areas of overlap related to efficiency, savings, optimization and acting now so as to avoid some future threat or risk—all of which tied to sustainability and citizens being involved in efforts to promote it. These narratives reflected how involved actors interpreted smart projects (i.e., as mechanisms to enable efficiency and optimization, and thus contribute to sustainability and citizen engagement), as well as how they wanted other involved actors to also behave within these initiatives (i.e., use fewer resources). Smarter Sustainable Dubuque narratives also underscored how smart technologies would differentiate the city, thereby helping to purportedly attract talent and resources and spur economic growth. Given the way that sustainability, and smarter sustainability, is described, the smart city "preemptive consensus" (Greenfield, 2013) emerging from Dubuque reinforces the current market-led status quo by greening capitalism, while also reinforcing the responsibilization of citizens (Rose, 1999, p. 174). This consensus demonstrates how neoliberal trends, while shaping smart project strategy

[56] Since I primarily interviewed actors involved with smart projects, by default my universe of interviews did not include all of the groups or individuals openly against or excluded from these projects. While I was able to speak to a few people who were not affiliated with smart endeavors, this was by no means representative of those excluded or critical of these projects.

and engagement, also seem to be influencing the way that these endeavors are represented, and the emphasis that is placed upon this representation.

7.2 Branding Smarter Sustainable Dubuque

As discussed in Chapter 4, local governments feel increasingly compelled to ‘sell’ their city in attempts to attract and retain talent, city residents, tourism, investment and business—all of which support revenue creation through taxes (Hall and Hubbard, 1996; Kotler et al., 1993; Wiig, 2015). In this context of ‘selling’ cities, they become products, used and experienced by the end user, or consumer—whether a business, tourist or resident (Harvey, 1989a). According to IT providers, the adoption of smart technologies is an inexpensive way to enhance city brand and consequently attract resources, making the city a more attractive product (Buschner et al., 2010; Sevcik, 2011). Hence from this perspective, smart projects seemingly offer not only a technological but also a brand fix. This purported double boon was apparent in Dubuque, where the city experienced a significant boost to its brand with SSD—so much so that gains attributed to the SSD brand seem to outweigh benefits from more traditional forms of return on investment (ROI) on smart projects like operational efficiencies. To an extent, the necessity for this ‘sale’ can supersede the need for actual operational gains— where smart initiatives fulfill a symbolic function, but do little to boost economic performance or attain the other more tangible gains that the projects were promised to deliver (Abrahamson, 1991; Wiig, 2015).

Below I look at the strategies the local government has taken to boost city brand in Dubuque and discuss how IBM has interacted with this process. To inform this section, 7.2, I looked at materials—including documents, websites, presentations and video interviews, among others—created by the local government to promote the city of Dubuque, SSD and individual smart city projects that are being, or have been, implemented. I also looked at media coverage related to Dubuque and its pursuit of smart city projects and sustainability. Case study interviews I conducted for this work also informed this section, but to a lesser extent than they did in section 7.1. Figures 8 and 9, and Appendix 11.5 provide additional details on these resources.

7.2.1 Brand Enhancement

In city brand promotion associated with SSD projects, the local government portrays Dubuque as a small, Midwestern city that has been able to transform itself into a model for smart and sustainability (Buol, 2010; Dickinson, 2010; Dregne, 2010b; Hawks-Goodmann in IBM, 2012a; Lyons, 2010a). According to brand promoters, the approaches to smart and sustainability employed by the local government contribute to the city's uniqueness and desirability—drawing in businesses, resources, individuals and other local governments to experience, or learn from, what Dubuque has to offer (Grover, 2010; Hawks-Goodmann, 2010; Lyons in The City of Dubuque and IBM Social Media, 2011). As noted by Dubuque's City Manager Michael Van Milligen in his keynote presentation at an IBM Software event:

> I'm honored to be with you to demonstrate how technology and community engagement are changing the way the city of Dubuque is servicing its residents… by the time I'm done I'm hoping that you're going to want to live in Dubuque, Iowa. (M. Van Milligen 2013)

In their presentation "Economic Development: Branding Your Community", Cori Burbach, Dubuque's Sustainable Community Coordinator, and Rick Dickinson, President and CEO of the GDDC, shared their perspective of enhancing city brand to promote economic growth for an International City / County Management Association (ICMA)[57] webinar (ICMA, 2013). In this presentation, Burbach and Dickinson described how SD and SSD help differentiate Dubuque in the areas of business retention, business attraction, regional marketing and incubating new businesses. They state that SD and SSD brands have been 'successful' because they are more than just a logo—rather, they articulate the primary benefits of being in Dubuque and offer a strong value proposition that, they feel, provides the city a competitive edge (ICMA, 2013). The SSD value proposition is to provide "residents and businesses with information and tools they need to do what they want" to help "save money, conserve resources, and improve the local economy and environment"

[57] The International City/County Management Association is an organization that focuses on supporting local government management to help create sustainable communities and an enhanced quality of life worldwide (ICMA, 2008).

(ICMA, 2013)—and, unsurprisingly, SSD narratives support this value proposition, as evidenced in my discussion in section 7.1.

Along these same lines, in an interview with the local paper the *Telegraph Herald*, the Mayor and SSD Project Manager talked about what they hoped the city would gain with the brand they have been creating around SSD (as well as the implementation of the program itself). Mayor Buol called the partnership with IBM "another defining moment in Dubuque's history" due to the way that SSD will purportedly improve infrastructure expenditure savings and create new jobs, through its implementation as well as through the new business it attracts (Mozinski, 2009b). In the same article, the SSD Project Manager David Lyons noted that some of the green jobs associated with Sustainable Dubuque were already in place, and that these jobs represented the "Dubuque economy going into the next new marketplace" (Lyons in Mozinski, 2009b). Lyons added that by partnering with IBM in SSD, other businesses will be enticed to invest in Dubuque (Mozinski 2009a, 2009b)—a reference that opens up the issue of co-branding with IBM, which is explored below.

As these excerpts demonstrate, the intent behind enhancing city brand, through SSD and other initiatives, is to spur economic growth and development. By differentiating the city with the application of smart, the local government feels they can draw in desired talent and resources to fuel this growth (Buol, 2010; Dickinson, 2010a; Dregne, 2010b; Grover, 2010; Hawks-Goodmann, 2010; Lyons, 2010a; Telegraph Herald, 2014; The City of Dubuque, 2009e, 2010b, 2010e). And, it would seem that benefits do lean more toward enhanced image more so than optimization ends. To date, the reported operational efficiency gains for SSD projects have included: (a) a reduction in water utilization by 6.6 percent and eightfold increase in leak detection and response among Smarter Water Pilot Study volunteer households (PR Newswire, 2011a), leading to saving the city U.S. $290,000 in water management (Flansburg, 2012); (b) a total savings of U.S. $2,111 amongst participating volunteer households over a three month period for the Smarter Electricity Pilot Study (Naphade, 2012); and (c) the creation of 1,300 jobs in the city (Telegraph Herald, 2014).

While these gains are notable for a city of this size, indirect gains attributed to the SSD brand seem to dwarf these outcomes. The implementation of SD and SSD has also helped the local government gain over US$27 million in federal funding (The City of Dubuque, 2011b). These funds are from the American Recovery and Reinvestment Act (ARRA), and have been used to leverage investment from local and state government as well as private businesses and non-profits, including US$10.6 million in additional federal and state grant funding that leverages ARRA funding and is being used to create jobs and improve the sustainability of Dubuque (The City of Dubuque, 2011b). Further, according to a senior executive with the GDDC, job growth associated with IBM's presence has been estimated to be about 2,400 jobs. Given these outcomes, it would seem that in Dubuque returns to date for the enhanced city brand outweigh more direct efficiency outcomes from implementing SSD projects. These gains have contributed to the wide range of accolades that have been bestowed upon the city over the past decade – a number that has grown with SD and SSD implementation. From being ranked as the best place to run a small business to the most livable city, from being called one of the most connected communities in the United States to one of the smartest cities in the world. With each new award, the SSD brand seems to be reinforced and strengthened (Burbach, 2010a; Greater Dubuque Development Corporation, 2013; IBM, 2011d; Levy, 2010; Lindsay, 2010; Smedley, 2010; The City of Dubuque, 2011a, 2013d).

However, funding, job growth and recognition aside, if placed under scrutiny, the marketing and messaging associated with SSD do seem to have surpassed achievements on the ground. The projects within SSD are small, but the attention and buzz generated around these efforts allude to something much larger. A similar misalignment can be seen with the example of the Smarter Cities Challenge Digital On-Ramps project in the U.S. city of Philadelphia. Here, IBM recommendations were encumbered by various social and technical difficulties that involved actors were unable to overcome (Wiig, 2015):

> Once the smart solution entered the messy reality of urban governance, of entrenched poverty in a de-industrialized inner city with few employment opportunities, the discourse of change faltered. IBM's report for Philadelphia acted as a guide, but by its very nature, written by outsiders unfamiliar with the local context of poverty and the lack of economic

> opportunity, the report could not anticipate the social and technical challenges faced by the team tasked with implementing the policy (Director of Innovation Management, 2012 in Wiig, 2015, p. 269).

Yet, "despite the supposed intent of addressing widespread socioeconomic inequality through an app", the primary impact of this smart city project was the promotional value it gave the city (Wiig, 2015, p. 269). Hence, narratives around this SCC imitative focused on the possible economic change due to this entrepreneurial approach, while underneath this the solution did not help address what it set out to solve (Wiig, 2015). What is interesting to note is that despite this misalignment in Dubuque, during my interviews with city leaders, SSD volunteers and supporters, and within the relevant media coverage that I reviewed, there seems to be, for the most part, acceptance of and enthusiasm for the SSD brand being generated (and the narratives associated with it). To an extent, I believe this acceptance and boosterism is partly due to the fact that while the SSD brand promoted does not match reality on the ground, it is perceived to resonate with it; in other words, the smart imaginary created through brand and narrative is seen as being connected to what exists in reality. Even if there is too much spin, and brand does not align with how the city exists in reality, over-zealous branding can be deemed 'successful' if it makes the city seem more competitive, attracts resources and builds local identity despite the misalignment. In cases symbolic associations fail to connect with reality (Harvey, 1989a); municipal public relations become pure marketing, similar to the corporate spin created to sell consumer goods.

7.2.2 Place Promotion Strategies

In Dubuque, the local government has used both traditional and non-traditional place promotion strategies. Dubuque city leaders have employed traditional marketing and public relations strategies such as media relations, in house publications and logo creation to help increase awareness and understanding of SD and SSD (Dregne, 2010a, 2010b). One good example of these traditional approaches includes logos developed for SD and SSD, where images were created to help intended audiences quickly associate a project or material with the concepts and organizations behind it. The SD and SSD logos in Figure 24 both reference sustainability and use the same color scheme to illustrate their connectedness. The leaf within the SD logo helps make the connection to the environment, and the sets of parentheses included in the SSD logo quickly remind the viewer of the link to wireless technology.

Figure 24. Dubuque logos for SD and SSD

Source: The City of Dubuque, 2013c; Dubuque2.0, 2010b.

The local government has also used traditional approaches, such as regularly providing press releases, online announcements and email list serve notifications of developments associated with SD and SSD. Yet, the brunt of the local government's public relations strategies for SD and SSD has not been focused on employing traditional marketing or public relations activities. According to Dubuque's Public Relations Manager, the annual budget for marketing is just U.S. $2000—clearly not a local government priority when it comes to building the SSD city brand. Rather than invest funds directly into traditional forms of brand development, the City Manager instead feels that investments should be made in projects that will directly support the brand that the city is trying to create, with the hopes of garnering coverage through earned media (The City of Dubuque, 2009d). Hence, various non-traditional forms of public relations have been employed in Dubuque to help promote the SD and SSD brand. These non-traditional strategies include using a third party organization to help with public relations, improving the built environment, promoting sustainability and co-branding with IBM. Below, I briefly explore the three former methods and go into detail on co-branding with IBM.

Non-Traditional Public Relations

As I mentioned in Chapter 4, local governments are increasingly using citizen boards and committees to be carriers of their public relations messages (Zavattaro, 2010a, p. 82). Each interaction of the committee or board provides an opportunity to spread the government's message to third parties and the city residents involved, who then in turn have the ability to further transmit the messages (Zavattaro, 2010a, p. 48). Directly involving the community was one non-traditional public relations strategy used in Dubuque. To help inform the formation of the SD Task Force and SSD Steering Committee, local government leaders first surveyed for relevant organizations that they felt should be included, such as local businesses, education organizations, civic groups, service clubs, neighborhood organizations and religious institutions. While getting information from these groups on who should be involved, they were concurrently making these groups aware of the SSD project so that these groups, in turn, could also spread messaging through word of mouth. The same approach was taken to shape Dubuque2.0, the agency that managed public relations and awareness raising around the city's smart and sustainability initiatives (ICMA, 2013).

Another non-traditional marketing approach that the local government has employed to help enhance the city's image and shape the brand being formed around SD and SSD has been focusing on improving the city's built environment (Zavattaro, 2010a). In general, local governments want their cities to be perceived based on their aesthetic appeal, with alignment between desired perceptions and how users view the city. This focus on built environment appeal stems from the understanding that people internalize their surroundings, thus to enhance city brand, local governments must improve how their cities are experienced in terms of both natural and man-made environments. The more aesthetically pleasing a city's built environment, the better it is perceived (Carlson, 2002). Linking brand and the built environment with efforts to revive the economy, the local government of Dubuque has "tried every economic development trick in the book—casinos, a pedestrian mall, a riverfront convention center" (Greenblatt, 2014, p. 2). Each of these efforts has contributed to transforming the city, as well as perceptions around it. As smart technologies have been added to the sustainability agenda, the smart concept has been included into this reimagining of Dubuque.

With the opening of an IBM Global Delivery Facility in downtown Dubuque, IBM has also had a small role in altering the city's built environment (and associated brand) with the launch of SSD. While cities have always depended on private sector actors to create jobs and put up buildings, new urban development projects associated with or being led by large corporate actors seem to create clusters of growth that go beyond just the building or campus that they have built (Greenblatt, 2014). When IBM moved into downtown Dubuque, they signed a 10-year lease to occupy the Roshek Building, which was at one time the largest department store in Iowa and since 2010 has been listed on the U.S. National Register of Historic Places. As part of IBM's agreement to occupy this market in an area that had been somewhat plagued with vacancy and neglect, it worked with The City of Dubuque and Dubuque Initiatives to upgrade the facility by making it a green building that uses industry-leading, energy-efficient technology (IBM, 2009d). In an IBM Press Release on the announcement of this effort to update the Roshek Building, Mayor Buol commented,

> We are extremely proud that IBM chose Dubuque for this project and particularly thrilled about the role that Dubuque's sustainability initiative played in that decision. IBM's decision to locate in the Roshek Building, through adaptive reuse of a historic structure in the heart of our downtown, illustrates our shared commitment to sustainable development, historic preservation, and community revitalization. (IBM, 2009d)

Five years later, as a result of IBM moving in, there are more coffee shops, a more vibrant nightlife, more restaurants, and more general activity in the blocks surrounding the office due to the influx of workers into this space. While the Roshek Building renovation was just one building downtown, it seems that several city leaders perceive that its effect has gone well beyond its walls. For, they feel that the presence of IBM in Dubuque's downtown area contributes to its perceptions of being an attractive area to other companies (Greenblatt, 2014).

Finally, sustainability has also been part and parcel of non-traditional place promotion strategies to entice resources to Dubuque. As noted by Richard Moe, President of the National Trust for Historic Preservation, in promotional materials by the local government:

> Some may think of Dubuque as an industrial town whose best days are behind it, but they're wrong. This city has positioned itself on the cutting edge of the single-most important issue of our time [sustainability]. I don't

> know of another city this size that gets it as fully as Dubuque. (Moe in Sustainable Dubuque, 2009)

One of the key factors that drew IBM to Dubuque was the local government's focus on sustainability. In promotional materials created for the city by the local government, Milind Naphade, the former IBM Research Project Manager who led IBM's SSD efforts, summarized this attraction: "IBM selected Dubuque as a smarter city pilot because of its leadership in sustainability" (The City of Dubuque, 2010f). Building on the momentum initiated by the arrival of IBM, the local private sector has seen a rise in emphasis on green and green technology. A few local businesses have adapted their operations, services and / or products to fall in line with this sustainability focus, while a few new small business ventures around green have also been launched (Burbach, 2010b; Lyons, 2010a). In addition to these three non-traditional strategies, the local government has also promoted the city based on its relationship with IBM.

Co-Branding with IBM

As noted in Chapter 2, numerous local governments have partnered with IBM's Smarter Cities Challenge in hopes that their cities would gain benefits from the associated IBM brand (Wiig, 2015). In this vein, over seventy-five percent of those who I interviewed in Dubuque felt that the city's partnership with IBM has greatly enhanced the city's brand. As noted by one Dubuquer: "IBM coming into the city was a huge confidence boost for people" (Dubuque resident in Greenblatt, 2014). Historically, Dubuque has been perceived as a primarily blue-collar city. However the arrival of IBM, a white-collar industry, has purportedly shifted perceptions, changing attitudes and narratives about the city for those within and external to Dubuque. Describing this phenomenon in my interviews with them, two senior city leaders and a GDDC senior executive noted that they feel there has been a psychological impact on the community by the presence of IBM—it is a source of city pride. As stated by the GDDC executive I interviewed, IBM's presence moves Dubuque to a "new playing field", from blue to white collar: "the psychological impact is greatest on people, business and city officials… it reaffirms the benefits of playing well together". IBM's arrival is seen as yet another 'success' due to PPP efforts within the city, and the accompanying change in perspective, taking Dubuque from blue to white collar, helps expand the scope of future SSD narratives. As stated by Mayor Buol, IBM's presence basically means the city is essentially "preapproved" when other companies are considering relocation to the city (Buol in Greenblatt, 2014). Overall, partnership with IBM and the SSD endeavor are seen as game-changers for the city and its image. According to a senior executive from the GDDC in an interview that I conducted with him, "the intangible benefits cannot be overstated—community pride, brand awareness, partnership with IBM, etc. Simply put, Dubuque's image is better because of this [SSD] initiative."

IBM's presence is also linked to changes within the city's perceived social milieu; hence providing more grist for SSD narratives. With the opening of the IBM office, there was an influx of young professionals into Dubuque. According to twenty-five percent of the local government officials interviewed, this has already had a notable impact. For instance, the city's Sustainable Community Coordinator Cori Burbach observed:

> IBM's workforce is very diverse. They have challenged the community to add new things. We have new ethnic restaurants—Thai, Indian. We have an Indian grocery store. We have new loft apartments. It is spurred [additional] development of the downtown. Old warehouses are being rehabbed; the first floors are restaurants and offices, and the second floors and up are residences. (Burbach in Flansburg, 2012, p. 5)

Echoing this notion of IBM helping to diversify Dubuque, Greenblatt (2014) notes that now the city "boasts two cricket leagues to accommodate the many South Asians and other new residents who are addicted to the game" (Greenblatt, 2014, p. 3). Whether or not there has been legitimate or sizeable demographic changes that have led to social and cultural diversification within the Dubuque, city leaders are using the presence of IBM to shift the city's brand away from being perceived as a homogeneous, agricultural and blue-collar city to a more multi-cultural, white-collar environment—an environment that also has a changing workforce, not just in terms of demographics but also age. Due to Dubuque's aging population, business and city leaders are striving to make the city increasingly attractive to the roughly 18,000 university level students studying in Dubuque so that more stay after graduation. These leaders are using smart and sustainability as a lure to help make this happen.

According to the City Manager, Michael Van Milligen, one of the main goals for SD and SSD is youth retention, ideally attracting much of the regional population of college students to come and live in Dubuque (M. Van Milligen, 2013). As described by the CEO of the GDDC in an IBM video interview:

> Technology is part of the lure for that new generation which we hope to keep and attract to our community. They live in a different world than my generation did… They want to see connectivity. They… care about their community, their nation, their world. They're concerned about their environment…and they want to be drawn to a place that addresses those same concerns. (Dickinson, 2010)

By focusing on sustainability and smart technologies, city leaders are hoping that this will aid in talent retention and attraction. To this end, narrative and brand promotion around smart and SSD are often crafted in ways to target youth, as described by one city business leader in an IBM interview: "What's beautiful about this is that the younger generation who sees this as a way to make a difference, both for their lives personally, but also to make this a Smarter Planet; a better place to live for themselves and for their children" (Dickinson, 2010). In addition changing workforce, another narrative theme created to promote brand is the perception that the capacity for growth and innovation within the city has increased. As noted by the city's Sustainable Community Coordinator in an interview with IBM:

> [City residents] saw IBM come to Dubuque because of our sustainability initiatives. They see now that our economic development professionals are able to recruit businesses who are interested in coming to a community that has these values and so they want to say you know what, when somebody is looking for a new sustainable service they're going to look in Dubuque because that is what businesses believe in here. (Burbach, 2010b)

Smarter Sustainable Dubuque and the city's partnership with IBM are credited with helping to spark this innovative transformation toward reaching the city's sustainability goals. Like a contagion, the creative problem-solving approach to sustainability that has been attributed to SSD is perceived to have spread beyond its projects, acting as a catalyst to other emerging sustainability efforts within the city (see Deakin and Al Waer, 2011, 2012). And, in the process, according to related narratives, new businesses are emerging and jobs are being created (Greater Dubuque Development Corporation, 2006, 2011a). It is clear that within SSD narratives originating from Dubuque city leaders, the endeavor is perceived to have transformed the city—improving brand, fostering growth and development, and attracting resources. As summed up by the Vice President of Programs of the CFGD in an IBM video:

> If we can do the smart city program well and it becomes part of the infrastructure of our community, we will have established an important competitive edge which will attract future opportunities, economically, socially and environmentally. (Dregne, 2010b)

As leaders from Dubuque's local government and business community have shared the city's experiences at conferences and events around the world, they mention IBM, providing the company with valuable attention and endorsement (The City of Dubuque, 2013a, 2013b). Further, the same press coverage that has highlighted Dubuque as an up and coming smart city has listed IBM as the local government's partner, garnering the company national and international attention in the smart cities space—including coverage in well-respected news sources like the Economist, New York Times, BBC News and BusinessWeek (Acohido, 2009; BBC News, 2011; Dillow, 2011; Forbes, 2007; Hamm, 2009a; Hoffman, 2009; Lindsay, 2010; Lohr, 2009a). In this process, the local government has tied its brand to that of IBM, while IBM also has used the SSD projects to help increase its brand in the smart city market (IBM, 2009b, 2010c, 2010d, 2011c, 2011d, 2011e, 2012a and 2012c). This type of co-branding with IBM can also be see with the company's smart city projects in: Rio de Janeiro, Brazil, where IBM and the city partnered to integrate citywide data from some 30 agencies in a centralized command center (IBM, 2010b; IBM, 2011b; Paes, 2012; Singer, 2012) and Melbourne, Australia where the city participated in the Smart City Challenge to look at how the city deals with disruptive events and emergencies that may impact the city (City of Melbourne, 2016; IBM, 2015d). With both of these cities, both IBM and the local government promoted these endeavor to help further their respective brands.

Conclusions

Dubuque presents a good example of how IT provider interactions around smart projects can affect city representation; for through smart projects with IBM, the local government has integrated messaging about smart not only into narratives about SSD projects, but also into those about the city. These SSD narratives demonstrate how messaging from IBM Smarter Cities has been adapted and made relevant to the Dubuque context and audience, where the local government and involved third party actors have customized smart to local history, landscape, culture and target group. Woven within this local customization are also assumptions of smart such as efficiency and optimization to assist with sustainability promotion, applying smart technologies to spur local economic growth and development, citizen participation, and the need to act now to avert future risks and threats (Burbach, 2010; Buol, 2010; Dickinson, 2010; Hawks-Goodmann, 2010; IBM, 2012b; Steinhauser, 2010b; The City of Dubuque, 2012e).

Within these stories, there is a shifting of smart discourse away from ‘big’ and potentially contentious sustainability issues (Swyngedouw, 2010)—climate change, resource depletion, environmental damage, etc.—towards the thrifty and resourceful self-understandings of Dubuquers. This sheds light on how corporate platforms, such as IBM’s Smarter Cities narrative framework, can be fairly generic in terms of both technology and rhetoric, enabling them to be adapted and accepted in different contexts. In general, SSD oral and written narratives provided examples of how the local government is: (a) recreating IBM Smarter Cities narrative themes; (b) adopting and / or reinforcing various assumptions of smart; and as a result (c) adopting policies from the private sector around city competitiveness, brand and promotion.

Additionally, I found that the Dubuque local government is placing an increasing emphasis on place promotion to boost city competitiveness (Wiig, 2015). Within these place promotion strategies, the local government bolsters traditional strategies with non-traditional approaches (Zavattaro, 2010a). This includes co-promoting with IBM, where city officials have become active advocates for IBM, endorsing the tech giant through their efforts to promote Dubuque at conferences, webinars and other events (Burbach, 2010b; Dickinson, 2010; Greenblatt, 2014; The City of Dubuque, 2013a, 2013b). I found that in this case study, the biggest gain from the local government’s pursuit of smart projects and its partnership with IBM, has been the perceived boost in city brand. Yet, what exists in reality may fall short of the image created around the SSD initiative, for most smart projects have been small, of limited duration and did not use the most advanced technologies. Still, SSD has been deemed ‘successful’ by those involved since it is seen as having helped make the city more competitive and aided in attracting resources (Greater Dubuque Development Corporation, 2011a; Grover, 2010; Hawks-Goodmann, 2010; The City of Dubuque and IBM Social Media, 2011).

Thus, in the Dubuque example, IBM policies, approaches and practices to make the city smart, or at least appear smart, have been integrated into city strategy and the SSD initiative, with subsequent effects on related governance arrangements. This has led to changes in city objectives and priorities, and how the local government goes about achieving them. And, through the PPPs to implement these endeavors, changes are taking place within the local government in terms of roles, like that of the IT Department, and as well as in terms of expectations between the local government and citizens. Alongside this transformation, narratives about smart projects, SSD and the city have emerged, reinforcing these shifts in strategy and engagement. In this manner, representation through narrative and brand in Dubuque are indicative of how, through interactions with IBM, aspects of urban governance are being influenced and redesigned through smart projects (Shelton et al., 2014). Since IBM is creating the foundation for these forms of representation, they are influencing the ways in which these changes are taking place.

8 Portland: Seeking Solutions from City Residents through Smart

The City of Portland, Oregon has gone from being regarded at the turn of the 20th century as one of the most dangerous port cities in the world, plagued by organized crime and racketeering (Olsen, 2012), to being seen as a bastion for sustainability, a forerunner in urban planning and a center for progressive political values (Weber, 2014). The city has a reputation for offering a good quality of life, with picturesque views, affordable living, an extensive public transportation system and a flourishing civic community (Grist, 2007; Maerz, 2011; Mayer and Provo, 2004). This ‘attractiveness’ has enticed city residents and business alike, and is frequently attributed to the local government’s focus on sustainable urban planning and its willingness to engage the public with associated processes (Johnson, 2004; Mayer and Provo, 2004; Putnam et al., 2003).

Figure 25. Images of Portland

Source: Photo images were obtained from: Ashland Daily Photo, see: http://traveljapanblog.com/ashland/tag/portland/; Paul Nelson, Visit Downtown Portland Facebook Page, see: https://www.facebook.com/media/set/?set=a.301815310522.336571.271004920522&type=1; and the Northern American Raspberry and Blackberry Association webpage, see: http://www.raspberryblackberry.com/.

Contrary to the Dubuque case study, where IBM’s influence made inroads into local governance policy and planning processes via interactions around smart projects, Portland provided an example of a local government reticent to accept the smart city imaginary and skeptical of its promised outcomes. Smart technologies have not been a prevalent factor in the city’s strategy or in the way that the local government represents the city. Rather, the local government’s primary interest in smart technologies, in terms of its relationship with IBM, has centered on exploring how such projects could be used as tools to help inform urban planning processes and facilitate engagement around them. Despite this differing interpretation and approach to smart technologies from Dubuque, the Portland case study still demonstrated how smart projects can be construed as experiments that reinforce assumptions of smart (Hollands, 2008) and a neoliberal ethos (Brenner and Theodore, 2002). Through this lens of analysis, in Chapters 8 and 9 I explore how the Portland local government and involved actors have construed and approached smart projects, and how, if at all, interactions with IBM have come to affect urban governance. I do so through the analysis of case study interviews and interactions with actors involved in the projects that I examined, and by looking at materials created around these initiatives.

In addition to a varied perspective of and approach to smart technologies, the Portland case study also shed light on potential adverse implications of these initiatives, providing caution signs along the path to smart. Initially in Portland I set out to examine a smart grid project and a systems modeling project called Systems Dynamics for Smarter Cities (SDSC). However, difficulties surrounding the grid project left me seeking for other endeavors to examine. This led to me following two other IBM smart city projects that did not get off the ground. Through the examination of these failed attempts, I found two potential weaknesses of smart projects, both externalities that fell outside of IBM's purview. Firstly, that these projects can fail due to a lack of data, despite all the data that they purportedly generate. Secondly, that like many other city initiatives, they are vulnerable to political whim. I discuss these 'failures' further below. After two years of problems securing a second smart city initiative to examine in Portland, I was able to identify another viable option: a crowdsourcing research project.

In this chapter, I explore IBM interactions with urban governance around strategy and engagement via the smart projects examined. I begin by looking at the city's strategy, the Portland Plan, which sets conducive conditions for smart projects to emerge—namely through an emphasis on responsibilizing citizens (Beck, 2005; Rose, 1999, p. 174) for Plan implementation and the rising presence of private sectors actors involved in local policy and planning processes (Harvey, 1989a). I then discuss the crowdsourcing research project, which highlights how online platforms can be used as means to empower city residents (Kitchin, 2014b; Vanolo 2014), while also passing responsibility onto them (Beck, 2005; Rose, 1999, p. 174).

Based on findings from this research commissioned by IBM, I outline some of the advantages of using technology to engage city residents—such as gaining input from a larger number of residents, being able to provide unified information for citizen review, and enabling a 'neutral' environment for comment and feedback (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012). I also illustrate how such an approach can lend itself to participants making decisions solely based on their own needs rather than those of the community as a whole, and thus potentially contributing to segregation within civic affairs (Ford Foundation et al., 2014; Turkle, 2011).

Observations and findings in section 8.1 were primarily derived by examining materials—such as websites, documents and presentations, among others—created by the local government to describe their city strategy, The Portland Plan, and the smart projects they explored. These materials reflect the meanings and understandings that the local government has assigned to smart projects, and identify the objectives and priorities that these actors are pursuing and how they plan to go about achieving them. In addition, I examined smart project materials created by IBM to help understand their perspectives toward these efforts in Portland. Section 8.2 was informed by these same materials as well as case study interviews that I conducted for this research. Figures 8 and 9, and Appendix 11.5 provide further details on these sources of information. The purpose of this chapter is to apply observations from Chapters 2 and 4 to the Portland case study and to examine how crowdsourcing efforts may inform local government planning and policies via project strategy and engagement, and what the repercussions of these endeavors may be.

8.1 The Portland Edge

Located in the northwest of the United States, Portland is poised between Mt. Hood and the rugged Pacific shoreline, near the confluence of the Willamette and Columbia rivers (Ozawa, 2004a). To its south lies the Willamette Valley, known for its production of wine, berries, vegetables and hops. This surrounding landscape offers city residents a wide range of recreational activities, mountain views and close ties to the natural environment (Mayer and Provo, 2004). The city's size is about 350 square kilometers (United States Census Bureau, 2012a). Over two million people reside within the Portland metropolitan statistical area; within the city's municipal limits there are roughly 587,000 people (Portland State University Population Research Center, 2013a, 2013b), making the city's population comparable to that of Helsinki, Finland (City of Helsinki, 2015), Stuttgart, Germany (City Population, 2014), Glasgow, United Kingdom (National Records of Scotland, 2011) and Genoa, Italy (U.N. Data, 2012). Similar to Dubuque, the population in Portland is relatively homogenous, with over three-fourths being non-Hispanic white—although, this is changing annually with increasing racial and ethnic diversity. Unlike Dubuque however, the city is young; the median age is thirty-five, with only eleven percent ages sixty-five and older (United States Census Bureau, 2012b).

Figure 26. Portland's Hawthorne Bridge

Source: Image from Wikipedia. See: http://en.wikipedia.org/wiki/Portland,_Oregon (accessed September 9, 2013).

The city is led by the Portland City Council, which is comprised of the Mayor, four Commissioners, and an independent auditor who serves a checks-and-balances role for the Council and is responsible for public resource use accountability. The four Commissioners, along with the Mayor, each serve as administrators to various different city bureaus and departments (Portland Online, 2013h). The current Mayor is Charlie Hales, who took office in January 2013, replacing the former Mayor Sam Adams.[58] On a broader scale, the city of Portland and its surrounding metropolitan region are served by Metro, the only directly elected metropolitan planning organization within the United States. Within this model, citizens can influence

[58] Since the majority of my fieldwork was conducted during the term of the previous Mayor, Sam Adams, the brunt of my observations will reflect Mayor Adams's policies and administration.

regional land use, transportation planning and solid waste management by their votes for the Metro government, which is responsible for these activities across the Portland metropolitan area (McCauley, 2009).

For decades, Portland has had a reputation for being a city where people want to live—attracting residents and businesses with its appealing landscape, green policies and practices, exceptional public transportation, affordability, thriving civic community and self-proclaimed 'unique' culture (Grist, 2007; Maerz, 2011; Mayer and Provo, 2004; Ozawa, 2004a; Scalza, 2012). Portlanders often refer to these attributes as the "Portland Edge" (Mayer and Provo, 2004). One of the primary economic drivers to the initial growth of Portland was its location alongside two key rivers and its proximity to the ocean—a factor that has enabled the city to play a pivotal role as a trading gateway with the rest of the world, exporting the wealth of resources located in the surrounding area.[59] As the city has shifted from being a natural resource-oriented economy to one based on knowledge, high technology firms have taken root. During the 1980s, the Portland region was known as "Silicon Forest" due to its rapidly rising number of high technology firms and consequent innovation, where annual patent registration remained roughly three times that of the U.S. national average from 1975 to 1999. Throughout these two decades, the city experienced rapid economic growth that drew in significant numbers of single, well-educated youth (Mayer and Provo, 2004). The city has an annual GDP of $137 billion (United States Bureau of Economic Analysis, 2007).

Over the last decade however, job losses in the technology sector have contributed to a rise in the city's poverty rates. High unemployment and homelessness plague the city, while the state of Oregon's overall conditions have also worsened, with low living wages, skyrocketing hunger rates, and a rising gap between the rich and the poor that has grown four times faster than the national average (Mirk, 2009; Prince, 2004). As a result, some urban experts feel that the stratification between Portland's wealthy and well-educated population and its working class poor might rise to levels similar to that of Manhattan over the next few decades (Kotkin, 2010, p. 18).

[59] This movement of goods has shaped the development of the city's infrastructure, including the warehouses and railroads necessary to enable this trade (Mayer & Provo, 2004).

In the face of these economic challenges and their social consequences, the local government has been striving to maintain the Portland Edge by taking new approaches to three key areas for which the city is renown: sustainability, urban planning and community engagement (Ozawa, 2004b). Unlike the case in Dubuque, the application of smart technologies to these three areas is not a focal point of the city's strategy, the Portland Plan, which makes no mention of smart technologies. However, the local government has done exploratory work to see how technology may be applied for better outcomes in regards to sustainability, urban planning and community engagement. Further in contrast to Dubuque, according to one-third of those who I interviewed in Portland, the local government has approached smart technology projects with measured pause and skepticism, with the exception of the city's former mayor. Though city leaders have been interested in seeing how technology and smart projects could potentially inform urban planning processes (which touch upon sustainability and community engagement), they have questioned the value of smart projects, wondering if they would offer cure or palliation for the challenges the city is facing. Instead of being viewed as a panacea, the local government seems to construe smart as another form of urban entrepreneurship, akin to the "Creative City" (Florida, 2002; Vanolo, 2008) or "Eco-city" (Register, 2006)—the latter of which aligns with their EcoDistrict work (EcoDistricts, 2016).

8.1.1 The Portland Plan

Due to Portland's surrounding natural environment and its abundant resources, planning in the region has been a focus of the local government for over one hundred years. City officials have been careful to slow urban sprawl, striving to preserve the environment while also maintaining a perceived high quality of life (Mayer and Provo, 2004). Consequently, Portland has earned the reputation for being a leader in sustainability and urban planning. It is considered the most environmentally friendly city in the United States and the second most in the world (Grist, 2007).[60] Further, it

[60] In terms of political leaning, Portland is regarded as one of the most 'progressive' cities within the United States—in part due to the city's numerous social programs for vulnerable groups such as the

is seen as a city where aspiring urban planners can go to earn applied credentials. As the American "Capital of Good Planning" (Abbott, 2004), Portland is regarded as a pivotal center for sustainability, regional planning, growth management and innovative urban policies (Mayer and Provo, 2004). So, in this regard, the city differs from Dubuque, where a perceived lack of 'strong' city brand has led the local government to emphasize brand enhancement through a range of place promotion strategies. Portland's reputation for being a 'successful' urban community is often attributed to leadership at the community, local and state levels, and decades of city residents getting involved in urban governance processes through consultations, town meetings, demonstrations, volunteer activities, charrettes and focus group sessions, among others (Orloff, 2004; Ozawa, 2004a). This attentive approach to urban planning, and the consultation processes undertaken to inform it, is demonstrated by the Portland Plan.

The Portland Plan is a strategic planning process led by the local government that outlines the city's objectives, programs and desired outcomes for the next twenty-five years (Portland Online, 2013a). To develop the Portland Plan, more than 20 government agencies, numerous businesses and civic organizations, and thousands of residents were involved in a range of town hall meetings, focus group sessions and other consultative processes that included soliciting feedback in person as well as online. The consultation process lasted over two years, included over 300 public meetings and gathered over 20,000 comments during four phases where: (a) background information was made openly available and the public / businesses identified goals for nine action areas; (b) the goals were reviewed for additional feedback and prioritization; (c) Portlanders shared ideas for obtaining these goals and priorities at fairs and community meetings; and (d) the draft Plan was presented to the public for final review and input during public hearings and work sessions (Portland Online, 2013a). In part, the local government used this broad consultation strategy to make sure that the Plan was perceived as inclusive and to reflect shifts in accountability for the Plan's implementation.

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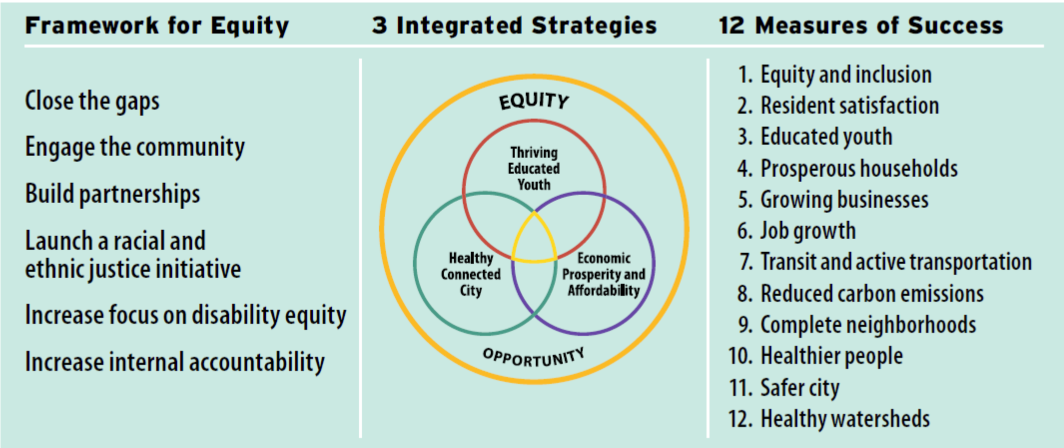
homeless, civically and politically active residents, and environmentally friendly policies and programs (Mayer & Provo, 2004).

The result of this process, the 2013 Portland Plan (shown in Figure 27), is described by the local government as a means to address "some of the community's most pressing challenges, including income disparities, high unemployment, a low high school graduation rate and environmental concerns" (Portland Online, 2013a, p. 1). Similar to the approach to sustainability taken in Dubuque, the Plan is centered on the "Three E's"—environment, economy and equity—a theoretical framework often used in regional or sustainable development plans (Campbell, 1996; McDonough and Braungart, 2002; Wheeler, 2002; Yaro and Hiss, 1996 in Mayer and Provo, 2004). This broadened approach, as discussed in Chapter 6, assumes a maintenance of the existing socioeconomic structure, where sustainability generally entails better management of resources (Swyngedouw, 2010, p. 215).

Figure 27. Overview of the Portland Plan



Source: Portland Online, 2013a, p. 2.

Given my focus on smart technologies, what is first apparent when reviewing this strategy is the absence of reference to technology, for "healthy connected city" refers to being able to bike or walk to anything that you need within your community not to connection through ICT (Portland Online, 2013a). The fact that the Portland Plan is bereft of references to smart technologies and projects alludes to the possibility that the local government and stakeholders involved in building the Plan do not view smart projects as key to helping achieve city outcomes. Yet, while the Plan does not specifically detail the need for smart technologies, aspects of the city's strategy and how it was developed do reinforce urban entrepreneurial conditions that are conducive to smart projects.

8.1.2 Laying the Foundation for Smart

The Portland Plan and the processes used to create it promote the use of PPPs to address urban affairs. For example, before the Plan process began, the local government and varied sponsors held an Inspiring Communities series to help inform city residents about the issues the Plan would cover and to share best practices used in other cities related to these issues (Portland Online, 2013b). Figure 28 gives an idea of the types of actors involved in shaping the Portland's future strategy, ranging from government agencies and academic institutions to private sector actors like IBM (Portland Online, 2013a). Bringing in this wide array of actors to develop and implement the Plan has helped the local government diffuse risk, responsibilities and resources across a network (Agranoff, 2003; Kooiman, 1993; Stoker, 1998). It also can be construed as an effort by the local government to attempt to attract external funding and investments to aid in Plan implementation (Harvey, 1989a). As discussed in Chapter 4, those that support the use of PPPs vie that these partnerships can assist in providing private finance to public initiatives, thereby enabling improved and greater access to services and infrastructure (European Commission, 2003; Payne, 1999 and Public Private Advisory Group on PPPs, 2001 in Hearne, 2009, p. 11-12).

Figure 28. Inspiring Communities series sponsors

Source: Portland Online, 2013b.

IBM was a sponsor of the Inspiring Communities series—and while a consultative process versus a partnership to implement a project, by engaging in this series IBM staff hoped to turn the former into the latter; or, at the very least influence the city's strategy so that technology and smart city concepts would become integral to the

Plan, affecting not one but several city systems. This sponsor role also enabled IBM to build deeper relationships with the mayor and the city's Bureau of Planning and Sustainability, both of which later became partners in the Systems Dynamics for Smarter Cities project. This type of sponsorship is typical to IBM marketing processes, where marketing is viewed as a service and service is viewed as marketing (Iwata, 2011). In other words, IBM provides various services pro bono while it builds key relationships and shares relevant expertise that IBM staff feel will help win future deals. Despite IBM's efforts within this series to guide conversation and approach to the Plan, the application of smart technologies was not integrated into the Plan. Hence smart city solutions like those sold by IBM were not deemed by participants involved in developing the Plan as a priority to achieve city outcomes.

Another entrée for smart projects was created within the city's strategy with the local government's emphasis on city residents being critical actors within Plan implementation to achieve desired outcomes. The Plan outlines a range of actions that individuals can undertake to help contribute to Plan goals through activities at home, at work and / or within their classroom or organization (Portland Online, 2013g). And, while it reads as standard and fairly anodyne rhetoric of city planning, it conveys, in part, the perceptions that the local government has of city residents and what their roles should be within achieving city goals. As noted in Chapter 4, with an entrepreneurial approach to local government, responsibilities are increasingly being pushed down not only to the secondary and tertiary sectors, but also to the citizen (Beck, 2005, p. 170; Giddens, 1998; Stoker, 1998). In this responsibilization (Rose, 1999, p. 174), citizens become responsible actors to help achieve government outcomes; and as the Dubuque case study demonstrates, smart projects can help facilitate this process.[61] As noted in the document, the Portland Plan "is not just a City of Portland or government plan, it is a plan that individual Portlanders can, and must, help implement" (Portland Online, 2013f).

[61] Though, by no means do all smart city projects involve delegation of responsibility to citizens. This seems to be more typical with projects that require end user behavior change for the desired project outcomes to be achieved (e.g., sustainability initiatives).

In the remaining sections of this chapter and in Chapter 9 I examine the two case study projects that I explored in Portland. Figure 29 provides details on these two endeavors: (a) a crowdsourcing research project overseen by Portland State University, which was conducted to help IBM better understand how citizens can be engaged to inform urban planning; and (b) a systems modeling project, Systems Dynamics for Smarter Cities, that was undertaken to help improve city planning and strategy development, while potentially boosting sustainability outcomes by enabling increased efficiency of city operations.

Figure 29. Smart projects examined in Portland

	Systems Dynamics for Smarter Cities Project[62]	**Crowdsourcing to Inform Urban Planning Research Project**[63]
Overview	An online portal that integrated data from across city systems to enable city leaders to explore interactive visual maps and simulate macro-level policy changes	A research project that examined the open innovation technique of crowdsourcing to inform urban planning
Aim	To test the idea of modeling systems dynamics within an urban environment with the understanding that if 'successful', the model could be commercialized and turned into an offering	To ascertain how crowdsourcing may be applied to urban planning
Duration	1 year (2010-2011)	1 year (2011-2012)
Involved partners	IBM staff, Portland State University, Forio Business Solutions, and government representatives and subject matter experts that specialized on housing, economy, budget, government services, transportation, asset management, utilities, health and wellness, public safety, education, arts, culture, neighborhood and housing, design and planning	Portland State University
Finance	The development of this software was at no cost to the city given it was an IBM test case	This project was funded by an IBM Faculty Award paid by IBM Research

8.2 Bottom-Up Urban Planning

While the majority of IBM smart cities projects seek to apply technologies to city systems and services through top-down, technocratic approaches, researchers within the company were also curious about exploring bottom-up approaches that could

[62] For more information see IBM, 2011b, 2011f.
[63] For more information see Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012.

spur innovation within urban environments and potentially open up new avenues of business opportunity (City in Motion Meeting, 2011a, 2011b, 2011c). In this vein, IBM Research staff began considering how methods like crowdsourcing and crowdsensing might be applied to inform urban planning and the implementation of city strategies to expand the smart city market. This exploration by IBM Research of more citizen-focused smart projects pre-dates IBM Smarter Cities narratives around targeting city residents by roughly two years (see for example IBM, 2014j). Yet, I do not think that IBM narratives shifted to include a citizen-centric focus as a result of this these efforts of IBM Research; rather, these new messages more likely reflect market realities and a continual effort by IBM to gain smart city market share.

Two different pilot projects that focused on city residents were pursued by IBM Research, both of which fell through during their initial development due to the novelty, costs and uncertainty associated with these endeavors. On the third try of exploring possibilities within this realm, IBM Research staff were able to solidify a research project that explored the literature around open innovation and crowdsourcing applied to urban planning processes. For the purposes of my research, I have included this project in my analysis as it enables an examination of the application of crowdsourcing to urban planning, where city residents become involved in problem solving and decision making about city services and infrastructure via digital infrastructure.

8.2.1 Failed Crowdsensing Pilot

IT providers and local governments are increasingly exploring how city residents can serve as data sources, where people can voluntarily gather and upload data, or unknowingly contribute data by something as seemingly innocuous as carrying a cell phone. This technique, called crowdsensing, is made possible with mobile and wireless technologies, and enables people to act as voluntary or involuntary sensors through their mobile phone or other connected devices, such as tablets, GPS and laptops. Navigation devices are a good example of crowdsensing; they tap into cellular networks to gather insights on people’s movements and provide information on traffic delays (Pereira et al., 2011). Another example is the Crowd4Roads project, a three-year initiative launched in 2016 that is funded and supervised by the European Commission. This project aims to engage drivers and passengers to adopt "more sustainable car usage habits and road maintenance policies" by establishing a "synergistic relationship between BlaBlaCar, the largest ride sharing community worldwide", and SmartRoadSense, a "crowd sensing system which exploits the accelerometers of car-mounted smartphones as non-intrusive sensors of road surface quality" (Crowd4Roads, 2015).

The first crowdsensing pilot that IBM Research staff tried to launch was also focused around transportation. Stemming from the relationship built with the Portland State University during the SDSC project, IBM Research staff set up a fellowship grant with Ethan Seltzer, Professor at Toulan School of Urban Studies and Planning and Interim Director of School of Art+Design at Portland State University, to lead the design of the pilot (City in Motion Meeting, 2011b). Given the success attributed to the smart pilot projects in Dubuque, the city was seen as a fertile testing ground for a crowdsensing solution rather than the Portland locale. Through internal discussions within IBM Research staff, the idea for a First of a Kind (FOAK) research project was born, called City in Motion (CIM). IBM Research staff and Seltzer were curious to see how real-time data generated by city residents could help inform land use and transportation planning decisions, as well as longer term urban plans. The idea was to gather mobile phone data to get a better idea of how people move throughout the city, when they move, what form of transportation they use, and what patterns of movement they form. This would then be integrated with other forms of real-time data—e.g. car GPS, bus GIS sensors, traffic cameras, taxis, Mapquest, Google Maps, etc.—as well as more traditional forms of information like zoning and census data that land use and transportation planners traditionally use (City in Motion Meeting, 2011a, 2011b).

As the idea germinated, the number of stakeholders involved in CIM project planning grew. From IBM, cloud computing and transportation experts were consulted or pulled into the fold. Discussions were held with the local Metropolitan Planning Organization, the East Central Inter-government Agency, which handles transportation planning in Dubuque, as well as the local government office responsible for land use planning (City in Motion Meeting, 2011c). Representatives from the architectural and planning firm HDR Engineering, Inc. were also consulted to help figure out how these data could help emergency planning, architecture and engineering firms, which work with lots of data but often do not know what other types of data are available to inform their work, how to gather new data, and how to understand all of the data that can be gathered and translated into insight. After months of discussions however, the FOAK proposal failed. In the spirit of the FOAK, which involves IBM donating time and expertise to test a new idea, the hope had been that certain mobile companies operating in Dubuque would provide anonymized local user data at low or no cost to help inform the project. Instead, the cellular companies came back with a price for the data that IBM was not willing to pay, especially for such a small, experimental (and unpaid) project (City in Motion Meeting, 2011c).

And herein lies an important, and seemingly contradictory, observation to note—that smart projects, can fail due to a lack of data, despite all of the data that they help create, capture and analyze. Whilst smart initiatives do involve integrating digital infrastructure into city systems and services, they often do so through PPPs that involve a wide range of actors; actors that may have conflicting or varying interests around the project (Monbiot, 2000). Within these PPPs, each actor may be generating and / or analyzing their own data—to which the local government and other partnering organizations may or may not have access. Within a smart project, local governments do not automatically have ownership of the data generated, though in most cases, they will have some form of access. In Dubuque for example, the local government had access to aggregate level data from the utility company for the Smarter Electrical Pilot project; it did not however, have access to data at a granular level for privacy reasons (Naphade, 2012).

In the case of this failed pilot, IBM and its CIM partners attempted to get the local mobile phone company to join in the pilot and donate the data needed to run the analysis necessary to inform transportation planning. However, while IBM was willing to do this project pro bono, the mobile company wanted to charge for this endeavor (unsurprisingly, their main goal is to turn a profit). While the data necessary to implement the pilot existed, it was financially inaccessible to Dubuque city leaders or other CIM partners. This illustrates how having access to the 'right' types of data is central to smart projects; and, how easily smart projects can quickly fail without this access. As a workaround to this vulnerability, Seltzer proposed that instead the team use crowdsourcing as a means to inform urban planning, where data would be provided voluntarily from the city residents themselves instead of via crowdsensing.

8.2.2 Failed Crowdsourcing Pilot

Smart projects by design encourage partnerships across a range of urban actors who are often involved in innovation (Deakin and Al Waer, 2011, 2012). For this reason, these initiatives align well with crowdsourcing,[64] an open innovation technique that is common within the private sector to guide business decisions, processes and development (Howe, 2009). The concept of crowdsourcing, when described, sounds similar to themes found within citizen engagement and planning literature, for it refers to the cooperative creation of ideas and applications outside of the boundaries of any single firm, including involving the users of a system or product (Gassman and Enkel, 2004 in Seltzer and Mahmoudi, 2012). In his analysis of the potential of crowdsourcing, Brabham (2010) notes that: "the crowd's strength lies in its composite or aggregate of ideas, rather than in a collaboration of ideas. … This 'wisdom of crowds' is derived not from averaging solutions, but from aggregating them" (Brabham, 2010, p. 1125 in Seltzer and Mahmoudi, 2012). One example of a mass collaboration project that is crowdsourced is Wikipedia, where anyone can contribute or alter information, and others can verify or delete the information provided—its wisdom is derived from the crowd. Within the city context, crowdsourcing is a form of open innovation where local governments tap into the 'wisdom' of city residents through the Internet (Seltzer and Mahmoudi, 2012). A willingness to apply this private sector technique to public issues reflects, to an

[64] The term crowdsourcing is usually attributed to Jeffrey Howe, who wrote several *Wired* magazine articles on the topic (2006) and a subsequent book (2009). According to Howe (2006, 2009), crowdsourcing, a consequence of outsourcing problem-solving to companies in India and China, is the unearthing of knowledge and talent from people in many different places who are loosely affiliated through the Internet (Seltzer & Mahmoudi, 2012).

extent, the perception that the private sector is more innovative (Hearne, 2009, p. 11-12).

Once the crowdsensing FOAK failed, IBM Research staff and Seltzer brainstormed other ways to apply his research fellowship to running a crowdsourcing pilot. Since Seltzer was based in Portland, it became an obvious possibility as a site for the project. In addition to location, two other factors helped influence the decision to use Portland as the pilot city: (a) the local government's emphasis on engaging city residents through consultative, decision making and policy-forming activities; and (b) an existing online portal designed to gather input from city residents on city policies and resource allocation called Opt In.

Portland's local government frequently employs consultative processes that involve city residents (Johnson, 2004; Putnam et al., 2003; Witt, 2004). For example, the Portland Plan process took several years due to the numerous rounds of town meetings and sessions held for gathering and engaging stakeholders (Portland Online, 2013a, 2013b). As such, integrating a bottom-up approach to inform urban planning is not a novel idea for Portlanders. Seltzer hoped to build on this practice and create a pilot that linked to members from the existing online Opt In panel, which was created by Metro to get feedback from residents on decisions and planning related to the Portland metropolitan area (Metro, 2014). As referred to by an expert who I interviewed from Portland State University, Opt In is like "civic engagement 2.0". This Opt In panel[65] is used to question and survey members on a range of issues like "housing, sustainability, parks, clean drinking water, urban growth and development, garbage, and more" (Metro, 2014).

In general, Opt In managers implement one to two surveys per month. The response rate depends on the survey, with between 3,000-6,000 people participating in each survey or question with only one reminder sent. There is no Opt In budget to run the surveys, rather each government department that chooses to use the panel must pay

[65] In my interview with the head of DHM Research, he noted that at the time the pilot idea was explored in the fall of 2012, there were 10,000 panel members. By the end of 2013, Panel membership was over 18,000.

the associated fees. For each survey there are fifteen to twenty questions with space for open-ended comments. Metro and its partners receive only anonymous, aggregate reports of participants' survey responses, which are shared on the Opt In website for both members and local decision-makers to review (DHM Research, 2014; Metro, 2014). According to a community engagement expert from Portland State University and the head of the firm that runs the Panel, results are about equal to or better than random sampling. And, given the high costs of traditional public consultation, these experts feel that Opt In is attractive because while there are costs involved, using the Panel is cheaper than traditional methods.

The Panel surveys are run by DHM Research, a private sector organization that provides clients assistance with "communications, marketing, planning, and policy-making through focus groups, telephone and online surveys, and the development and utilization of online panels" (DHM Research, 2014), in effect privatizing related messaging and public engagement for these projects. Opt In partner agencies include the Northwest Health Foundation, AARP, Inc. (formerly American Association of Retired Persons), the United Way of the Columbia-Willamette, and the Portland State University College of Urban and Public Affairs (Metro, 2014). Part of the reason for this diversification of actors, as noted by the head of DHM Research in my interview with him, is that people would be more likely to join if the Panel was associated with a trusted name. Therefore a range of groups were recruited to become involved so as to appeal to a range of individuals. In my discussions with Seltzer about the Panel and its use for the crowdsourcing project, he said that he found the idea of piloting a crowdsourcing exercise with the Opt In Panel attractive due to the fact that Panel members are already used to using technology to provide input to inform urban planning decisions and policies. In addition, the Panel has broad representation—it is stratified by demographics (age, race, socio-economic status), geography and bi-partisanship (Panel members are almost evenly split between Republicans and Democrats) (DHM Research, 2014).

However, despite the attractiveness of utilizing Opt In for a crowdsourcing experiment, the idea fell through. According to a Metro official who I interviewed, this was partially due to timing. Seltzer contacted Metro with the idea right after there was push back from the Republican Party about the way an Opt In survey was worded. Consequently, a small group was quite vocal against the Opt In Panel. For this reason, the executive from the Metro government noted that Metro was hesitant to engage the Panel again so soon after the event, especially if the crowdsourcing experiment was found to be controversial. So, even though there was an existing infrastructure to run the pilot—a group of Panel members, a platform for participation already built, and IBM resources on hand to run the experiment—the effort failed for political reasons. Metro did not want any more negative exposure around the Panel or its operations. And so, another smart project vulnerability emerged from reviewing these failed pilots—aversion to the political risks involved with these types of initiatives. While some city leaders may initiate smart projects to deflect attention from other failed endeavors (Hollands, 2008), they also realize that these projects also present risk, which is more likely to immediately fall upon the involved local government actors than their private sector partners (Agranoff, 2003; Stoker, 1998).

8.2.3 Crowdsourcing to Inform Urban Planning Research Project

After these two failed pilots, IBM Research and Seltzer agreed to apply the fellowship grant to a literature review that would be undertaken by Seltzer and Dillon Mahmoudi, a PhD Student and Research Assistant with Portland State University's Urban Studies and Planning Department. Conducted in "an effort to encourage a cross-disciplinary dialogue between planners and those engaged in innovation processes in other sectors", the two examined the purposes and expectations of citizen participation and the open innovation technique of crowdsourcing (Seltzer and Mahmoudi, 2012, p. 1). They then looked at how crowdsourcing has been applied to urban planning to provide insight on approach and effectiveness. In contrast to IBM's approach in Dubuque, which was top-down, this project explored how to facilitate a bottom-up, participatory approach to urban governance by using smart technologies (Deakin and Al Waer, 2011).

This focus in their research touches upon two assumptions commonly associated with smart projects: (a) that smart project necessitate a pro-business bias, reflected by the private sector techniques that defined this endeavor (Hollands, 2008; Townsend, 2013, p. 5, 31); and (b) that smart technologies routinely involve community participation, and with this, there is an implied consensus around implementing these technologies (Coe et al., 2000; Hollands, 2008; Komninos, 2002, p.188). It should be noted that while IBM Research funded this initiative and helped decide upon the overarching topic, they were not involved in the project as it developed in terms of research contributions, feedback on drafts or input on direction. Instead, they were primarily interested in the final conclusions and observations of the work, and how these then could be applied to adapt existing or create new marketable solutions.

Seltzer and Mahmoudi began by reviewing literature on open innovation (Chesbrough and Appleyard, 2007; Gassman and Enkel, 2004; Speidel, 2011) and crowdsourcing to see how each might be aligned and / or applied to urban planning (Evans-Cowley and Hollander, 2010). The purpose of this exercise was to see if crowdsourcing could be used as a ‘good’ tool to facilitate public consultation. Within this review, Seltzer and Mahmoudi found that open innovation and techniques like crowdsourcing do seem to share commonalities with the objectives of public consultation, for both seek to gain the involvement of ‘users’ of a system or product (i.e., city residents in an urban context), and therefore would be applicable to urban planning. As noted by Evans-Cowley (2011),

> City and regional planning is a perfect discipline for crowdsourcing because planners are constantly identifying problems and working to find solutions. Planners excel in framing problems and soliciting input from the public, and they intuitively recognize the power (of) the public to solve problems as a group. (p. 3)

One reason that is helping to make crowdsourcing a more attractive option for local governments is the increasingly pressure they face to do more with less resources (Shelton et al., 2014). Recognizing that while traditional public consultations processes can be quite expensive and time consuming, local governments still take the view that they help gain useful information and confer legitimacy on projects and plans. Furthermore, these processes, by pulling together a broad range of input, often provide greater resilience to local government initiatives. Given these pronounced benefits and the growing constraints on time and money, local governments have looked to business sector open innovation techniques like crowdsourcing to facilitate or enhance public consultation (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012).

To provide insight on approach and effectiveness in applied practice versus theory, Mahmoudi and Seltzer looked at a project in Omaha, Nebraska to get a better idea of how crowdsourcing has been applied to inform urban planning. The project they examined was implemented by MindMixer, an Omaha-based firm created to "develop tools for applying open innovation and crowd wisdom to planning" and policy making—one of the few firms now operating in this market. MindMixer's first citywide website, Engage Omaha (www.engageomaha.com), was designed to, in the words of MindMixer CEO and Co-Founder Nick Bowden, "augment the city's outreach efforts to its citizens … most importantly to gather feedback on the city budget to help prioritize different services that each department is offering over the course of the next budget year for the city" (Bowden in Gerlock, 2011). Engage Omaha represents a growing trend of local governments turning to crowdsourcing or other Internet-mediated mechanisms for public consultation processes; and as such, is yet another channel in which technology is being integrated into city systems, operations and services delivery.

In their review of Engage Omaha, Mahmoudi and Seltzer found that while crowdsourcing engagement is not as robust as ideal, it can still be deemed valuable by participants. Participating Omaha residents valued the interaction with city staff around budget formulation. Omaha city staff valued the legitimization of the plans that they felt was gained via feedback from a larger, diverse cross-section of the city. City staff additionally saw value in the ability to disseminate information with links related to each topic's problem statement, giving participating city residents immediate access to the same information and additional details if they so choose. And, through the increased participation enabled by Engage Omaha, Mahmoudi and Seltzer found that the city of Omaha was able to go beyond its institutional boundaries in ways it otherwise may not have for city resident input (Mahmoudi and Seltzer, 2012). Thus, Mahmoudi and Seltzer deemed the Engage Omaha budgetary exercise ‘successful’ since both city residents and the local government felt it added value.

Similar crowdsourcing projects have been tested in cities like Hamburg, Germany, where NextHamburg, a citizens’ think tank, is crowdsourcing the city together with citizens through a citizen-driven platform and incubator that is enabling them to influence politics (Petrin, 2015). Another example comes from China, where the Beijing Transport Research Center and the World Bank are looking for areas that transportation planners should be paying attention to by crowdsourcing feedback on issues related to cycling and walking infrastructure through the website, smart phone apps, SMS or social media. The user-generated reports are then mapped and visualized and made available for public discussion (Web Urbanist, 2016).

Challenges

While Mahmoudi and Seltzer described the potential advantages and benefits of crowdsourcing in this review, they also noted several challenges associated with these types of projects. Firstly, attracting and sustaining participation from a large and diversified group over time is challenging—people get pulled away by life’s demands, interests wane, and unmet expectations lead to discouragement. And, even getting initial active participation is challenging (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012). According to Seltzer, crowdsourcing participation seems to follow a 1-10-89 rule—where one person will come up with an idea, ten people will support and / or discuss it, and eighty-nine others will lurk, watching this activity from the sidelines. Hence online participation seems fairly limited to just reviewing shared information. Yet, Seltzer notes that there is still a way to get value out of the lurkers by tracking their viewing and reading behavior and making it available to stakeholders, enabling better understanding of the issues or discussions of top interest (Seltzer, 2012). Secondly, Seltzer and Mahmoudi note that another key problem with these types of projects is that, due to the nature of crowdsourcing, local governments may not always know who is participating in the process, or whether the key stakeholders they would like to have participating are engaged. While the private sector may want to engage with any innovator during open innovation, local governments tend to want to engage only their own constituents (Mahmoudi and Seltzer, 2012). This lack of transparency is a limitation especially for efforts where governments want to ensure they include input from targeted groups.

A third challenge identified relates to how this process is approached. In their analysis, Seltzer and Mahmoudi found that for these processes to be 'effective', local governments must clearly define what they want out of the process. For example, they should outline the impact or outcome they would like to achieve rather than a specific solution or approach used to obtain this outcome. To assist in the problem solving associated with reaching these desired outcomes, the local government should also share the concepts associated with the problem, what relevant factors may be unknown, as well as what city leaders realistically can and cannot do to solve the problem so that crowdsourced solutions are viable options (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012). In other words, crowdsourcing can be an effective tool to inform urban planning if the problem being crowdsourced is specifically defined and clear expectations are set for what types of information or recommendations will fall within the local government's scope associated with the exercise.

Another caution around crowdsourcing techniques relates to the fact that unlike with commercial activities, crowdsourcing in the public sector is focused on political processes and values verses profit. Ultimately, urban plans are "socially constructed and are political statements, requiring, ultimately, a great deal of face-to-face interaction rather than anonymous Internet-based activity" (Seltzer and Mahmoudi, 2012, p. 12). Hence, while crowdsourcing does have potential with urban planning processes, it should be complemented by more traditional public consultation techniques and conducted within a narrow band of specific applications. In their recommendations, Mahmoudi and Seltzer note that after a planning problem and its goals have been outlined, crowdsourcing could be useful to help identify options to meet plan goals (2012). And, as this practice becomes more common, over time, what does and does not work in terms of application will become more and more apparent.

This research around crowdsourcing and urban planning raises several questions about the practice. Are town meetings and online platforms serving different types of city constituents? How does the medium of interaction affect the type and quality of feedback or input provided, and is this interaction perceived as 'meaningful'? How can local governments ensure that only city residents are participating in crowdsourcing projects? Who gains from moving urban planning discussions online? How does the role of the tech provider affect the way that the online platform is designed, seen and interpreted by users? And, how might the role of the tech provider affect engagement, and perceptions and expectations that city residents and the local government have for each other? In the section below I explore some of these issues, and how they coalesce with the assumptions of the smart concept. In particular I look at the shifting relationships between local government and city residents and the application of business models to public sector processes—both of which are encapsulated within crowdsourcing efforts to inform urban planning.

8.2.4 Apps for Urban Planning

As described by Seltzer and Mahmoudi (2012), crowdsourcing can be part of a bottom-up strategy to inform urban planning. It enables gathering input from more city residents that might not have been possible with more traditional public consultation processes like town hall meetings and surveys. Within my fieldwork research, I found two divergent interpretations of what this turning to crowdsourced urban planning may signify in relation to local governance engagement arrangements: (a) a positivist view of these initiatives and the opportunities they bring, which was unsurprisingly best articulated by the head of the tech firm that provided crowdsourcing services for Opt In; and (b) a more critical analysis of what this technology trend might mean for relationships between and among local government and city residents.

To gain insight into the operations of Opt In, I spoke with Adam Davis, the head of DHM Research, the small marketing and political analysis firm that operates the Opt In Panel. As expected, Davis viewed these types of projects as a boon for local governments and city residents alike. But, Davis is not alone with this belief; many within the tech industry feel that digital will help empower democracy due to the "efficiency and transparency gains from using ICTs for engaging the public" (Ford Foundation et al., 2014, p. 10). "By creating open data platforms… government is democratizing the data" (ElBaz in Ford Foundation et al., 2014, p. 10). City CIOs and CTOs also align themselves with this thinking, for it can often lower consultation transaction costs (Ford Foundation et al., 2014).

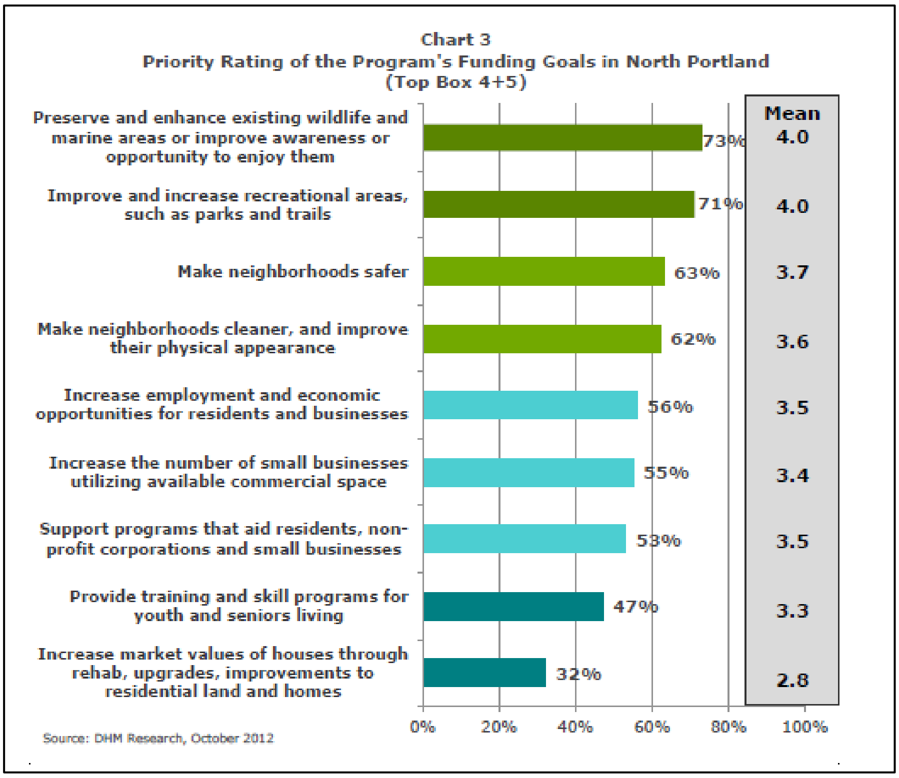
For Davis, panels like Opt In are a good solution for the public engagement system in the United States, which according to him is broken due to the busyness of everyday lives, the deterioration of overall civic engagement[66] and a lack of civility within local politics. In his experience, town hall meetings quickly devolve into name calling and shouting matches, with little respect for those involved. So from Davis' perspective, the use of technology to enable participation is a good alternative for engagement because it enables people to voice their opinion on a specific issue that they otherwise may not have been able to share, while also divorcing some emotion from the process, which may enable more people to feel comfortable participating.

In Davis' view, interacting online through crowdsourcing or panels like Opt In is a new form of engagement, a way to deepen interaction and get more people involved in urban governance. With the use of such online platforms, those implementing the exercise can ensure that all those who participate get the exact same information, something that may not occur with town meetings. And, by design, the Opt In panel is controlled and vetted so that only residents living inside the Portland Metropolitan area can participate. To assist with transparency, the results of surveys are posted on the platform so that members can understand overall voting. What is not clear however is how this type of feedback filters into the local government's decision-making / resource allocation processes. Figure 30 provides an example of an Opt In

[66] The diminution of civic engagement is explored in-depth by Robert Putnam is his examination of social capital and civic engagement within America (1993, 1995; Putnam et al., 2003). Putnam defines "social capital" as the "features of social life—networks, norms, and trust—that enable participants to act together more effectively to pursue shared objectives" (Putnam, 1995). By "civic engagement" he is referring to "people's connections with the life of their communities, not only with politics" (Putnam, 1995).

survey on grant program awareness and application in North Portland (DHM Research, 2014).

Figure 30. Example of Opt In Panel feedback



Source: DHM Research, 2012.

While online crowdsourcing panels like Opt In may enable more to participate, a seemingly ‘neutral’ environment and uniform / standardized information sharing, the thought of shifting engagement to this type of interaction pulls into question what it might mean for the relationships between local governments and city residents. For in this type of consultation, there will also be a tech provider and / or technology that will sit as an intermediary between the two; thus raising several concerns. Will the allure of ‘participating’ in urban governance processes through hand-held devices persist, or will the novelty wear off leading to disengagement? Will city residents consider entering their opinions in the appropriate fields on a webpage or taking an online survey a ‘meaningful’ enough action that will lead them to come back and repeatedly participate? Will this method lend itself to certain types of people dominating the conversation? How is feedback integrated into decision-making processes, and what is the transparency around this process? And, while these questions about the potential implications of crowdsourcing emerge, there is a deeper undercurrent that comes to mind. What will be the implications if we continue to displace human interaction around urban governance processes with interaction with each other via technology? Will we still have compassion and understanding for those in need or who have different interests within our community? How will local governments foster a sense of community if interactions between city residents and local government only exist through a laptop or hand-held device? And, how might smart technologies affect 'citizenship' and what it means to be involved in civic affairs as smart technologies proliferate? As noted in the beginning of this chapter, the implications of the digital citizen engagement that smart technologies enable still remain unclear.

Technology as the Intermediary

Sherry Turkle (2011), in her book *Alone Together: Why we expect more from technology and less from each other*, notes this rising trend: "We bend to the inanimate with new solicitude. We fear the risks and disappointments of relationships with our fellow humans. We expect more from technology and less from each other" (Turkle, 2011, p. xii). And, as Turkle argues, if technology is distancing us from each other in our personal relationships, are techniques like crowdsourcing doing the same via the Internet at a community level? Crowdsourcing techniques might be more affordable ways to get additional input from certain demographic groups within a city, but is the information gathered worth the relational cost? In a sense, crowdsourcing and online panels like Opt In are decentralizing decision making to the extreme, where individuals cast their vote or respond with no respect to or consideration for how the impact may affect others.

Because face-to-face discussions do not take place, participants do not get to hear other viewpoints or perspectives; they do not necessarily have to read them if they are posted online. Hence, participants' decisions are made solely customized to their own individualized needs and concerns. An over reliance on technologies for public engagement in this sense can lead to or intensify civic segregation. Paul Dourish, Professor and Co-Director of the Center for Social Computing, Informatics and

Computer Science at University of California, Irvine, notes that the digital city is more fragmented, “individualistic and disjointed” by nature than the physical city, and thus “is particularly problematic for civic participation” (Ford Foundation et al., 2014, p. 10).

Another concern to consider with such approaches to public consultation is that if the local government implements the crowdsourced solution, this involves experimentation with the solution recommended and created by users. Instead of applying known solutions that have been previously tested, in cases where crowdsourced solutions are implemented the local government faces more risk—it is a gamble somewhat akin to a startup within the private sector, a risk more local governments are willing to take in efforts to cut costs. Yet the stakes for failure are much higher within public sector initiatives (Agranoff, 2003), where trust and relationships can be permanently or seriously damaged by repeated government failure in meeting city resident expectations.

Further, the practice of moving consultation processes online mirrors typical marketing practices of the private sector, demonstrating another example of smart projects encouraging a pro-business bias (Hollands, 2008). The use of technology to facilitate the consultation process can be seen as an extension of customer relations management practices that are promoted within the private sector as means to help lure and retain customers (Kotler et al., 2002, p. 14). Just as retail stores or banks may create an app to build a ‘relationship’ with its customers, crowdsourcing apps for urban planning can be seen as an extension of the same. With this crowdsourcing approach to inform urban operations and planning, city residents become customer consumers (Cohen, 2001), where they consume the city and its services as a product. As envisioned by IT providers, urban planning apps will enable local governments to share information with and glean insight from their customer consumers to improve the way that they function and provide services, just like retail websites and apps that enable customers to provide feedback which is then integrated into product design (Buschner et al., 2010). In this manner, crowdsourcing platforms will enable local governments to court their resident customer consumers—raising questions around the nature of future citizen-local government relationships.

Conclusions

While this chapter looked into interactions around strategy and engagement via a research project on crowdsourcing for urban planning, it also revealed cracks in the smart city veneer that did not seem readily apparent in the Dubuque case study became visible. Even before these projects were designed and implemented, the local government expressed reserve, suggesting that city officials questioned the allure of the smart city imaginary. My interviews with those involved in the crowdsourcing research project revealed that rather than seeing the smart city imaginary as a complete departure from the past, they viewed smart technologies as incremental advancements in gathering and analyzing data on city systems and services, with the primary difference being the integration of real-time data and enhanced ability for analysis and visualization. In addition to revealing differing perceptions of smart city projects between actors in Portland and Dubuque, this case study also shed light on some of the frailties associated with smart projects. Through the exploration of the failed pilots associated with Portland, I found two clear weaknesses with smart projects—that these projects can, ironically, fail due to a lack of data (despite all the data they help generate), and that like many other city endeavors, they are vulnerable to political whim.

Unlike the smart city experience in Dubuque, the city's strategy, the Portland Plan, did not include reference to smart technologies or place emphasis on using technologies to help achieve city goals. The Plan was formed through broad consultation with city residents, civic groups and businesses, and although IBM became involved in this process in an attempt to get the smart city theme woven into this Plan, local government and those consulted did not view this approach as a priority for the city and hence did not include it in the strategy (Portland Online, 2013b). While this omission may seem discouraging for IBM and other smart city providers in terms of opportunities in the city, aspects of the Plan still help lay a foundation for smart projects to emerge in the future. Firstly, through the consultation process to develop the Plan, the local government included a wide range of actors that could be involved in public-private partnerships for Plan implementation (Portland Online, 2013b). These PPP arrangements, typically sought after by local governments in an attempt to attract external funding (Harvey, 1989a), stem from the perceived innovation and management expertise of the private sector (Hearne, 2009, p. 11-12) and a pro-business bias (Hollands, 2008). In this manner, this paves the way for entrepreneurial policy experiments like smart projects or initiatives such as the "Creative City" (Florida, 2002; Vanolo, 2008) or "Eco-city" (Register, 2006). The second area in which the Plan lays a foundation for smart projects is with the emphasis it places on city residents becoming responsible to aid in Plan implementation (Portland Online, 2013b).

In parallel to the local government viewing city residents as key actors for Plan implementation, IBM Research was keen to better understand how technologies could be used to engage city residents to inform urban planning. The resulting crowdsourcing research project highlighted the advantages to using technology to engage city residents—such as gaining input from a larger number of residents, being able to provide unified information for citizen review, and enabling a 'neutral' environment for comment and feedback (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012). This bottom-up, participatory approach offers an alternative to the types of smart projects driven from the top-down (Townsend, 2013, pp. 86, 249), such as those implemented in Dubuque. However, this research also pointed to risks posed by this open innovation technique, such as participants making decisions solely based on their own needs rather than those of the community as a whole, a practice that could intensify segregation within civic affairs (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012). In this vein, the smart city is more fragmented and disjointed than the physical city, and thus presents new challenges for civic participation (Ford Foundation et al., 2014). While a research endeavor, this project looked at how business techniques, i.e., open innovation (Chesbrough and Appleyard, 2007), could be applied to public sector processes (Evans-Cowley and Hollander, 2010). In this manner, it reinforced two assumptions linked to smart initiatives: a pro-business bias (Hollands, 2008) and community participation with implied consensus (Coe et al., 2000; Hollands, 2008; Komninos, 2002, p.188).

While the ramifications of using technologies to engage citizens remain unclear, this research project shed light on various concerns—around who is engaged, how meaningful is the interaction, how might this affect other forms of citizen engagement and interaction, and how will this insertion of technology / the IT provider into the local government-city resident relationship affect their perspectives of and expectations for each other. As envisioned by the IT provider, this insertion enables radical change, altering the relationships between policy makers / managers and citizens (Buschner et al., 2010). While this Portland example was quite different from the smart city projects that I explored in Dubuque, it still underscored the notion that smart projects are examples of neoliberal policy experiments as they are imbued with an entrepreneurial management style (Brenner and Theodore, 2002) and accentuate the assumptions of smart (Hollands, 2008). I continue this exploration of Portland's journey with smart in the next chapter with an examination of the SDSC project.

9 Portland: Exploring Solutionism while Questioning Smart

In many ways for IBM Marketing, the city of Portland was an ideal place to test its system of systems approach to modeling city operations (IBM 2011b, 2011f). The local government's recognized expertise in long-term urban planning (Abbott, 2004) and emphasis on sustainability (Grist, 2007) created an opportune framework for shaping the modeling exercise. Additionally, as a medium-sized city, it enabled expanding the realm for testing a smart city solution beyond the small city of Dubuque. Unlike the projects in Dubuque where IBM Research took the lead, the Systems Dynamics for Smarter Cities effort was created and overseen by IBM Marketing. The resulting simulation tool existed as an online portal that enabled city officials to visualize how changes in resource allocation and policy may affect future states of various city systems.

Figure 31. The Portland skyline at night

Source: Image from Wikipedia. See: http://en.wikipedia.org/wiki/Portland,_Oregon (accessed September 9, 2013).

At the heart of this project, which involved the gathering and analysis of vast amounts of data, the city was perceived by the IBM team as "visualized facts" (Kitchin, 2015, p. 6) that could be used by the local government to help manage and govern the city. Through this solutionist approach to urban planning (Mattern, 2013), project staff posited that with the 'right' data and algorithms, city leaders would be able to glean valuable, actionable insight from this systems modeling tool. Underscoring this approach are neoliberal principles that prioritize "market-led and technological solutions" to governing and managing the city and data capture and analysis to inform decision making about city operations and resources (Kitchin, 2014b, p. 2). Concurrently, two assumptions of smart are also reflected in this project; that smart technologies: (a) help optimize the management of resources, including supporting sustainability (Hollands, 2008; Miller, 2013; Townsend, 2013, pp. 58, 83) and (b) necessitate a pro-business bias, including the use of business models and frameworks (Hollands, 2008; Townsend, 2013, pp. 5, 31). In this manner, this project, like those examined above, can be construed as another manifestation of neoliberal policy experiments in an urban environment (Brenner and Theodore, 2002). I explore the SDSC project through this lens in the chapter below.

I begin with an overview of the history and thinking behind urban modeling exercises, and how these informed the SDSC project. I discuss IBM's vision for the project, and how this aligned with local government planning objectives and processes. I highlight the unexpected gains from this work, as well as the perils that these types of projects pose to cities and urban governance. I then look at how the lack of IT provider interactions around project and city representation reflected a lack of support and buy-in vision within the local government for IBM's Smarter Cities. The purpose of this chapter is to explore how findings from Chapters 2 and 4 apply to the Portland example, and shed light on IBM's interactions with the local government around strategy, engagement and representation through this endeavor.

9.1 Modeling Urban Activity and Environments

In the SDSC project, modeling exercises, more typical to business analytics, were developed to glean insight on interactions between city systems to inform urban planning around sustainability and economic development. As discussed in Chapter 2, this approach to modeling city systems is not new, for it dates back to the 1950s, when military, computer science, business and electrical engineering applications were tested in urban environments (Townsend, 2013, pp. 79-81). In my interview with the SDSC project lead, Justin Cook, he noted that the work of Jay Forrester was a key influencer in the conceptualization and development of this effort. In the 1950s, Forrester, building on Norbert Wiener's "cybernetics", founded "systems dynamics", a means by which one can simulate the interactions of things within dynamic systems. Forrester first applied this concept to industrial business cycles, and then moved on to apply it to urban activity in his work *Urban Dynamics*

(1969)—an endeavor that attracted global attention, with many questioning the feasibility of modeling complex, social systems like cities (Radzicki and Taylor, 2008 in Hennessy et al., 2011).

By the mid-1970s, urban planning professionals and scholars had moved away from this type of approach. Arguably the most well-known critique of Forrester's work is Douglas Lee's (1973) article "Requiem for Large-scale Models", which outlines the primary reasons that system dynamics modeling does not yield accurate results in cities—noting that these models are not comprehensive enough, too large, overly complicated, too expensive, too mechanical, and based upon questionable assumptions and equations (Lee, 1973). Instead, Lee suggested the use of simple and transparent models, ones that could better coexist with the randomness (e.g. hurricanes or terrorist attacks) and unpredictable factors (e.g. human behavior) that emerge in cities (Goodspeed, 2011; Lee, 1973). As discussed in Chapter 2, Joe Flood (2010), through his examination of the application of computer models in New York City, also found fault with these models. In this case, the consequent over-zealous focus on efficiency and an overreliance on technocrats and algorithms that emerged led to poor decisions around fire department staff and resources, leading to a decade of fires that burned across the city (Flood, 2010, pp. 19-24, 263-277). He cautioned that such modeling approaches may lead to similar reductionist mindsets in other cities, creating gaps and inadequacies in city services with the potential for the same types of adverse results.

Yet, despite the failings and challenges of past applications of systems modeling, this idea has emerged again within urban discourse—in some instances perhaps as a marketing ploy, while in others as a positivist investigation into how this thinking could be updated and applied for better outcomes (Batty, 2013; West, 2011). This revised approach to systems modeling seeks to apply complexity science to cities, whereby cities can purportedly be improved by an enhanced ability to measure and therefore manage. To explore this notion further, IBM sponsored its first Urban Systems Symposium in 2011, with panel experts like Economist Paul Romer (Professor, Stern School of Business, New York University) and Activist and Writer Stewart Brand (former author / publisher of *Whole Earth Catalog*). It was at this event that IBM presented its systems dynamics work in Portland (Lindsay, 2011); and, to some extent, demonstrated its lack of familiarity with the urban planning profession and its evolution—a tendency not unique to IBM, but rather common to many of the IT providers in the smart city market (McNeill, 2014). I explore IBM's SDSC project, and how IBM has interacted with urban governance via this project around strategy and engagement in section 9.2 below. Materials created by IBM and the local government to describe this effort—such as media coverage, websites, project documents and presentations—informed this analysis. Case study interviews with project actors also contributed to this analysis. Figures 8 and 10, and Appendix 11.5 provide further details.

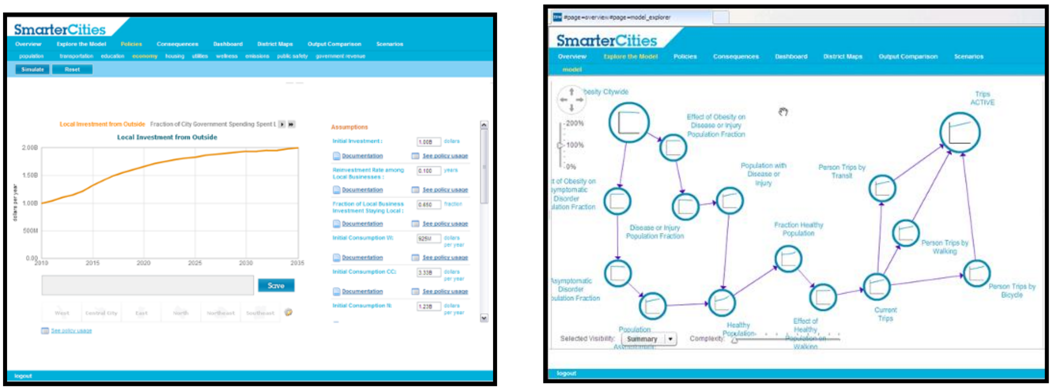
9.2 Systems Dynamics for Smarter Cities

Within numerous IBM narratives, cities are viewed as being: "made up of a complex system of systems that are inextricably linked" (IBM, 2011b), and that given the complexity of cities and their systems and the way that local governments often manage them in silos, understanding how these systems interact and will continue to do so over time has not yet been possible (Dencik, 2013; Dirks and Keeling, 2009; IBM, 2011b, f). As discussed in Chapter 5, framing cities from this system of systems perspective has been an IBM strategy to help justify its role in the smart city market and to portray itself as an immediate expert, for the firm has long been perceived as a master of systems integration from a tech perspective (Harrison, 2010; Harrison et al. 2009). Based on this understanding of cities and their systems, IBM sought to test the idea of modeling systems dynamics within an urban environment with the understanding that if 'successful', the model could be commercialized, turned into an offering, and replicated throughout cities around the world.

Drawn to Portland for its reputation in urban planning and sustainability, an IBM team approached Portland's local government with the idea of piloting new digital analytics software enabled by new computing power and analytics that, as claimed by IBM, would allow city leaders visibility across city systems, in real time and over the long term (IBM, 2011b, 2011f). After several meetings between IBM staff and various government officials, the local government agreed to a pilot, which was launched in April 2010. To develop the systems model, IBM facilitated workshop sessions with representatives from 18 local government agencies and over 75 local subject matter experts from a range of disciplines to help identify interconnections between city systems. Building on this information, IBM staff, researchers from Portland State University, and developers from Forio Business Simulations, a systems software company, gathered data and identified the algorithms to use within the simulation tool (IBM, 2011b, 2011f).

The model was populated with ten years of historical data, combining roughly 7,000 different indicators from across city systems—such as housing, education, public safety and transportation—with 3,000 equations to demonstrate the interactions between the variables associated with these indicators (IBM, 2011b, 2011f). The resulting modeling tool enabled city leaders to explore interactive visual maps and simulate macro-level policy changes through an online portal that integrated these data from across all city systems. In addition to purportedly helping city leaders understand how the city functions and operates, the model was built to support the development of metrics for the Portland Plan (IBM, 2011b). Figure 32 provides examples of screenshots from the tool (note that the tool is no longer running, these images are from an internal IBM presentation).

Figure 32. Images from the Systems Dynamics for Smarter Cities tool



Source: IBM Brand System Strategy, “Systems Thinking for a Smarter Reconstruction”, March 23, 2012. Internal Document.

By toggling different controls on the online platform, planners could create simulated predictive responses around various urban issues—issues that hypothetically could now be better understood due to the model’s ability to help break up the “information silos that so far have hampered an integrated view of how an action in one policy area can affect other areas” (Zeitler, 2011). The lead IBM staff who worked on the project called the model a “strategic thinking” and “decision-making” tool, which could “help policy makers explore the ripple effects of different options and the interdependencies of different city systems” (Cook in Townsend, 2013, p. 83). And, it is this description of the simulation tool that made former Mayor Adams an enthusiast for the development of this project. When describing some of the challenges local governments face Adams noted:

> …Lack of insight, lack of research. I hate to say it, I’m a nerd—but it is data. Not data in and of itself, but insight. The notion of what can we do better with the resources that we have, is really, really key. In a lot of cases, it is the matchmaking of needs and wants that comes with analysis and insight. (Adams in Camner, 2010)

In this context, Adams wanted to move his administration from the “sticks and bricks” of data to information—a transformation that he saw possible with the systems modeling tool (Adams in Camner, 2010). Counter to the Mayor’s enthusiasm for the model, several experts from the Portland Bureau of Planning and Sustainability and Portland State University were cautious and skeptical about this urban modeling experiment, for they were aware of how similar efforts had fared in the past and were debunked over 30 years ago. In documents describing the project, Cook and his team acknowledge previous failed efforts (i.e., those of Forrester) and outline how their model differed by employing modeling approaches from both economics and urban studies (Hennessy et al., 2011). Other differences between these approaches included: (a) variation in number of equations, Forrester used only 118 while Cook and team used over 3,000; (b) the process by which the model was developed—Cook and a large team of relevant city experts from the local government and Portland State University built the model in Portland, while Forrester acted alone; and (c) increased visibility and transparency with the online simulation platform, for it was made available to those who helped co-create it and the assumptions being made could be readily seen; Forrester’s model however was perceived as a ‘black box’[67] (Hinchcliffe, 1996), where one could see inputs and

[67] I further discuss the notion of black-boxing city systems below.

outputs, but have no real transparency or understanding of how the resulting outputs were obtained (Hennessy et al., 2012).

Yet, the differences, and / or similarities, between the two models are not important for the sake of my argument when analyzing this project. Rather, what is important is the fact that: (a) the entire project is built on the notion of solutionism—or the belief that with the ‘right’ data and the ‘right’ algorithms, any problem within the city can be solved; (b) the model reflects a continuation of business approaches being applied to urban environments to help better understand and manage them; and (c) interest in developing this type of positivist approach seems to be growing (again) with the emergence of “urban systems” and “urban science” (Batty, 2013; Urban Systems Symposium, 2011; West, 2011). This type of modeling approach is especially more common with city’s pursuing sustainability agendas and / or attempting to address issues of climate change. In Bali, Indonesia for example, modeling efforts are being undertaken to help “increase the capacity of local systems to understand how their urban practices contribute to environmental degradation (and thereby, climate change), and how specific decisions about those practices can achieve positive change” to improve outcomes (OECD Global Science Forum, 2011, p. 4). For IBM, an organization perceived as being an expert in systems integration (Harrison, 2010), this rise in the belief of systems modeling and how it may contribute to urban science represents a potential rise in business opportunities.

9.2.1 Testing Turnkey Urban Planning

Given the experimental nature of SDSC, in my interview with the IBM project lead he noted that the contract with the city to develop the model stemmed from a FOAK proposal—meaning that IBM deferred costs incurred while developing the project so that it could test the new technology. Hence, throughout the development of the model, IBM approached Portland as a living lab experiment (IBM, 2011b; Yasin, 2011), where subjects within the experiment were also construed as drivers to innovation (Schaffers et al., 2011). This living lab model proved valuable for IBM. The collaboration enabled IBM to apply its emerging Smarter Cities experience and test drive its modeling capabilities at the metropolitan level—a market in which IBM had not typically operated prior to its Smarter Cities campaign. Further, by participating in this urban planning process, it enabled IBM to gain insight city planning—where, according to IBM narratives, improvements could be made with IBM's assistance (IBM, 2011b, IBM 2011f). In effect, IBM, an IT provider, was claiming the ability to improve the process of urban planning, without any real professional urban planning experience to back up this claim. As outlined in its related press release for the project:

> Based upon IBM's experience in working with and conducting assessments of cities around the world, they've found that strategic planning in many cities is still being done in stovepipes without a holistic view of impacts / consequences across systems. By leveraging systems dynamics modeling techniques, IBM will be able to help other cities plan 'smarter'. (IBM, 2011b)

Most importantly, or at least deemed so at the time, the experiment enabled IBM to use Portland as a Petri dish for developing consulting services and software that the organization hoped it could scale, replicate and sell globally (Zeitler, 2011). IBM Marketing envisioned that the urban modeling software would become increasingly popular for local governments interested in longer-term planning. And, they felt that individual models could be adapted from the software developed for Portland to analyze specific situations at additional costs for customization to any city around the world (IBM, 2011b; Mincer, 2011). As discussed in Chapter 5, similar to IBM's thinking around the Smarter Cities Challenge, the organization understood city problems to be 'universal', where a set of standardized solutions could be replicated, scaled and implemented (McNeill, 2014). For instance, when describing the systems thinking project, the IBM project manager noted: "we've been trying to model across cities" (Cook in Yasin, 2011). And, according to former IBMer Naveen Lamba, who also supported the systems modeling project, the model could be easily applied globally to cities of different size and structure (Lamba in Zeitler, 2011). This assumption that the systems modeling project, and any smart city solution, can be equally applied and scaled to any city around the world is replete within IBM's Smarter Cities narratives (IBM, 2009a, 2011a, 2012e, 2013a, 2014b, 2014i, 2014j), and represents an oversimplification of cities and their challenges—a purposive reduction to increase market applicability (McNeill, 2014). This has influenced IBM stories about smart cities, as well as project design and implementation, regardless of city size, socio-economic status, context and location.

The notion of creating this “urban planning in a box”, a tool that can be globally scaled and replicated and is built upon the same types of data sources and algorithms, only underscores IBM’s lack of understanding of cities, and all of their varying sizes, demographics, organizational structures, legal processes, codes, laws, regulations, political models, cultures, socio-economic environments, infrastructure, age, concerns and mandates, among the myriad of other variables that make cities distinct (Kitchin, 2014b). IBM staff assumed that the same types of data sets and algorithms used in the Portland model would be universally applicable—what was designed for one microcosm could be applied to all. In its designs for this plan, IBM staff even noted that Forio, the co-developer for the Portland simulation, could be substituted with a range of vendors.

Despite these ambitious plans for commoditization, IBM has not sold the simulation tool to any cities. In part, the challenge for urban simulation tools like the SDSC model lies in the balance of value gained versus the effort invested to develop and maintain the model. In the end, less than a year after the completion, the Portland local government decided not to pay for the maintenance of the model and its online platform, thus closing it down. According to Joe Zehnder, Chief Planner with the City of Portland’s Bureau of Planning and Sustainability, the model “proved… to be something where we weren’t really going to be able to maintain or use it—in a way that people were going to have confidence in—to illustrate these relationships” across city systems (Zehnder in Townsend, 2013, p. 84).

9.2.2 Unanticipated By-products

In the end, the SDSC project did not inform the 2013 Portland Plan; yet IBM staff reported that it did help influence some of the metrics chosen for the Plan. While the solution did not become a replicable model, in my interviews with the IBM project lead, a local urban expert and a government staff member, each noted that there were beneficial outcomes that had little to do with the technology involved. While IBM’s gains from the project were those to be expected—e.g., experience working closely with a city client and the ability to test the viability of a solution before further investment to go to market—gains for the local government were unexpected. In my interviews with the local government, three of five noted two clear valuable outcomes from this work: the new relationships and collaborative models that emerged, and a deeper understanding of how Portland is a system of systems. Summing up a main goal of the year-long pilot, Zehnder stated:

> We wanted to break down our typical policy or investment silos like transportation, housing, economic development and the environment and look at how policy and investments within any of those areas could play a role in accomplishing a limited and shared set of priorities. (Zehnder in Yasin, 2011)

And, through the consultation process used to develop this model, silos began to be broken. The majority of those whom I interviewed involved with the project noted that they felt the biggest benefit of the project was in the relationships it helped build across local government silos during model development. While Portland's government agencies communicated with each other before this project, Zehnder noted that this experience and the integration of their respective data did offer "more depth" (Zeitler, 2011). For example, in my interview with Radcliffe Dacanay, a city planner from Portland's Bureau of Sustainability, he noted that the method to develop the systems thinking model offered participants "enlightenment" around how the city functioned as a system and systems interacted with each other, a process facilitated by the face-to-face exercises to develop the tool: "The systems dynamics exercises were a good way to get people to see outside of their own interests; to see beyond their rice bowl to other rice bowls". In a similar vein, Dubuque's Information Services Manager, Chris Kohlmann, noted that due to the rise of smart technology projects in the city, there were a lot more face-to-face interactions between departments that had never worked with each other before, as well as a forcing of greater collaboration across new and existing government channels:

> In many ways, the use of smart technologies has initiated conversations that help us cross boundaries and get people out of their silos to collaborate. For example, the Smarter Water Pilot brought many different departments to the table, several of which had never worked together before. Besides the

> obvious stakeholders related to the water distribution network, we brought together experts on buildings, water treatment, engineering, finance, mapping / GIS, public relations and IT, among others. (Kohlmann, 2014)

Though Kohlmann notes that there is still progress to be made before there is a fully integrated network across city systems, these smart projects did help to bridge silos and foster innovative collaboration. These observations underscore findings from Deakin and Al Waer, who posit that the learning, knowledge transfer and capacity building linked to smart initiatives fosters innovation and creative partnerships (2012, p. 8). Thus in both cities, smart technologies informed the governance arrangements around these projects, which prompted communication across groups that traditionally did not collaborate together, while helping to strengthen existing relationships.

Five project staff who I interviewed—including a member of IBM staff, three local government officials, and a local urban expert—also noted that local government officials gained insight on how city systems interact with each other and how Portland operates as a system of systems. While city leaders understand that cities operate as interconnected systems, the real challenge lies in knowing how to best manage across these systems. Zehnder summarized their experience with the project by noting involved local government staff gained "an increased awareness that, like all cities, [Portland] operated in silos", where government departments were not collaborating effectively. In this way, Zehnder noted that the simulation platform was "a useful tool to challenge your thinking and assumptions" (Zehnder in Zeitler, 2011).

Additionally, those who participated in these workshops said that they found them to be informative and productive, especially due to the "hexagon modeling method"[68] that was employed. This method, which enables collaborative thinking through visualization, was used to inform the simulation model by illustrating how the

[68] The hexagon modeling method can be used to help map out systems thinking. It is "an approach to bridging the gap between the generalist thinking of decision makers and the specialism of modellers by concentrating on the preliminary issue conceptualisation stage of modelling. A new type of visual facilitation is described using hexagons as a flexible mapping technique to bridge the gap between thoughts and models" (Hodgson, 1992, p. 1).

involved groups viewed city system interrelationships within Portland. Two local government interviewees noted that local government staff who had been involved in the exercise had begun using the hexagon modeling method in their own planning and citizen engagement workshops because of the insight it enabled for participants. This outcome—the acceptance and use of a typically business process to clarify thinking—directly supports the notion of a pro-business bias within smart projects, and that smart projects can be a means by which business frameworks, processes and approaches are spread (Wiig, 2015). This sheds light on yet another way IT providers can influence urban governance through smart projects, not only during implementation, but also potentially after.

9.2.3 Unexpected Perils

Whilst there were gains deemed beneficial by the local government, this project also highlighted the potential dangers that smart initiatives may present: (a) the gap between the smart project vision sold to the city and what the project implementation team can actually deliver; (b) the use of tools for urban planning activities created by IT providers with no or limited experience in urbanism; and (c) the lack of transparency resulting from complexity and mistaken assumptions.

Vision and Inexperience

The project outcomes of increased communication across city agencies and an enhanced understanding of city operations as a system of systems were deemed valuable by local government staff and involved local experts. Yet, according to one local urban expert who I interviewed, they stand out in stark contrast to the initial sales pitch that IBM staff gave to the then Mayor Adams on the model and what it could do for city planning. Based on the IBM sales presentation, Adams thought the tool, through its predictions, would tell him what to do in order to make the city more sustainable. In my interview with the IBM project lead however, he noted that the IBM implementation team better understood the limitations of the tool—including its static nature, its reliance upon the accuracy of the involved algorithms, and its ability to foreshadow potential, rather than actual, outcomes. This over-zealous presentation reflected the salesperson's lack of understanding of the systems model and highlighted the differentiation between the depth of technical knowledge required for sales team versus other IBM divisions affiliated with project implementation.

As the project moved forward, the IBM implementation team, together with local government experts, worked to realign the mayor's expectations and understanding of the model, attempting to temper promises from the sales pitch in terms of capabilities and outcomes—driving home the fact that the systems thinking tool was not a crystal ball. Instead, the IBM project lead tried to stress that the tool could be used as a way to educate city leaders about city systems interrelations so that they could ask better questions during the planning process. The divergence between smart city sales pitches and implementation raises another set of issues associated with smart projects—how marketing and sales staff are driving and creating smarter cities visions, rather than experts who may have a better understanding of what is possible and what is not.

Through my experience at IBM, I have learned that this discrepancy between the sales pitch and the viewpoints of the implementation team reflects departmental divisions within the company and varied areas of expertise. As summarized by one IBM Smarter Cities salesperson who I interviewed, "the struggle is how IBM can help once cities buy the IBM vision. The IT costs associated with smart solutions sometimes means that it is difficult to deliver on the vision originally sold to the city". Often sales persons, who are required to meet quarterly quotas to keep their jobs, are the first point of contact that a potential local government client would have with IBM. What they promise an offering can do sometimes does not align with what the implementation team can actually deliver—a discrepancy that can cause headaches for IBM (or any other technology provider) in the latter stages of the project cycle, and lead to potential ruin for a local government that is being held responsible by its city residents to deliver value for invested taxpayer dollars. If this practice is common amongst all technology giants in the smarter cities space, it could mean that the visions of smarter cities sold to local governments will almost always fall short of what is delivered. And herein lies the risk to local government—for if city leaders over promise to their constituents what smart projects can do, it will not only contribute to deteriorating public trust in and perceptions of the local government due to unmet expectations, but could also cost local politicians their jobs. And, in the longer term, there could also be risk for the IT providers who overpromise and under deliver, for cities officials do communicate with each other. While the effects of this practice may not be immediate, eventually the IT provider will suffer from diminished sales due to poor track performance in this regard.

The second peril raised by this project relates to who is shaping our cities as smart projects proliferate. In the case of the SDSC project, the idea did not emerge from IBM's Research Department; rather it was born in IBM Marketing. Soon after the Smarter Planet campaign launched, the company explored the concept of systems thinking and how it could be applied across industries, including the public sector. As the Smarter Cities campaign emerged, the head of IBM Marketing & Communications wanted to know how, through the work that IBM does, systems thinking could be applied to cities—hence, the SDSC project was born. What this illustrates within the overall smart cities trend is that people without experience in urbanism are creating visions, and consequently values, of what cities should be, and it is this emerging smart city imaginary that is (re)shaping urban governance in cities around the world where local governments are actively pursuing smart technologies.

The third peril raised from this project stems from a lack of transparency. For the complexity and mistaken assumptions that often accompany these efforts may enable various forms of obfuscation: a black boxing of city systems, a conflation of reality with what the systems model represents, attempts to 'optimize' public matters, and mistaken assumptions of model neutrality.

<u>Obfuscation</u>

Simulation models may contribute to making urban planning processes opaque. According to discourse around smart projects, especially that produced by tech providers, these endeavors purportedly make the invisible visible by providing data throughout a system and across systems, thereby raising local government and resident awareness of the city systems around them. This purported visibility is enabled by interfaces (e.g., websites, apps or audio-visual displays) that are designed to make complex data and information gathered from city systems easily consumable and understood (Buschner et. al., 2010; Kanter and Litow, 2009). In this way, smart technologies, as purported by IT providers, are a key to open the black boxes of infrastructure systems to those who have access to the data that they create (Cisco, 2010; General Electric, 2011; IBM, 2009a; MacManus, 2009; Siemens, 2010). This is put forward despite the fact that, in reality, smart projects add another layer of complexity through the addition of sophisticated technologies to the city systems that are already not well understood by local government actors and city residents. Even without malicious intent, incompetency could have widespread affects across an entire city system. The complexity associated with smart projects, layered upon already complex city systems, makes one wonder if the largest risk associated with smart projects is that they become black boxes even closed to those who have the skills to understand them (Siegele, 2010).

While IBM has not sold any of these simulation tools, as cities increasingly use and rely upon smart technologies and the data they create, these types of exercises to understand linkages between city systems will become more common. It is feasible to envision cases where city leaders make decisions from data, sets of data, or complex models integrating data without knowledge of how any of the information employed or created was gleaned. If city leaders rely upon this information for policy recommendations, while not understanding how it was derived or what might be the limitations of this information, it black boxes the resulting policy making and resource allocation decisions. Former Mayor Adams demonstrated this is quite possible with his quick willingness to accept any information from the simulation tool without really questioning how the information was acquired or what might be the parameters of the model's use. Former IBM Master Inventor and Distinguished Engineer Colin Harrison, who helped devise IBM's Smarter Cities strategy, noted early on during model development in Portland that Adams had:

> formed an idea in his mind of what this model was going to be able to do… the planners thought that he was viewing this model as a kind of oracle. He could ask any planning questions of the oracle, and it would tell him what

> the right thing to do was. The planners got very, very nervous about this, and we had to work through this to make sure that he understood that models aren't oracles. (Harrison in Townsend, 2013, pp. 88-89)

Contributing to this black box effect is the tendency that the representations these models create are conflated with reality—yet another risk imposed by these projects. Compelling visualizations of data analysis can make the results of analytics seem quite real. Yet, numbers do not reflect reality. Data will be flawed, incomplete and perhaps misunderstood without proper context, conditions will change, algorithms may be wrong, and that which is being measured will be affected by the mere process of its measurement (Kitchin, 2014b). Not understanding these limitations could pose a real threat for cities and their urban planning processes if these types of modeling tools are broadly adopted. For these reasons, access to and ownership of the model concerned some of Portland's city leaders involved in pilot development. Since former Mayor Adams did not recognize the model's limitations, involved local experts who I interviewed did not want access and ownership to reside with only one person. As one expert stated in my interview with him, "no one knows how to handle the gun".

This concern links to yet another risk presented by smart projects that emerged within this case study, the emphasis placed on optimization—an assumption common to smart projects (Hollands, 2008). The premise of the model was to enable cost reduction and efficiency—a supply versus demand-driven approach to urban planning. While a common and effective method in the private sector for supply chain management, Portland's urban experts felt that this method was not appropriate for cities. Instead, in my interviews with them, they stated that local government should employ approaches that stress value and are informed by demand. As one Portland urban expert noted in my interview with him, "cities are about people and that doesn't come out of a model". Along these lines, Zehnder reflected back on the project, noting:

> as we sat down with the modelers, we had to make the point to them that we will not be able to convince our constituents to trust anything coming out of a 'black box'… the whole act of choosing variables is a political one, a value-laden one. (Zehnder in Lindsay, 2011)

Yet, in the way that IT providers present the concept of data-driven decision making, the neutrality of data and technologies employed is often assumed; despite the fact that "technology of any kind is never neutral; it has the potential and capacity to be used socially and politically for quite different purposes" (R. Williams, 1983 in Hollands, 2008, p. 315). "The very act of choosing what to measure and what not to measure not only compromises the integrity of any model's ability to reflect reality, but also the prerogatives of the ones building the model" (Lindsay, 2011). The systems thinking model, by its very design, places an emphasis on measurement, which then translates into managing only that which can be measured (Bell, 2011; Mattern, 2013). If used to inform urban planning, data relevant to city functioning that is not entered or factored into the model will not be part of the resulting simulation upon which resource allocation and policy decisions are made; thereby skewing the model through data omission.

In many ways, the SDSC project represents the technocratization of local government, with the infusion of technology, IT experts and technology providers into urban governance processes (Söderström et al., 2014). In this case, data and algorithms were made central to the urban planning process with the aim of informing resource allocation and decision making. Yet, despite the willingness to apply a solutionist perspective in this endeavor, the local government decided against continuing to keep the model operational once the pilot ended; in effect, rejecting this type of approach to urban governance.

9.3 The Untold Story of Smart

In this next section, I explore IBM interactions with urban governance around representation through narrative and brand. To inform this investigation, I examined excerpts taken from: (a) the twenty-two materials I used to inform the Portland narrative review; and (b) the twenty-three interviews that I conducted with those studying or involved in smart projects in Portland.[69] Within these, I focused

[69] For details on these interviews and materials see Figures 8 and 10 in section 3.3, and Appendix 11.5.

primarily on the authors / interviewees who were primarily responsible for designing and implementing the smart projects that I examined, including the IBM project lead, the lead researcher from Portland State University, and key staff from the Bureau of Planning and Sustainability. I also reviewed media coverage to ascertain how the projects were being portrayed externally.

While the city narratives and brand promoted by local government in Dubuque were significantly informed by SSD and smart projects, these aspects of representation were not affected in Portland. I found no materials produced by the local government or IBM that promoted the crowdsourcing research project, and only a few instances where the local government mentioned the SDSC project. Instead, promotion of SDSC was done by IBM and the media. In part, this could potentially be due to the fact that the systems modeling project only lasted one year and that the other initiative that I examined was research. That said, the initial Smarter Water Pilot Study in Dubuque touched only 300 households and lasted just three months—yet it still led to a ground swell of attention that caused the local government to reimagine the city with smart. If narrative and brand were such strong elements of the smart projects in Dubuque, where the reimagining of smart started to inform the redesign of urban governance, why did the same not occur in Portland?

I posit that, in part, this lack of smart representation stems from the fact that Portland already has what is seen as a strong city brand—it is perceived as a leader in sustainability, urban planning and citizen engagement. Consequently, according to one of the city's public relations experts who I interviewed, the local government's narratives and brand support these perceptions, and have done so for decades. And, given the city's high rankings and reputation, the local government does not seem keen to alter what appears to be working. Additionally, I postulate that the other reason that smart was not a theme in project or city representation is due to the local government's skepticism of the value of smart projects. Despite this skepticism of IBM's vision of smart, there were attempts by IBM staff to try and contextualize Smarter Cities narratives in ways that fit with the local context to help 'sell' the concept of smart.

9.3.1 Smart Resistance

As noted above, neither the local government nor IBM created narratives around the crowdsourcing research project. There was however a push for media coverage around the SDSC, where the local government and IBM promoted the endeavor (IBM, 2011b; Lindsay, 2011; Mincer, 2011; Sanina, 2011; Yasin, 2011; Zeitler, 2011). Though the coverage was not as widespread as that experienced in Dubuque around its smart projects, the Portland story was picked up by Fast Company (Lindsay, 2011), PC World (Zeitler, 2011) and The Washington Post (McDuffee, 2011), and promoted by the local government on The City of Portland's website (Sanina, 2011) and by IBM on ibm.com and its YouTube channel (IBM, 2011b, 2011f). What's important to note is that within the narratives created by IBM around this project, IBM inserted itself into the urban planning process. With IBM narratives associated with systems modeling and this project, IBM's marketing department attempted to weave IBM into Portland's future by creating narratives that emphasized IBM's viewpoints on urban planning complexity, uncertainty and deficiencies with the city's existing planning practices—problems that could be solved, according to these narratives, with IBM's involvement.

For example, former IBMer Naveen Lamba noted that, in his opinion, cities are not managed in the best possible way—local governments typically do not recognize that cities are a collection of interconnected systems, "each domain is a complex system by themselves, but the way things actually happen, all these systems interact with each other and the system is really a system of systems" (Mincer, 2011). While in reality, city leaders already know this—the real challenge lies in knowing how to best manage across these systems, something for which no actor has all the answers. In order to help sell IBM's solution and approach, IBM narratives also emphasized the complexity of city systems and their interrelations, and the need for advanced computing to help illuminate these systems and interrelations. Michael Littlejohn, former IBM Vice President of Strategy for Smarter Cities, outlined how the unintended consequences of policy can be avoided with these types of models:

> while other analytical approaches rely on breaking a problem down into smaller and smaller pieces, the model we've created recognizes that the

> behavior of a system as a whole can be different from what might be anticipated by looking at its parts… Using this model, the City of Portland can experiment with different scenarios to see how their decisions might affect various parts of the city over the next 25 years. (IBM, 2011b)

Thus according to Littlejohn, this IBM solution helps unlock the complexity and uncertainty of city systems and gives insight into the effects that might occur from policy and resource allocation decisions made today—something he feels is not possible without the data and analytics provided by IBM. This type of crystal ball promise is enticing, especially to lesser experienced, technophile government officials like former Mayor Adams. In another attempt to promote IBM's Smarter Cities vision, IBM officials noted that the tool is key for city leaders to better manage their cities because of, what they call, existing shortcomings in planning processes:

> Municipal government is still very much a world of silos… the various departments—transportation, education, public works, and so forth—often have very little interaction with each other, dramatically increasing the possibility that an action in one area of government will have an unexpected effect on another area. (Littlejohn in Mincer, 2011)

In other words, in these IBM narratives, city systems are complex, how they interact is uncertain, and the fact that cities operate in silos means that city officials are at a disadvantage when it comes to urban planning—all shortcomings that IBM can purportedly help overcome. In press releases about the systems modeling project, IBM noted that "new policies implemented in one part of the city can affect other city efforts, citizens, businesses and the environment in unexpected and sometimes counter-intuitive ways. IBM's System Dynamics for Smarter Cities model is designed to help mayors and other municipal officials reduce the unintended negative consequences of municipal actions on citizens, as well as uncover hidden beneficial relationships among municipal policies" (IBM, 2011b). According to the narrative, these unintended consequences and hidden benefits would seemingly go unnoticed or unanticipated without IBM's solutions.

IBM narratives directed at Portland also emphasized the IT provider perspective that urban planning to date has been haphazard and done by happenstance—therefore stressing the need for a tool to make order of this purported disorder. At the Urban

Systems Symposium in 2011 that I attended, a leading IBM Smarter Cities strategist noted while facilitating the event how city leaders can "finally" be more "scientific" about the way they went about urban planning—implying that to date, there has not been a rigorous approach to this process (Urban Systems Symposium, 2011). Unsurprisingly, this caused quite a stir amongst the audience, which was mainly comprised of urban professionals and academics. Reinforcing this IT provider notion, one article on the Portland project noted that "smart cities don't happen by accident", implying that without these types of modeling solutions, city officials have been guessing or using their gut instincts to inform urban planning (Haller, 2011). Yet, despite strong positioning within IBM and media narratives around the need for a systems thinking tool to better plan and manage urban affairs, neither the solution nor the associated narratives around smart took hold in Portland.

Portland's local government's uncertainty about the value of smart endeavors made it less likely that IBM, through its projects, would interact with local government around city strategy or representation. In the end, the local government decided not to test crowdsourcing via the Opt In Panel and shut down the SDSC model shortly after its completion. According to two local urban experts and four local government staff who I interviewed, there was a rejection of IBM's vision of and approach to being a smart city. Hence, it makes sense that rhetorical and symbolic associations associated with smart projects and its assumptions were not woven into the local government's strategies for creating city narratives and brand. So, while smart projects continue to proliferate in Dubuque as a central focus of local government strategy and city representation, in Portland the local government remains skeptical and is not making the application of smart technologies a central focus of the city's strategy, or supporting it via the ways that local government represents the city.

Conclusions

This chapter explored IBM's interactions with the local policy and planning processes around strategy, engagement and representation associated with the Systems Dynamics for Smarter Cities project. In this endeavor, the city was perceived as "visualized facts" (Kitchin, 2015, p. 6), where data and analytics were central to informing decision making about resources and policy. With this approach, it was assumed that the 'right' data and algorithms could optimize city operations to improve sustainability outcomes (Mattern, 2013). Thus, this effort reinforced two assumptions commonly associated with smart projects: that these endeavors help improve efficiency and resource management (Hollands, 2008; Miller, 2013; Townsend, 2013, pp. 58, 83) and that they require the use of business models and approaches (Hollands, 2008; Townsend, 2013, pp. 5, 31). This prioritization of "market-led and technological solutions" to managing city operations and of data capture and analysis to inform decision making, reflects the neoliberal undercurrents of this effort (Kitchin, 2014b, p. 2).

According to those who I interviewed with local government and project staff, the project delivered beneficial outcomes including increased communication across government agencies and an enhanced understanding of interrelations across city systems (see also Yasin, 2011; Zeitler, 2011). Surprisingly, the primary gains from this effort were not the technological advancements or their outcomes; rather, they were the resulting governance arrangements and processes required to implement this work. Through my examination, I found several risks that may be associated with these types of initiatives—problematic concerns that can be extrapolated to other similar types of modeling projects. These included challenges such as the fact that these projects can be misunderstood in terms of their capabilities and limitations, and that due to their complexity, rather than illuminate, they can make the systems seem opaque, blackboxing the city system being examined (Hinchcliffe, 1996). In addition, they are frequently designed and implemented by tech giants with limited urban experience (McNeill, 2014), further potentially hindering the transparency that these models purportedly deliver.

As discussed in Chapter 4, such models are problematic due to the centrality that they place on measurement, for they can lead to managing only what can be measured (Bell, 2011). And, by reducing the city and urban challenges (McNeill, 2014), this systems modeling approach recasts complex issues and events as "neatly defined problems with definite, computable solutions" (Morozov, 2013, p. 9 in Mattern, 2013). Despite the repeated past failures tied to urban modeling efforts (Flood, 2010), IBM still invested time and effort to develop and test this simulation tool. In the end, after the model was completed, the local government decided not to pay for continued operations, thereby rejecting this approach to managing city systems and operations. Further, IBM was unable to commoditize and sell this approach to other cities.

The hesitancy by the Portland local government to fully implement this project was linked to IBM's inability to get the local government to 'buy' into IBM's Smarter Cities vision and incorporate its narrative themes around smart into project and / or city representation. Part of this IBM 'failure' (assuming their end goal is to create and sell smart city solutions) can be linked to pre-existing local government skepticism to systems modeling and its use for managing city operations. While the local government was interested in testing smart technologies and understanding how they may better enable planning, sustainability efforts and citizen engagement, they also remained skeptical of the purported benefits claimed by IBM. One-third of the local government officials who I interviewed in Portland expressed concern over this type of approach. The local government did not view smart technologies as a panacea to various city woes—sustainability challenges, economic decline, etc. (White, 2015)—rather they were seen as one of numerous potential tools in their urban toolkit to address city challenges. Additionally, the city already has a strong city brand (Grist, 2007; Maerz, 2011; Mayer and Provo, 2004), and therefore the local government was less inclined to change it to an image linked to smart.

In this manner, this example provided a useful contrast to the City of Dubuque, where the local government embraced the concept of smart wholeheartedly. Despite this variation in perspective, SDSC strategy objectives and approach, similar to all other smart projects that I examined, reinforced the notion that smart projects can be viewed as neoliberal policy experiments (Brenner and Theodore, 2002) that further entrepreneurial management styles (Hollands, 2008). In my last chapter below, I examine these two different city experiences, and extrapolating from observations within these case studies, I share my concluding remarks on IT provider interactions with urban governance via smart project strategy, engagement and representation.

10 Conclusions

Information and communication technologies are increasingly being infused into city systems and services as part of a growing trend to make cities smart (Kitchin, 2014b; Townsend, 2013). To better understand potential implications of this trend, my investigation explored how IT providers, through smart projects, are interacting with urban governance via corporate and policy strategies, modes of engagement with public and civic actors, and forms of representation concerning both smart technologies and the cities where they are being implemented. My research pursued several queries: How are smart projects, steered by IT providers, interacting with local government city objectives, priorities and approaches, and what might be the implications of this interaction? How are smart projects changing the roles of and expectations between and among the local government and city residents, and what is the role of the IT provider within this transformation? And, how might the smart city imaginary, captured in project narrative and brand birthed by IT providers, be informing the redesign of urban governance mechanisms? To shed light on these questions, using key informant interviews and case study analysis, I looked at how the IT provider IBM interacted with urban governance in the U.S. cities of Dubuque, Iowa and Portland, Oregon.

Throughout this research, I was employed by IBM, which placed me as an inside observer to this analysis, and shaped and informed all aspects of my investigation, presenting distinct opportunity and limitations. While this positioning enabled me unique access for my research, it also meant that my objectiveness, interactions and interviewee responses in both my case study and key informant interviews were colored to an extent by this bias, despite measures undertaken to mitigate it. Case study selection was also limited, for smart city competitors were unlikely to share their data with an IBM employee. IBM's relationship with the local government in each city also influenced the ways that those interviewed responded to me. Given the presence and role of IBM in Dubuque, smart project actors were less likely to share negative feedback than those in Portland, where IBM is just one of many IT provider partners. Findings from this investigation are narrowed by the size and scale of the cities examined, and by the fact that both case studies are located within the United

States, thus confining my analysis to urban trends and patterns typical to similar types of advanced capitalist environments. Thus, this work must be considered in this context.

The resulting analysis provides snapshots of two very different paths to smart. On one path, the local government charged forward without hesitation, seeking the promised smart city imaginary just beyond the horizon. The other local government however treaded slowly, considering the value of the journey and the desirability of the destination. By looking at these contrasting examples, my work contributes to the mounting cannon of smart city literature by adding empirical and analytical details that compliment previous academic study of discourse around the concept (Greenfield, 2013; Hollands, 2008; Shelton et al., 2014) and technical aspects of smart technologies and policies (Batty, 2013; Harrison et al., 2009; West, 2011). Through my investigation, I provide an in-depth view of the IT provider IBM alongside the rise of the corporate entrepreneurial smart city, and from these findings, suppositions on what these initiatives might mean for municipal administrations and city residents in comparable urban environments.

10.1 Observations and Findings

Despite the remarkable claims in compelling smart city narratives and packaging, the idea of using data and analytics to improve decision making and resource allocation within cities is not new (Shelton et al., 2014). Further, just as the premise behind the smart city is not a novel concept, it is also not a clear one—there are a myriad of understandings, definitions and conceptualizations of smart (Caragliu et al., 2009; Deakin and Al Waer, 2011; Duany et al., 2010; Florida, 2005; Hollands, 2008; Kitchin et al., 2015). This label is liberally applied to almost any application of ICT to city systems and services (Albino et al., 2015; Kitchin, 2014b). Regardless of variation, with each smart project there are common assumptions (Hollands, 2008) that reinforce entrepreneurial management styles, including: integrating smart technologies into city strategy (Eger, 1997; Hollands, 2008); emphasizing city competitiveness to entice resources (Coe et al., 2000; Hollands, 2008); promoting economic development; embracing a pro-business bias (Graham and Marvin, 2001;

Hollands, 2008); encouraging community participation (Coe et al., 2000; Komninos, 2002, p.188); and optimizing to enhance political and economic efficiency (Eger, 1997; Hollands, 2008) and sustainability efforts (Hollands, 2008; Miller, 2013). These assumptions buttress strategies and doctrines that continue and advance the privatization, commodification and marketization of public provision. In this manner, smart projects underscore the critical role that cities are playing in the reproduction and mutation of neoliberal trends within urban environments (Brenner and Theodore, 2002)—a process that I found taking place through tech provider interactions around the strategy, engagement and representation of smart projects.

Based on my research and observations, I believe that as smart projects proliferate, this expansion will pave the way for IT providers—often more well-versed at working with business enterprises and national governments than municipal leaders—to more broadly inform urban governance processes. In my case study analysis, I found that as IBM interacted with local policy and planning processes around smart project strategy, engagement and representation, the firm was able to promote its perspectives on the role, structure, function and relationships of local government. For, IBM is not just selling smart city technologies; rather, it is propagating assertions about data centric and solutionist approaches, the transformation of roles and interactions between and among local government and city residents, and the promotion of cities becoming smart. These proposed shifts conveniently insert data and analytics, and hence IBM and other tech providers pursuing similar opportunities, into a wide range of urban governance activities and processes—thereby helping to develop and expand the smart city market (Buschner et al., 2010; Cisco, 2010; General Electric, 2011; Kanter and Litow, 2009; MacManus, 2009; Microsoft, 2012; Siemens, 2010).

10.1.1 Dubuque

The small Midwestern town of Dubuque has been, for IBM, an ideal living lab in which it can test its smart city solutions due to the city's receptiveness and size, both of which facilitated project design and implementation. Smart projects in Dubuque began with a partnership between the local government and IBM to create Smarter Sustainable Dubuque (SSD). This initiative aims to improve city sustainability by applying technologies to city systems and services, and has included pilots focusing on utilities, transportation, health and wellness and trash / recycling. In addition to sustainability outcomes, the local government hopes that SSD will help improve city brand, and consequently the city's competitive edge and its ability to entice the talent and resources that will fuel economic growth (The City of Dubuque 2009e, 2010b, 2010e). While individual project goals have varied, each pilot has emphasized citizen engagement, primarily in the form of behavior change. Of the numerous SSD projects, I focused on the Smarter Water and Smarter Electricity Pilot Studies, which leveraged AMI to create a web-based portal system that enabled households to view details on daily utility consumption to aid in decision making about resources. Both projects demonstrated how through interactions around project strategy, engagement and representation, IBM was able to promote its vision for local government.

Strategy objectives and priorities for these pilot studies, as well as others within the SSD program, reinforced entrepreneurial management styles and smart concept assumptions, including: emphasizing efficiency, optimization and the use of technologies to achieve city aims (Eger, 1997; Hollands, 2008; Miller, 2013); citizen participation to help achieve these endeavors (Coe et al., 2000; Komninos, 2002); and a pro-business bias (Hollands, 2008). During implementation, I observed several private sector / IT provider practices being employed, such as utilizing a living lab approach to mitigate risk (Schaffers et al., 2011), the agile method for rapid iteration (IBM, 2015b) and behavioral economics to steer city resident behavior (Ariely, 2008; Cialdini, 2008). As smart assumptions, entrepreneurial management styles and IT provider business practices were adopted, a data-centric and solutionist approach (Mattern, 2013) was increasingly apparent within local government operations. For example during my fieldwork, the city's Information Services Manager stated that she had noticed changing perceptions of her role and the role of the IT department—where they were increasingly being expected to take a more predominant leadership role in SSD and non-SSD projects. More and more local government officials and offices consulted her and her office to better understand how they could use sensors, real-time and / or big data, and advanced analytics to increase their projects' impact and better track project progress. She attributed this change to an increased emphasis that local government actors were, in her words, placing on the role that data and analytics play within the city's strategy and the centrality these play in achieving strategy ends (Kohlmann, 2014).

In this case study, I also noted that IBM was able to promote its assertions around the changing roles of city residents and local governments through interactions around project engagement. For instance, by design, the web-based portals employed within the pilot studies facilitated the responsibilization of city residents and reinforced the notion of city residents being citizen consumers (Beck, 2005; Needham, 2003). Both the Smarter Water and Smarter Electricity Pilot Studies were created with the premise that if city residents have the right information they will make more 'informed' choices about the way that they consume resources (The City of Dubuque, 2009e, 2010b, 2010c). As described by City Manager Mike Van Milligen (2013), the local government is "changing the way the city of Dubuque is servicing its residents… what we are doing is making our citizens the solution to our local challenges".

In this context, rather than city residents being passive recipients of government services, they are becoming involved in the way that these services are shaped, delivered and consumed. And, they are increasingly seen as active agents in solving the challenges Dubuque faces (Dillow, 2011). The design of SSD projects has facilitated both of these changes, where through the sharing of data / information, the local government has been able to reinforce and inform a shift in the role of city residents by also transferring expected financial and behavioral responsibilities (Rose, 1999). Hence, through interactions around partnerships and governance arrangements in these endeavors, IBM assertions about the role of local government and city residents were shared, and while most likely these assertions were not the sole impetus for these changes, IBM's vision did add to the momentum of this transformation.

Finally, interactions around project strategy supported IBM's assertion that the local government should promote Dubuque as being smart, thereby endorsing the notion of the smart city, and in some cases, also explicitly recommending IBM. During my investigation, I found the Dubuque local government to be a strong supporter of smart projects—as evidenced by the formation of SSD and its partnership with IBM (The City of Dubuque, 2009e). Consequently, messaging from IBM's Smarter Cities campaign has been adapted and made relevant to the local context and audience, enabling the shifting of smart discourse away from complex sustainability issues to a more simple representation that aligns with local self-understandings and city context (Burbach, 2010b; Hawks-Goodmann, 2010; Steinhauser, 2010b). These efforts of promotion in Dubuque seemed to be so effective[70] that it could be argued that the most significant impact of smart projects to date has been the boost to city brand (rather than, for example, operational efficiencies). This is evidenced by the significant returns that the local government attributes to its smart narrative and branding strategies, including the additional multi-million dollar grant funding that the city received to continue smart and sustainability projects (The City of Dubuque, 2011b).

In addition to IBM messaging being integrated into city narratives around smart, there have been efforts by the local government to co-brand with IBM due to the organization's perceived brand strength (Greenblatt, 2014; Wiig, 2015). Several city leaders who I interviewed felt that with the SSD partnership and the opening of IBM's Global Delivery Facility in Dubuque, the city gained a significant boost to its brand, both internally amongst Dubuquers and externally to those outside of the city. They also felt that IBM's presence has helped change perceptions of Dubuque from a blue-collar to white-collar urban environment. Thus, within local government narratives and branding around smart, IBM has been a focus, and therefore endorsed alongside efforts to promote the city (Burbach, 2010b; M. Van Milligen, 2013).

In sum, within Dubuque, interactions with local government policy and planning processes around smart project strategy, engagement and representation, created opportunities for IBM to promote its assertions about the redesign of urban

[70] As a result of efforts to 'sell' Dubuque as a smart city, it has received a wide range of local, national and international recognition (Acohido, 2009; BBC News, 2011; Dillow, 2011; Forbes, 2007; Hamm, 2009a; Hoffman, 2009; Lindsay, 2010; Lohr, 2009a), including being ranked as one of the 'smartest' cities in the world (Fast Company, 2011).

governance mechanisms. These assertions took hold, at least during my period of study, as evidenced by the addition of smart concept assumptions to the city's sustainability strategy, the adoption of tech provider business practices, the transformation of the CIO role and office, changes in the local government's perceived expectations and role for city residents, and the co-promotion of the city with IBM.

10.1.2 Portland

Unlike in Dubuque, the city of Portland, from IBM's perspective, proved to be a more challenging environment for its smart city vision and projects. The local government, while curious about the application of smart technologies, was skeptical about the smart city imaginary and the promised outcomes that come along with it. Though city leaders have been interested in seeing how technology and smart projects could potentially inform urban planning processes and contribute to sustainability efforts, they have questioned the value of these initiatives, wondering if they would offer cure or palliation for the challenges that the city is facing. Instead of viewing smart projects as a panacea, the local government is more avidly pursuing another form of urban entrepreneurship, the Eco-City (Register, 2006).

For my case study analysis in Portland, I looked at two projects: a) a crowdsourcing research project overseen by Portland State University, which was conducted to help IBM better understand how citizens can be engaged to inform urban planning; and (b) a systems modeling project, Systems Dynamics for Smarter Cities (SDSC), that was undertaken to help improve city planning and strategy development, while potentially boosting sustainability outcomes by enabling increased efficiency of city operations. In my investigation of these efforts, cracks within the smart city veneer emerged—for the potential adverse consequences of these types of initiatives became more apparent than in the Dubuque case study. In addition, two of the smart city projects that I tried to examine failed before the projects could launch, further demonstrating frailties. In the end, neither project examined yielded a durable solution or initiative; in part demonstrating the local government's resistance to IBM's smart city strategy and approach. That said, through interactions around smart projects, IBM was still able to reinforce its vision for how local governments should function and operate, as well as how, why and with whom it should engage.

While the use of technologies was not a focus in the city's strategy the Portland Plan (Portland Online, 2013a), various assumptions of smart were apparent within it; namely, an emphasis on citizen engagement (Coe et al., 2000; Komninos, 2002), efficiency and optimization (linked to sustainability) (Hollands, 2008; Miller, 2013), and a pro-business bias (Hollands, 2008). This created an opening for IBM to share its related assertions about strategy and engagement—that local governments should become data-centric and solutionist, adopt tech provider business practices, and transform the roles of and interactions between and among local government and city residents, while involving IBM in this process.

While examining the SDSC project, I found that the local government demonstrated an openness to this data-centric and solutionist approach, as well as a willingness to test IT provider frameworks like systems thinking when they agreed to partner with IBM to pursue this initiative. In this project, IBM and the local government created a simulation model that epitomized a data-centric and solutionist approach (IBM, 2011b, 2011f), for the premise of this model was built upon the notion that with the 'right' data and algorithms, city leaders would be able to make better decisions about resource allocation, policy and future planning (Bell, 2011; Mattern, 2013; Shelton et al., 2014). Yet, as this initiative developed, it revealed a central weakness of smart projects—that they are conceived and led by IT providers, organizations that typically do not understand the complexities associated with cities and city operations, and the experiences of urban planning (McNeill, 2014). This reality contributed to the local government deciding not to keep the tool operational, for several local government actors did not trust the model or the simulations it produced (Zehnder in Townsend, 2013, p. 84). Despite this rejection of the IBM project by not continuing funding, I found that several government experts who had worked on SDSC had adopted business practices from this effort. In my interviews with these government actors, they discussed their adoption of a method that IBM used to help derive the model (i.e., the hexagon method) and noted how they were applying it in their own work with other government offices. This demonstrated the ease and speed with which IT provider practices could be transmitted to local government actors—even if the projects associated with these practices did not persist.

In addition, my examination of SDSC revealed how smart projects can influence the ways in which city actors engage with each other. To an extent, this project served as a forcing function to bring city officials from various government departments together face-to-face, enabling agencies that do not traditionally interact to communicate with each other (Yasin, 2001; Zeitler, 2011). In this case, instead of technology eliminating or mediating social interactions, it increased them. Several interviewees from the local government and experts who helped develop this project noted that because model development required bringing together such a wide range of government actors and experts at the same time to discuss the same issues, they felt that the biggest gains from this project were not from the model itself, but rather the governance arrangements and networks created to implement this work. In this manner, this project reinforced the notion that smart projects by design encourage partnerships across a range of urban actors, frequently leading to learning, knowledge transfer and capacity building that may not have taken place otherwise (Deakin and Al Waer, 2011, 2012).

Interestingly, while the SDSC project brought involved individuals together, initial findings from the crowdsourcing research project demonstrated that the use of these techniques in urban planning may have the opposite effect. While proponents for crowdsourcing argue that this method enables the gathering of more feedback from a larger number of residents in a 'neutral' environment, research indicates that this approach can lend itself to participants making decisions based on their own needs and their needs alone (Mahmoudi and Seltzer, 2012; Seltzer and Mahmoudi, 2012). Over time, this could lead to intensified segregation within civic affairs, thereby affecting future engagement, while also augmenting resident expectations that cities should be 'customized' to each individual's needs (Ford Foundation et al., 2014).

In terms of getting the local government to promote Portland as a smart city, IBM was completely unsuccessful in both projects. As noted above, the local government has approached smart initiatives with reservation; and in the context of the projects that I examined, this has translated into a rejection of IBM's Smarter Cities vision, with the concept of smart having no subsequent impact on city objectives, priorities or representation, and with nominal effect on approach to city strategy and engagement around these projects. Yet, that is not to say that some of the assumptions of smart and urban entrepreneurial characteristics were not already present within local government strategy or practices. For those that already did exist, interactions with IBM around smart project strategy and engagement served to reinforce these notions.

Juxtaposed against each other, these two case studies show areas of overlap and difference. In both case studies, entrepreneurial management styles and the assumptions of smart were prevalent in each of the smart projects examined. As such, these projects demonstrated how smart initiatives can serve as neoliberal policy experiments in urban environments (Brenner and Theodore, 2002). In this manner, through tech provider interactions with urban governance around these endeavors, perspectives, approaches and practices can be transferred that continue and advance the privatization, commodification and marketization of public provision. Further, these case studies also highlight difference. One local government embraced smart and, through interactions with IBM around smart projects, integrated this concept into strategy, affecting engagement and representation. The other local government however, explored smart technologies yet remained unconvinced of the promised outcomes of smart, and therefore IBM's interactions had negligible effects on strategy, engagement and representation.

10.2 Implications

> Data promises to be for the twenty-first century what steam power was for the eighteenth, electricity for the nineteenth and fossil fuels for twentieth—that is, the creator of enormous wealth and progress. (Rometty in Dencik, 2013, p. 4)

As evidenced in the quote above by IBM Chairman and CEO Ginny Rometty, from the IBM perspective, data are a new commodity within which lies great opportunity—opportunity that can only be captured with the aid of an IT provider (Dencik, 2013). In the urban context, IBM has compellingly packaged this idea of unharnessed opportunity and presented it to city governments around the world to create, expand and dominate the smart city market. As IBM and other similar smart city IT providers interact with urban governance via smart project strategy, engagement and representation in cities around the world, there are various implications on how this may affect local government policy and planning processes. These implications are tied to the assertions that IBM, and similar IT providers, promote alongside their wares—that local governments should:

- Adopt a data-centric and solutionist approach and employ IT provider business models and practices;
- Transform the roles of and interactions between and among local government and city residents, with the IT provider and / or their technologies acting as an intermediary within this transformation; and
- Promote their city as being smart.

10.2.1 Data-centricity and IT Provider Approaches

My first research question examined how smart projects, steered by IT providers, are interacting with local government city objectives, priorities and approaches, and what the implications of this interaction might be. By design, smart city projects emphasize the measurement and optimization of government resources and processes, leading to a heavy focus on data and the assumption that with the 'right' data sets and algorithms, city problems can be resolved. This approach establishes the IT provider as an intermediary to resolving any and all city challenges, for within this thinking 'problems' cannot be identified nor 'solutions' found without the insight enabled by data and analytics (Bell, 2011; Mattern, 2013). The extension of this thinking, as envisioned by IBM and similar IT providers, portrays governments of the future as almost entirely data, and hence IT provider, reliant (Buschner et al., 2010; Eggers, 2007; IBM, 2014b; Kanter and Litow, 2009; O'Reilly, 2010). Often alongside this advocated reliance, there is a transference of private sector / tech provider practices (Wiig, 2015)—a mobility of policies that are steeped in entrepreneurial strategies and a neoliberal ethos. Through my case study analysis, I found that through interaction around smart projects, IBM promoted data centricity and solutionism in an attempt to shape project objectives, priorities and approaches.

Smart city solutions, as described by IT providers, can purportedly enhance the transparency of city systems through the improved ability to collect, aggregate and analyze data. Yet, systems within cities are complex. Layering complex technologies within and across these systems, while providing the potential to glean insight on operations, also accentuates complexity and creates the potential to lessen versus ameliorate comprehension of system functioning. If systems become too complex, they will be black boxed to the point that no one expert can understand them (Townsend, 2013, p. 14). Further, decisions about data and algorithms in smart projects are political, not solely technical—including decisions about what data is to be collected, how and how often it is to be collected, as well as what data should be overlooked, and why. Choices about the algorithms to use for analysis and how and in what format findings are relayed, are also value-laden. Assumed data neutrality creates the potential for misunderstanding the information generated by smart projects, thereby obfuscating how city systems and services are truly functioning and what might be their actual outcomes (Townsend, 2013, pp. 88-89).

Further, as emphasis is increasingly placed on measurement (Bell, 2011) and data, more and more local government decisions become ‘evidenced-based’ (Shelton et al., 2014). Within this, data optimization is seen as a key end goal (Greenfield, 2013, Chapter 13, kl. 436-448, 1280; White, 2015). Yet, it is unclear what it means for a city to be ‘optimized’, and what optimization may mean for city residents. Early indications point to social and economic fragmentation within cities as a result of ‘optimized’ networked infrastructures, as these systems tend to leave behind those most vulnerable or unable to afford access (Graham and Marvin, 2001). Over time, one may find that an ‘efficient’ and ‘optimized’ city may not be an attractive one.

Additionally, smart projects tend to be more speculative than typical public sector initiatives, exposing local governments to increased risks as their cities become test beds for new types of approaches, frameworks and models that are borrowed from the private sector (Hollands, 2008). While some private sector practices work well for business, it is unclear if they are appropriate for public provision. For example, while agile is highly conducive for managing software development, this method of rapid iteration—based on planning, learning and failing quickly—could prove risky in terms of stability of government services and provision, and potentially endanger citizen trust in government. There is also risk around the way that smart initiatives are frequently managed and implemented through PPPs, thereby leading to questions around accountability if problems emerge, possibly threatening maintenance and continuity of operations if clear and detailed lines of responsibility and contingencies are not outlined at project inception (Graham and Marvin, 2001, p. 14). This is particularly a concern with the rising trend of moving city services to the cloud—a change depicted by tech providers as the solution to offload 'pesky' backend IT management functions.

Hence, the assertion that local governments should adopt data-centric and solutionist approaches and IT provider practices raises questions around how, if adopted, these approaches and practices will potentially: (a) skew understanding of city systems and services, and reshape associated values of provision; (b) contribute to exclusion and vulnerability; and (c) expose local governments to higher levels of risk associated with the stability and continuity of city systems and services.

10.2.2 Urban Governance Transformation

My second research question looked at how smart projects are changing the roles of and expectations between and among the local government and city residents, and the role that the IT provider is taking in this transformation. From the view of IT providers, smart projects are ushering in new forms of governance and new ways for connecting stakeholders within cities (Buschner et al., 2010; Kanter and Litow, 2009; O'Reilly, 2010). This includes the desire tech providers have to "rewire governments, transforming the way they work internally and together with outside partners and citizens (Buschner et al., 2010, p. 9). This IT provider vision of transformation, also shared by IBM, involves, among others, changes in government function (what government is tasked to do) and governance (how government goes about doing these tasks). In my case studies, I found that, like other IT providers in the smart city market, IBM has a clear vision for the role, structure, function and relationships of local government, which the organization shared through interactions around smart projects.

In the interests of business expansion, tech giants are promoting a vision of government that is entirely IT provider and data reliant by encouraging local governments to increasingly become consumer-centric, flexible, responsive and adaptable in real time. In the IT provider ideal, the local government becomes a facilitator for other private sector or nongovernment organizations to manage and deliver government services (Buschner et al., 2010; IBM, 2014b). This outsourcing of 'traditional' local government function would make government services market-driven, further driving neoliberal principles of privatization into urban governance practices (Kettl, 2009; O'Reilly, 2010). Also included in this tech provider-desired transformation is a change in the associated roles of and expectations between and among city residents and local governments. The responsibilization of citizens is one such example (Rose, 1999, p. 174), for smart projects may be used to facilitate the transfer of responsibility from the local government to city residents; and in some cases, even be designed to encourage specific behavior or responses (Ariely, 2008; Cialdini, 2007). Another example of these desired role changes includes inserting tech providers into the relationship between local government and city residents, where these firms or their technologies serve as an intermediary between the two—such as in the case of crowdsourcing efforts and smart meter portals.

This government function and governance transformation, as envisioned by IT providers, has potential implications for cities, including, among others, changes in the nature of civic life. By design many smart projects require delegating more and more responsibility to city residents in terms of their behavior and financial obligations (usually those that are initiated top-down) (Needham, 2003; Livingstone et al., 2007) and are designed in ways to nudge citizen consumers to make certain decisions about the smart system and how they interact with it (Thaler and Sunstein, 2008). As such, smart projects reinforce the notion of citizenship being redefined as a right to participate in the marketplace, where through choices around consumption, citizens can affect positive social change (Beck, 2005, p. 170; Glickman, 1999, pp.

1-16; McGovern, 1998). Instead of ‘good’ citizens being those who actively participate in civic affairs, citizens can contribute through their purchasing power as consumers, thus transforming the meaning of civic life (Needham, 2003; Livingstone et al., 2007).

This proposed transformation also has implications in terms of the support it provides to the notion of city customization. Crowdsourcing and other similar online techniques, for example, could potentially lead to an over decentralization of decision making (Ford Foundation et al., 2014). With these open innovation or feedback techniques, participants provide feedback without hearing other viewpoints or perspectives, for these do not have to be read if viewed online (Seltzer and Mahmoudi, 2012). This contributes to participants increasingly customizing feedback to their own needs and concerns, and expecting these to be met. In time, an over reliance on technologies for public engagement could contribute to civic segregation if not balanced with more traditional consultation processes (Ford Foundation et al., 2014).

Hence, the assertion that local governments should transform their roles and interactions between and among local government and city residents and insert the IT provider into this process of transformation, raises various questions and concerns about how this may affect government function, governance, expectations between and among local government and city residents, the nature of civic life and citizen engagement, and where and how IT providers are situated within these processes.

10.2.3 Smart City Promotion

My last research question examined how the smart city imaginary, as portrayed in narrative and brand birthed by IT providers, may be informing the redesign of urban governance mechanisms. The “smart city imaginary” is a placeless utopian vision that “draws on general trends and addresses a broad audience” to promote the idea of a smart city by presenting a future where city officials are able to manage or avert systemic crises through the use of smart city technologies. In this imaginary, “urban strife is simultaneously posed and resolved” (White, 2015, p. 3). The way that this imaginary is expressed in narratives is important to note—for how urban challenges are described affects the types of solutions chosen to address them, as well as how they are addressed (Jessop, 1997). Through interaction around the representation of smart projects, I found that in smart city narratives IBM staff simplified and standardized cities and the challenges they face to help ensure the global applicability of their Smarter Cities campaign. These narratives were promoted extensively across various media and combined with the IBM brand alongside an emphasis on city brand and its link to competitiveness and economic development. I observed in my case studies that through smart project implementation, IBM also promoted the idea that local governments should sell their city as smart to help increase their perceived competitiveness. While not stated outright, the goal was to also get the local government to, through this promotion, implicitly endorse the smart city, use of smart technologies and, in some cases, IBM.

To make the smart city imaginary globally applicable, IT providers have reduced the complexity of cities in their associated narratives designed to engage city leader 'buyers'. In addition to cities and city challenges being over simplified, so are the solutions to address them so that they can be standardized and easily replicated and scaled (McNeill, 2014). As cities gravitate to viewing standardized versions of urban challenges that are promoted through smart discourse (Greenfield, 2013, Chapter 14, kl. 1377), various concerns emerge stemming from this reductionism, for one size does not fit all in the city context. A congestion charging solution effective in Barcelona may not work in Shanghai or Delhi—and in the worst case scenario, may actually worsen mobility issues. Mistakes as such could be quite costly in terms of money, time and citizen trust, among others. Yet, buy-in to this reductionist messaging is not a given, as evidenced in the Portland case study—for, acceptance of and receptivity to the smart city imaginary varies by local government. While it is unclear how this reductionism has affected local governments and their approaches to urban affairs during my study, it is clear that it has shaped and informed IBM's approaches and solutions (McNeill, 2014).

Concurrent to reductionist messaging, within these initiatives there is also an emphasis placed on the need to promote smart projects and the cities pursuing them

(Wiig, 2015). This focus, to an extent, is a reflection of the trend to commodify urban environments. Local governments are increasingly concerned with how their city is ‘packaged’ and ‘sold’, for a city in demand is purportedly able to attract the talent and resources it needs (Eger, 1997). In this sense, smart technologies are perceived as an inexpensive way to gain a competitive edge by boosting city brand. Conveniently, the PPPs that typically serve as the foundation of smart projects create a perfect network to promote these endeavors through the use of boosterish narratives—deemed critical under the perceived pressure of increasing intralocal competition (Wiig, 2015). This raises questions around how this might affect local government-city resident relationships and interactions, as well as to what point will the desire to create clever marketing about the city supersede the aspiration for local governments to deliver quality services. Related to this brand emphasis, large IT providers within the smart city market typically have a strong company brand (e.g., Microsoft, HP, GE, IBM and Cisco). This may encourage local governments to become more willing to co-promote their city alongside the IT provider (Wiig, 2015). This raises concerns around the intermingling of brand—for, if a local government becomes overly dependent on linking its city brand to one IT provider, what happens if / when that organization moves on to the next city or technology fad.

Within this tech provider emphasis on smart city promotion however there is a crucial flaw in reasoning. As posited by IT providers, increasing intralocal competition necessitates ‘forward-thinking’ local governments to differentiate their city from its competitors—with smart city solutions deemed as an affordable and effective way to do so (Buschner et al., 2010; Cisco, 2010; Dencik, 2013; IBM, 2012e, 2014d). To implement smart city solutions successfully, tech providers urge local governments to turn to them to provide the required hardware, software and middleware, as needed, as well as the adjoining consulting services. Yet, as these same IT providers work with numerous local governments, differentiating smart city approaches and techniques learned within one city will soon be transferred to others. Thus, the purported competitive advantage is diminished as IT providers spread their smart city wares (McKenna, 2006, p. 14).

Hence, various concerns become apparent when looking at smart project representation and the tech providers' desire for local governments to promote their city as smart. These include, among others: (a) over simplification of cities and city challenges leading to the selection of ineffective or inappropriate solutions; (b) commodification of the city to the point that "the triumph of image over substance is complete" (Harvey, 1989a, p. 14); and (c) local governments investing in a means to improve city brand that will soon be outdated. In this regard, IBM has already turned its focus from Smarter Cities to cities in the "Cognitive Era" (Dixon, 2016), where artificial intelligence capabilities are now being applied to solutions for urban environments.

10.3 The Path to Smart

Smart projects do not represent a distinct disruption from the past in terms of how technology, data, analytics have been applied to city systems. And while the trend of local governments choosing to employ smart city technologies may continue, over time, the smart labelling phenomenon, similar to other forms of urban entrepreneurship, will fade. This is already evident in IBM's move toward cognitive systems and solutions, where artificial intelligence capabilities are added to 'enhance' and 'improve' existing smart city solutions. According to IBM, being smart is no longer good enough (Dixon, 2016). Yet while the trend of the smart city may sunset, the significance of local governments deciding to take this journey may not be so fleeting, in terms both conceptual and concrete.

Conceptually, smart initiatives serve as mechanisms to further reinforce entrepreneurial and neoliberal strategies and doctrines, which when applied to urban environments, act as supporting influences to the privatization, commodification and marketization of public provision. On top of this, with each local governments' choice to pursue smart technologies, and each technological solution chosen, tangible path contingencies are established in terms of hardware, middleware and potentially software. Similar to how ancient Roman roads in Britain still serve as conduits (Young, 1996), some experts warn of the path contingencies that will be solidified with smart projects. As noted by Hill (2013):

> Literally hardwiring urban services to a particular device, a particular operating system, is a recipe for disaster, not efficiency… Put simply, city fabric changes slowly yet technology changes rapidly… There is a worrying lack of thought about adaptation in this desire to install the consumer tech layer as if it were core building services. (Hill, 2013 in Kitchin, 2014b, p. 10)

Though, while technological corporate lock-in is not automatically inevitable, it is an ideal of many tech providers offering smart city solutions (Kitchin, 2014b). This notion of lock-in becomes an even larger concern given that if one looks at innovation research, the hype around technological advances is often fleeting—for, the success of an innovation may be short-lived or rendered moot over time by parallel or alternative innovations arising elsewhere (Harvey, 1989a). This does not mean that the solutions and technologies currently deemed smart will not persist. Rather, the emphasis on them being smart will most likely change. If one looks to IBM, this evolution is already in process with the addition of cognitive capabilities.

Understanding the implications of local governments adopting smart technologies and applying them to city systems and services however is still critical, for while smart may soon no longer be the desired destination, the conceptual and physical path contingencies of this trend may persist. And while this investigation shed additional light on some of the potential ramifications of this trend, as noted in the discussion above, there is still more research to be done around the questions and concerns that smart initiatives raise for urban governance and what this may mean for municipal administrations and city residents.

11 Appendices

11.1 Examples of Cities Applying Smart Technologies

In early 2011, *Fast Company* ran an article highlighting what they considered to be the world's 'smartest' cities: Songdo, South Korea; Lavasa, India; PlanIT Valley, Portugal; Skolkovo, Russia; Masdar, United Arab Emirates; Wixi, China; King Abdullah Economic City, Saudi Arabia; Dubuque, Iowa; Ho Chi Minh City, Vietnam; and Nano City, India. What is interesting to note about this list is that half of these cities do not yet exist as a functioning city (Fast Company, 2011).[71] Songdo,[72] South Korea for example, when finished will be home to roughly 65,000 people and showcase the latest in green technologies. To date, it is the world's most expensive privately developed city, costing about U.S. $35 billion. Songdo is part of Cisco's "Smart+Connected Communities" initiative, and will serve as a test bed for Cisco's vision of a ubiquitous telepresence where everything is wired. In apartments, smartphones unlock front doors; air-conditioning, blinds and security systems are controlled by displays; and in-home videoconferencing can take place with doctors, businesses or local government. A Command Center is centrally located to manage the entire city, and will monitor traffic flows, weather patterns, security cameras, accidents and emergency response (Fast Company, 2011; The Economist, 2010c). As of 2016, about sixty percent of the planned infrastructure and buildings were completed (Arbes and Bethea, 2014).

PlanIT Valley,[73] outside of Porto in Portugal, is the first city to be designed like software, and is complete with its own urban operating system, a reflection of its roots from Microsoft. Conceived by software startup Living PlanIT, the city will have about 225,000 residents when completed, almost all will be partner employees, coming from Cisco, Accenture and McLaren Electronic Systems. By first building a

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[71] I include these examples solely for illustrative purposes. It should be noted that Fast Company did not provide any information on selection criteria for these cities, and that the companies primarily responsible for implementing these projects often advertise within this magazine.
[72] For details see: http://www.songdo.com/.
[73] For details see: http://living-planit.com/planitvalley.htm.

simulation of the city that allows detailed planning, Living PlanIT hopes to avoid some of the major costs of construction—such as designs being used only once, energy-inefficient buildings and materials wasted by being thrown away. The city is estimated to cost about U.S. $19 billion (almost double what was projected), and for the most part will be constructed by prefabricated parts (Jaffe, 2013). "Eventually the entire city and its buildings will be run by an 'urban operating system' that integrates all parts and combines them into all kinds of services, such as traffic management and better use of energy" (The Economist, 2010c).

In the United Arab Emirates, Masdar[74], which has the goal of being completely carbon neutral, has received a wide array of attention, from high praise to sharp criticism. The desert city, which will eventually house up to 40,000 residents once completed, uses both low-tech and high-tech design to try and meet its goal. Built using centuries-old Arabic building principles, it naturally creates shade and catches breezes with its curves, elevation and angles. Further, the entire city has been built on a raised platform to facilitate the maintenance and the installation of new gear. All city systems are instrumented—solar panels create energy, catchments collect dew and rainwater, and driverless electric cars are the only way to get around the city besides walking. However, the over use of sensors on everything and the command center approach to running the city has led way to criticism of it being controlled by "Big Brother." The city's isolation and exclusivity have also caused critics to label it as a gated community for the elite closed off from the real world (Fast Company, 2011; Ouroussoff, 2010; The Economist, 2010c). It is predicted to be completed by 2020 at the earliest, with a total cost of at least $20 billion (Jaffe, 2013).

This type of construction however, to create cities from scratch, will be the rarer path to smarter cities. These types of projects are extremely expensive and require generous government backing in the forms of cheap land and tax breaks, among others. Rather, this move to apply smart technologies to city systems will primarily take place within existing cities, where development moves forward step by step, one project at a time (Fast Company, 2011, The Economist, 2010c).

[74] For details see: http://www.masdarcity.ae/en/index.aspx.

11.2 Examples of Smart Technologies Applied to Infrastructure and Urban Planning

As mentioned in Chapter 2, most local governments adopt smart technologies in a piecemeal fashion—project-by-project, system-by-system. Often, local governments decide to pursue the smart designation by adding smart technologies first to city infrastructure systems, such as water, energy or transportation. Of the kinds of systems that IBM and city governments have tried to re-order through smart technologies, I describe three below as illustrative examples: water, electricity and transportation. I follow with a brief look at the application of smart technologies to urban planning, which informs the way that these infrastructures develop and evolve.

Water

Smart water projects, as described by IT providers, can help manage end-to-end water distribution—from the reservoir, to the pumping station, to smart pipes, to the holding tanks, to the smart meter at the user's site. Water systems that integrate smart technologies are said to be able to monitor their own health, remotely sensing damage, assessing water availability and predicting demand. As promoted by tech providers, these solutions help communities use and re-use water supplies, accurately monitor the condition and use of water, enable flexible pricing strategies, manage sewage flow and containment, and provide alerts for flooding. As such, IT providers see smart technologies as a key part of addressing the world's water crisis for it, in their words, better enables the monitoring and allocating of this resource (IBM, 2009a, 2011; Suzenet et al., 2002; Wilson, 2009). In the Netherlands for example, sensors and smart technologies have been employed throughout the low-lying Delta region to help ensure water quality and maintain safe water levels (Government of the Netherlands, 2016).

While there may be some truth to the altruistic narratives around smart projects helping protect this scarce resource, the primary reason that IT providers, water utilities and local governments responsible for providing water treatment or services pursue these projects is for financial reasons. IT providers profit from the implementation and maintenance of these projects; water utilities and local governments gain from better tracking and control of water, leading to more accurate billing. And, the costs to install these systems are more often than not passed along to the end user. This is one of the reasons why consumers remain wary of smart meter projects that affect their individual household. Often with AMI projects, there is: (a) a lack of clarity around who pays for the smart meter upgrade; (b) uncertainty about how households benefit; (c) inadequate household consultation by utility companies around project details (Gross, 2010; Zifcak, 2010); and (d) consumer mistrust toward the utility provider (Giordano et al., 2013, p. 75). While households may better understand their consumption due to a meter upgrade and an accompanying portal, this does not necessarily lead to a big reduction in monthly bills, as most households need a certain amount of water to function. Other concerns noted by city residents in terms of the move to smart water projects include: privacy and anonymity—with whom will the data be shared, and what information will be shared if it is passed on to a third party; meter accuracy and security in terms the meter being hacked or shut off; transparency in terms of rate structures and access to data created; choice around utility provider and rate structures (Leeds, 2010; Vadari, 2010); and even health concerns associated with the radio frequency transmitted (Guy, 2010).

Of the physical infrastructure systems made smart, water may be the most politically charged, especially with its “linkage to a rights-based conception of access to water and sanitation” (Gandy, 2004, p. 369). Smart initiatives, on the other hand, are often conceptualized around fee-based access to whatever is being made smart. Water rights, access and pricing are highly contentious issues that local governments and policy makers will increasingly face, especially as smart technologies are further applied to these systems and the numbers of people excluded from these systems grow. On top of this potential shift, exclusion from water networks and supplies is rising around the world—making water a privilege for those with more resources (Graham and Marvin, 2001, p. 130). “Water has always been closely intertwined with the flow of capital”, and with a greater control over water through smart technologies, this poses a greater threat to lack of access to water for the underprivileged (Gandy, 2004, p. 369). To date however, according to anecdotal information provided by an IBM technical expert who works with smart water technologies, the most common smart water projects have dealt with issues related to flood control, management and alerting, which overall seem to be more popular with the general public.

Electricity

Smart grid technologies, as described by IT providers, create a digital, automated, participatory electrical network that provides the potential to significantly improve electricity efficiency through better monitoring and control of the energy network as a supply chain from provider to end users. With these smart technologies, energy companies can purportedly quickly locate and diagnose power outages, re-route power and inform consumers when power will be restored. Further, the immediate availability of data enables real-time understanding of power demand, which supposedly helps power companies improve delivery and incorporate energy from different sources, such as wind and solar (Accenture, 2009; IBM, 2009a; Kaefer and Klein, 2008).

According to one enthusiast, “a smart grid will do for utilities, what the Internet did for information” (Craig Murray, Country Energy, Australia in IBM, 2009a, p. 12). In this statement, gains are clearly seen for the utility company, which can benefit from improved operations and billing. Richer data also enables utility companies to better ascertain when a new power station may be needed, or when it can be deferred by shifting to other sources of energy to help power the grid. In the end, the utility company looks to smart technologies for their gain, not necessarily gains for their end users. So while utility companies gain from this increased insight, enabling them to better manage power, households in general are not able to drastically change their consumption patterns (Gross, 2010; Zifcak, 2010). As in smart water meter projects, the end users, households, are still unsure about what exactly they may gain from these AMI-enabled projects. In a European Commission study of smart grid projects in Europe, Giordano et al. (2013) found that while various studies have been done to better understand “consumer’s perceptions, understanding and willingness to pay for the development of smart grid technologies,” there is also a “need to address erroneous beliefs and misconceptions that still exist about them and to strive for trust, transparency and feedback to gain consumer involvement and acceptance" (Giordano et al., 2013, p. 71).

Transportation

From the IT providers' perspective, smart technologies—such as cameras, sensors, social media updates from system users, dynamic signage, signals, fiber optics, network connectivity and analytics—can be applied to transportation systems to help reduce adverse environmental impact, while also assisting with issues related to supply and demand. The broad spectrum of smart technologies for transportation includes, among others: road user charging (highway, bridge and city-wide tolling), integrated fare management with public transportation, and traffic prediction (bus arrival, dynamic tolling, traveler information, and decision support) (IBM, 2009a; Siemens, 2010). According to smart technology providers, the benefits of integrating these technologies with transportation systems are numerous, and can include: (a) reducing traffic congestion with solutions that monitor, manage and predict traffic, helping to prevent gridlock; (b) empowering city residents by giving them real-time information on traffic problems and suggesting alternative routes or offering better public transport options; and (c) improving overall transportation systems efficiencies, thus supposedly benefitting all system users (IBM, 2009a; Siemens, 2010).

Despite these touted gains, which have yet to be broadly substantiated, city residents are often reluctant to jump on the smart transportation bandwagon. Congestion charging provides one example of end user reluctance. While the implementation of congestion pricing schemes often results in reduced congestion within urban zones, it has also sparked much criticism (e.g., San Francisco, London, and Manchester). Experience from the few cities where congestion pricing has been implemented shows that social acceptance is critical (e.g. Stockholm) (Ottewell, 2007; Stockholmsforsoket, 2006; United States Department of Transportation, 2008). Public discontent with congestion pricing, or the outright rejection of congestion pricing proposals, stems from a wide range of concerns, including: fears that the revenues will become just another tax (Hakim, 2007; NY1 News, 2007; Smith, 2009); privacy will be violated (Confessore, 2007); consequent economic burden and negative effects on neighboring communities (Hakim and Rivera, 2007; Safirova et. al., 2006; Schuster and Madore, 2007); adverse effects to retail businesses and the economic activity in affected areas (BBC News, 2007; Mayor of London, 2006, p. 5; Muspratt, 2004); and inequality issues—where driving becomes a privilege of the affluent because low income earners cannot afford road charges (Dobnik, 2007). Despite some public reluctance, and a keen understanding of the social, economic and political implications of smart transportation efforts, many local governments still pursue these solutions as an attempt to improve city mobility.

Urban Planning

Urban planners have sought to gather feedback from, or at some level involve, city residents to help shape and inform urban planning since roughly the 1960s[75] (Arnstein, 1969; Seltzer, 2012). Technology, according to some urban experts, is a tool that can aid in the democratization of urban design (Evans-Crowley, 2011; Seltzer and Mahmoudi, 2012). Utilizing technologies to help inform urban planning is not new; for decades data from infrastructure systems has been gathered and analyzed to help inform management, operations and future planning of sectors. What is new however, according to IT providers, is the ability to gather mass real-time data from city residents and to have the capability to analyze this unstructured data along with the structured data[76] garnered from city systems (Buschner et al., 2010; Cisco, 2010; IBM, 20011b; Kanter and Litow, 2009). As described by IT providers, the solutions that purportedly enable this type of analysis and system of systems perspective create an increased understanding of city operations from an individual and cross-systems scale, thus ostensibly allowing for increased efficiencies, improved operations, and even the ability to predict future scenarios, hence improving long-term planning and resource allocation (IBM, 2011b; Kanter and Litow, 2009).

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[75] This is primarily the case for cities in the West (Arnstein, 1969).
[76] Structured data are data that “resides in a fixed field within a record or file, it includes data contained in a relational database and / or spreadsheet, where data types (numeric, currency, alphabetic, name, date, address) are often restricted. Structured data are easily entered, stored, queried and analyzed. Unstructured data are all of the things that cannot readily be classified, such as photos, graphic images, videos, streaming instrument data, webpages, pdf files, PowerPoint presentations, emails, blog entries, wikis and word processing documents” (Beal, 2014). Unstructured data makes up about eighty percent of enterprise data (Preimesberger, 2013).

Another trend within urban planning is to attempt to engage city residents in ways that are considered ‘meaningful’ through the use of technology. While gathering feedback from city residents via email, texts or websites may involve new channels for communication, it does not create new forms of citizen engagement, for local governments have sought city resident feedback on city functioning and services for decades (Roberts, 2004; Seltzer and Mahmoudi, 2012). The use of technology, however, does create the potential for more people to provide feedback. Further, some local governments are looking to technology to see how it may be able to create new ways to engage city residents, including, but not limited to: passing on responsibility to citizens for helping address community problems, gathering input through crowdsourcing (collaborative problem solving enabled by the Internet), providing open data for citizens to become application developers (thus providing services the local government may not be able to afford to do), using city residents as sensors, or crowdsensing (i.e., where people serve as sensors through, for example, cell phone location data or GPS), and listening to city sentiment through social media platforms (Grossman, 2011).

11.3 Case Study Site Visit Timelines and Activities

Figure 33 details the various activities undertaken within my site visits to Dubuque from 2010 through 2013.

Figure 33. Dubuque case study site visit timeline and activities

1st Site Visit

September 2010

Interviewed representatives from local government, IBM, utility companies, smart project staff and involved 3rd parties

Attended numerous town / council meetings on Smarter Sustainable Dubuque and its development

2nd Site Visit

December 2010

Interviewed representatives from local government, smart project staff and participants, utility companies and involved 3rd parties

Observed IBM filmed interviews for Smarter Planet Leadership Project and IBM Smarter Water Pilot Study evaluation

3rd Site Visit

December 2011

Interviewed representatives from local government, involved 3rd parties and smart project staff

Observed interviews for IBM Smarter Electricity Pilot Study evaluation

4th Site Visit

September 2013

Interviewed local government and smart project staff

Attended local government's Sustainability Conference, where many Smarter Sustainable Dubuque projects were featured

Participated in a SSD Tour and a City Council Dubuque tour offered to conference attendees

Figure 34 outlines the activities I conducted during my site visits to Portland from 2010 through 2013.

Figure 34. Portland case study site visit timeline and activities

1st Site Visit

August 2010

Interviewed representatives from local government, IBM, relevant experts and smart project staff

Participated in a "J&M Café" session, which brings together sustainability, technology and local government experts

2nd Site Visit

February 2011

Interviewed representatives from local government, Portland State University, IBM, Metro government, smart project staff and relevant experts

3rd Site Visit

October 2013

Interviewed representatives from Metro government, local government and Portland State University

11.4 Case Study Interview Guide

Below is the initial set of questions that I used to interview actors involved in case study projects in both Dubuque and Portland. In some cases, I conducted several interviews with the same interviewee over time to better illuminate findings or delve deeper into a specific issue. For these interviews, questions were designed specifically for that interview / interviewee. Over time, this list evolved to better fit my analytical framework.

- What type of smart project is being implemented in your city?
- Why do you think the local government is pursuing smart technologies?
- What is your role in the smart project?
- What are the project goals / expected outcomes? What does the city hope to gain?
- How has this project been promoted?
- What other organizations do you work with on this project?
- Who are the key stakeholders involved in decision making, funding and implementation?
- How do stakeholders interact with each other?
- How do smart projects affect collaboration between the public and private sector? The public sector and citizens?
- How are local actors engaged?
- How do the involved technologies affect collaboration among actors?
- What levers are used to influence decisions and actions among stakeholders, and who has access to these levers?
- How does access to and ownership of data factor into these decisions and actions?
- Have there been efforts to engage citizens? What have been the results of these efforts? What have been the advantages and disadvantages to citizen engagement?
- How are issues negotiated across local, state and federal boundaries?
- How do existing governance arrangements shape smart projects, and how have smart projects affected governance arrangements?
- How have these projects affected services delivery?
- How are these projects described / promoted?

11.5 Materials Used to Inform Narrative Review

<u>Dubuque materials used to inform narrative review</u>

Local government - 19 materials	**IBM – 8 materials**	**Media – 17 materials**	**IBM and local government – 1 material**	**Involved 3rd party actors – 9 materials**
Buol, 2010	Erickson et al., 2011	Acohido, 2009	The City of Dubuque and IBM Social Media, 2011	Dickinson, 2010
Burbach, 2010b	IBM, 2011c	BBC News, 2011		Dregne, 2010a
Dubuque, PIO 2010	IBM, 2011d	Dillow, 2011		Dubuque2.0, 2010c
Hawks-Goodmann, 2010	IBM, 2012a	Enzler, 2010		Grover, 2010
Schultz, 2010	IBM, 2012e	Flansburg, 2012		Lyons, 2010a
Steinhauser, 2010a	Naphade, 2010	Forbes, 2007		Lyons, 2010b
Steinhauser, 2010b	Naphade, 2011	Hamm, 2009a		Sustainable Dubuque, 2010a
The City of Dubuque, 2009e	Naphade, 2012	Hoffman, 2009		Sustainable Dubuque, 2010b
The City of Dubuque, 2010a		ICMA, 2013		N. Van Milligen, 2010
The City of Dubuque, 2010b		Iowa Rivers, 2013		
The City of Dubuque, 2010c		Levy, 2010		
The City of Dubuque, 2010d		Lindsay, 2010		
The City of Dubuque, 2011e		Lohr, 2009a		
The City of Dubuque, 2011f		PBS Blueprint America, 2010a		
The City of Dubuque, 2013a		PBS Blueprint America, 2010b		
The City of Dubuque, 2013b		PBS Newshour, 2010		
M. Van Milligen, 2013		PR Newswire, 2011a		
		The Dubuque Town Crier, 2011a		
		The Dubuque Town Crier, 2011b		

Portland materials used to inform narrative review

Local government - 0 materials	IBM – 9 materials	Media – 13 materials	IBM and local government – 0 materials
	IBM, 2009a	Boyer, 1979	
	IBM, 2011a	Buchanon, 1975	
	IBM, 2011b	Haller, 2011	
	IBM, 2011f	IFC, 2012	
	IBM, 2012e	Keep Portland Weird, 2013	
	IBM, 2013a	Lindsay, 2011	
	IBM, 2014b	Maerz, 2011	
	IBM, 2014i	McDuffee, 2011	
	IBM, 2014j	Mincer, 2011	
		Sanina, 2011	
		Turnquist, 2010	
		Yasin, 2011	
		Zietler, 2011	

Materials reviewed to understand tech provider perspective

IBM - 36 materials	Other tech providers – 7 materials	Media – 4 materials	Industry analysts – 3 materials
Bevan and Briody, 2009	Buschner et al., 2010 (Arup)	Lohr, 2009b	World News, 2014 (Frost & Sullivan)
Dencik, 2013	Cisco, 2010	The Economist, 2010b	PR Newswire, 2013 (Navigant Research)
Dirks and Keeling, 2009	Elfrink, 2009 (Cisco)	The Economist, 2010d	Forrester Research, Inc., 2013
Dirks et al., 2009	General Electric, 2011	Watson, 2010	
IBM, 2009a	MacManus, 2009 (HP)		
IBM, 2009c	Microsoft, 2012		
IBM, 2010 a	Siemens, 2010		
IBM, 2010b			
IBM, 2010c			
IBM, 2010d			
IBM, 2010e			
IBM, 2011b			
IBM, 2011c			
IBM, 2011d			
IBM, 2011e			
IBM, 2011f			
IBM, 2011h			
IBM, 2012a			
IBM, 2012b			
IBM, 2012c			
IBM, 2012d			
IBM, 2012e			
IBM, 2012f			
IBM, 2013a			
IBM, 2013b			
IBM, 2013c			
IBM, 2014a			
IBM, 2014b			
IBM, 2014d			
IBM, 2014e			
IBM, 2014f			
IBM, 2014g			
IBM, 2014i			
IBM, 2014j			
Kantor and Litow, 2009			
Palmisano, 2008			

11.6 City Brand and Place Promotion

Many factors can affect the way a city is viewed or perceived, including: citizen characteristics, population size, socioeconomic status, business environment, political power, crime rate, employment rates, location, historical background, media coverage, tourist attractions, physical appearance, etc. These in turn affect that strategies taken to create a city brand, which may target and affect various audiences, such as city residents, tourists, investors, agents of commerce, and state and national decision-makers, among others (Avraham, 2004). Given these various factors and audiences, place promotion can be complex. Local governments can shape their city brand through various strategies ranging from urban planning and development to public relations and marketing. Strategies to improve city brand can be internally or externally focused. Internally-focused strategies are “concerned with identity building and strengthening the pride of the residents living in a place, thus creating an attractive environment with the ability to maintain its residents and business and in the long run also attract new citizens, tourists and business” (Jansson and Power, 2006, p. 6). On the other hand, outwardly-focused strategies are “concerned with external communication and is directly related to attracting investments, knowledge workers, visitors and tourists to a place” (Jansson and Power, 2006, p. 6). Each of these audiences will have different perceptions of city brand, which also operates at many different spatial and temporal levels—state, regional, national and international, and can vary according to season (Jansson and Power, 2006).

According to Hatch and Schultz (2008), strategies to improve city brand should blend aspects of both differentiation and belonging—differentiation from other cities (i.e., competitors) and a sense of belonging to something special for key actors (Hatch and Schultz, 2008). Further, if a city’s brand is to resonate with city residents and to those external who are familiar with the city, the image created should be connected to “local identity and debates” (Vanolo, 2008, p. 371). Place promotion experts, for instance, recommend that local governments develop brand strategies that focus on enhancing or improving the city through urban planning and development efforts that support the brand promoted rather than investing solely in marketing a logo or catchphrase (Avraham, 2004; Kotler et al., 1993), paralleling approaches to branding in the private sector. In her research examining how municipalities are increasingly adopting practices of public relations and marketing firms, Zavattaro (2010a) found other non-traditional methods frequently employed: using volunteers and outside organizations (i.e., third party actors) as public relations surrogates, investing in the built environment to improve how people view and experience the city, and focusing on environmental sustainability by going green. I explore these below.

One consequence of this rising emphasis on city brand is a shift in roles of who does this type of work. "Public relations is not a subsystem performed by public relations professionals, but by all members of the organization" (Falkheimer, 2007, p. 290). In other words, it is not just one department within local government responsible for public relations, rather all government employees are being tapped to assist with messaging and advocacy (Falkheimer, 2007). As noted in my section on engagement around smart projects, third party organizations are increasingly being recruited to assist local governments in governing. In terms of public relations, these organizations are used by local governments to "gain insight into their strategic priorities and help cut costs by using volunteers instead of city employees to tackle problems" (Zavattaro, 2010a, p. 81).

While the idea of outsourcing city functions to third party groups or consulting with citizens is not new, "the role these entities tangential to an organization can play in shaping messages and images" seems to be rising, where "citizen boards and committees are filled with people who can become more than volunteers but carriers of the [public relations] message" (Zavattaro, 2010a, p. 82). Each interaction—"which seems to be arranged on a continuum from the simplest form of interaction (employee-as neighbor) to specially convened blue ribbon panels"—is an opportunity to spread the government's message to third parties and the city residents involved, who then in turn have the ability to further transmit the messages to other city residents (Zavattaro, 2010a, p. 48).

One offshoot of this local government focus on brand and the consequent concern with public relations, is that citizens are increasingly being construed as consumers (Kotler and Lee, 2007, p. 117). Through this lens of citizen consumer, the types of information city residents receive from, and the way that they are engaged by, the local government varies. Instead of receiving solely factual information, local governments aim to create dialogues with citizen consumers around certain issues to inform their consumptive behavior. These dialogues however may or may not be sincere attempts for conversation, depending on the public relations spin on the information being shared (Kotler and Lee, 2007, pp. 9-11; Zavattaro, 2010b, p. 196). For, while public relations practices are becoming more common and accepted in municipalities, there has been criticism of this practice. “In the case of the PR model, it appears that the adoption took place without much thought, if any, being given to the consequences, intended or otherwise, of employing this approach in a setting substantially different from its private-sector habitat” (Heise, 1985, p. 203). Though Arthur Heise (1985) may acknowledge that public relations creates a potential way for government to connect with the public it serves; he argues that the connotations of public relations are too severe to overcome, so public organizations should avoid importing this private-sector practice. Contrary to Heise’s viewpoint however, there are many scholars who view public relations within the municipal context as a legitimate way to build community and foster relationships with city residents (Zavattaro, 2010a, pp. 43-44).

Another non-traditional public relations strategy that cities use to enhance their image, as highlighted by Zavattaro (2010a), includes a focus on aesthetic and affective appeal, which is “meant to capture emotive, image appeals” that local governments can “use as selling points” (p. 83). Within this method, local governments focus on how they want the city to be viewed and experienced by those within or passing through it, and shape built environment efforts so that they align it with desired perceptions. This approach stems from the understanding that people internalize their built surroundings, thus to improve brand, local governments must focus on how the natural and built environment they provide is experienced (Carlson, 2002; Tuan, 1974, 1977). Local governments shape a city’s built environment through urban planning, and within the past two decades this has often been combined with a desire for promoting sustainability. Strategies for going green could include efforts to preserve air and water quality, enhancing public transportation, recycling programs, land preservation, and promoting Leadership in Energy and Environmental Design development, among others (Zavattaro, 2010b).

While aesthetic and sentimental appeal hinge upon imagery, this tactic linked to the built environment "relies on physical aspects the city creates and can sell but is directly linked to affectivity" (Zavattaro, 2010a, p. 90). In this sense, physical changes can be as important as mental images that show a city is changing. Thus, brand transformation is more likely to take hold if it is linked to and coordinated with the physical transformation of the built environment, which can be tied to a focus on sustainability that is pursued to further enhance brand (Jansson and Power, 2006).

11.7 Birth of a Smarter Planet

The Smarter Cities campaign began with one of the key authors for Sam Palmisano's 2008 Smarter Planet speech to the Council of Foreign Relations. I interviewed this IBM Corporate Executive Speechwriter to learn more about what Smarter Planet and Smarter Cities meant to him and how he shaped the development of the associated narratives. In our discussion, he noted that, "to be self-aggrandizing, I wanted the Smarter Planet campaign to teach the world to sing in perfect harmony". This refers to a seminal marketing ad made by Coca Cola in 1971, called Hilltop, that while selling Coca-Cola, also aimed to sell a feeling and idea through a narrative and imagery that inferred shared commonality (Coca Cola, n.d.). An important marketing ad to note because it focused not just on the product or its benefits, but on how the product would make you feel—through imagery and song, the ad told a story that conveyed meaning, assigned belonging and persuaded, all at a level targeting the individual.

Bill Backer, the creative director for the Coca-Cola account at McCann-Erickson, got the idea for the commercial when he and colleagues were forced to overnight at the airport in Shannon, Ireland due to heavy fog in early 1971. The next morning, once irate passengers from the night before were joking and chatting over Coca Colas. Backer noted "I could see and hear a song that treated the whole world as if it were a person—a person the singer would like to help and get to know" (Coca Cola, n.d.). In this same vein, the IBM Corporate Executive Speechwriter strived to create an overarching Smarter Planet narrative that targeted individuals and evoked an urge or desire to be part of something bigger than themselves, to believe in the possibility of making the world a better place through the use of advanced technologies. As summarized by Iwata at an Industry Summit in 2010, with Smarter Planet IBM was not introducing a new marketing campaign, it was "initiating a conversation with the world to forge a shared belief" (Iwata in Watson, 2010).

Given that Smarter Planet solutions, as initially described, were creating new workloads, new applications and new ways of doing things, "[IBM] had to develop a different vocabulary to be able to explain it both to [IBM staff], and to [its] customers" (Iwata in Watson, 2010). When building the overarching Smarter Planet message, upon which Smarter Cities messaging was constructed, the IBM Corporate Executive Speechwriter first focused on identifying commonplaces, or problems that almost everyone could agree on—i.e., there had to be consent that what was being described was an issue. He did not focus on creating universal clarity around the issue, rather he described the situation in a way that would get general buy-in. Consequently, it is not a coincidence that the problems identified in the original Smarter Planet message, which launched with Palmisano's speech and continued through a series of Op-ads (or Op-ed like advertisements), aligned with the typical Corporate Social Responsibility report, touching upon challenges faced within areas like food, water, transportation, public safety and the environment—all issues that affect cities as well. With this broad aperture for Smarter Planet narratives, IBM was enabling itself to stake a claim to not only transforming business but also society (Watson, 2010). As described by Iwata, "we're making a new market, admittedly… but we're trying to build a better world in the process" (Iwata in Watson, 2010). Thus, the stage was set for IBM to create, define and attempt to dominate new markets across a range of industries and sectors that could be made smart. While initial efforts focused on a broader scale, targeting private sector enterprises and national governments, state and local government were eventually added as potential buyers.

11.8 Examples of IBM Smarter Cities Narratives

Figure 35 provides some examples of the range of Smarter Cities narratives, such as CEO speeches, white papers and points of view, as well as examples of documents that have been customized by country and division. As noted in Chapter 5, each division within IBM has different aims depending on which solution / service they are trying to sell, and which part of the market they are trying to capture.

Figure 35. Examples of sources for IBM Smarter Cities narratives

Date	Title	Type	Author(s)	Identified purpose
2008	"A Smarter Planet: The Next Leadership Agenda"	Speech to the Council on Foreign Relations, New York City	Sam Palmisano (and an executive speech writer), Corporate	To introduce the Smarter Planet framework to an external audience
2009	"A vision of smarter cities: How cities can lead the way into a prosperous and sustainable future"	White paper	Susanne Dirks and Mary Keeling, GBS Institute for Business Value	To introduce the concept of smart and why cities need to be smarter as the challenges of urbanization grow
2009	"How Smart is your city? Helping cities measure progress"	White paper	Susanne Dirks, Marky Keeling and Jacob Dencik, GBS Institute for Business Value	To outline what it means to be a smart city, and show how cities can assess and monitor progress toward becoming smart
2009	"Towards a Smarter Economy: A Roadmap to Making it Happen"	White paper	IBM Australia	To illustrate what smart means across city systems within the Australian context
2010	"Building a smarter planet, city by city"	Speech to the Smarter Cities Forum, Shanghai	Sam Palmisano (and an executive speech writer), Corporate	To outline the urgency for cities to become smart, with examples of how cities can become smarter
2011	"The modern city—from vision to reality"	White paper	IBM United Kingdom	To outline the challenges UK cities are facing, and how these can be addressed through smart projects
2012	"Smarter, More Competitive Cities. Forward-thinking cities are investing in insight today"	Point of View	Marketing	To highlight how forward-thinking cities are becoming smarter and more competitive through data and analytics
2012	"IBM Smarter Cities Public Safety—Emergency Management"	White Paper	IBM Industry Solutions, SWG	To outline IBM's positioning around how cities can make their public safety / emergency management smarter

2012	"Social media and the city"	White Paper	IBM United Kingdom	To outline cities can harness the power of social media to become smarter
2013	"Improving economic competitiveness and vitality"	White Paper	Jacob Dencik, GBS Institute for Business Value	To outline how cities can become more economically competitive and sustainable by harnessing smart technologies
2014	"Smarter, More Competitive Cities. Cultivating charisma, resiliency and vitality"	Point of View	Marketing	To highlight the capabilities cities need to become smarter and more competitive, and the skills needed by city leaders to make their cities smarter
2014	"Smarter Cities: How cities can create value from data, cloud and engagement"	Point of View (internal only)	Marketing	To provide IBMers with an overview of IBM's POV on cities, the issues they face, and how IBM solutions can help cities address these issues
2014	"IBM Smarter Cities. Creating opportunities through leadership and innovation"	Brochure	IBM Industry Solutions, SWG	To provide an overview of how cities can become smarter across city systems, and outline what city leaders need to do to make their cities smarter

Source: Senior IBM Staff from Smarter Cities Sales & Development and Marketing & Communication.

11.9 Smarter Sustainable Dubuque

In addition to the Smarter Water and Electricity Pilot Studies, there have been several other projects as part of SSD. The local government, in partnership with IBM Research, launched a Smarter Travel pilot study in 2012 to better understanding how citizens move throughout the city and to help participants be more aware of the distances they travel each day. This smartphone application was developed by IBM Research and used RFID technology to “collect anonymous data on how, when and where volunteer participants travel with the community” (The City of Dubuque, 2011f). IBM Research analyzed the data, and the City of Dubuque and its transit partners used the findings to “implement practices and policies that incorporate lower-cost and lower-impact travel options within Dubuque” (The City of Dubuque, 2011f). Given the experimental nature of this work, IBM Research provided the smart technologies needed for these experiments at no cost to the local government. Dubuque2.0 assisted with volunteer recruitment. While initial data from these experiments enabled the city to adjust and add public transportation routes (The City of Dubuque, 2011f), this project and a few smaller, related Smarter Travel experiments encountered various technical issues. According to my interview with the city’s Information Services Manager and the SSD Project Manager, these issues included difficulties installing (and uninstalling) the required application, having the application burn through cell phone batteries, not getting cooperation from mobile companies to share anonymized data that would enable tracking aggregate citizen movement, having no way to communicate with those participating in the experiment due to anonymized downloading, and having the application fail in terms of sharing information on distances traveled with participants.

Expanding the SSD portfolio, the local government and IBM Research launched a Smarter Discard project in 2013 that tracked changes in residential waste diversion. Throughout the pilot—which aimed to “assist and incentivize” city residents to recycle and compost—data was collected to help inform the local government’s decision making around “policies, staffing, and equipment related to improving discard (trash / recycling) management and diversion to beneficial use” (The City of Dubuque, 2013e). Similar to the electricity and water pilots, a portal enabled the 300 volunteer households to view and understand their discard patterns (for trash, recycling, food scraps, yard debris) and compare them to other similar households (The City of Dubuque, 2013e). Also in 2013, the local government, IBM Research and the University of Iowa's College of Public Health implemented a Smarter Health and Wellness pilot which looked at how technology and community engagement can help individuals achieve their health and wellness goals. This pilot consisted primarily of two smartphone applications: the first provided "micro-sensing" technology that sensed movement, while the second enabled data collection on activities, goals and comparative feedback on each individual's performance and self-assessed well-being. IBM was responsible for providing an aggregate "CityView" Community Engagement Platform for the program, and making available mobility and individual engagement / data collection mobile applications for Android smartphones (The City of Dubuque, 2013f).

As more and more SSD projects are implemented, the local government hopes to be able to increasingly glean insight from the resulting data to help inform urban planning and policy formation. While each of these pilot projects are operating, city management has access to the anonymized data being created, which is presented at an aggregate level in a web-based portal that allows the local government to monitor resource consumption and the overall sustainability footprint of the volunteer households. For example, if the Smarter Water Pilot Study further expands, the local government hopes to use the data gathered to inform the city's water management responsibilities—treatment, distribution, and billing—with the aim of enabling the city to make more informed decisions about water production and distribution to help lower associated costs (The City of Dubuque, 2010b). One example of a similar type of model can be found in Rio de Janeiro, Brazil, where the local government has established a Centro De Operacoes Prefeitura Do Rio. In this center citywide data from thirty different agencies is integrated and combined with other data like weather to enable enhanced city operations across agencies, while alerting employees and the public if emergencies or problems arise (Kitchin, 2014b). The aim of the Center, similar to that of Dubuque officials, is to break down walls between city silos to improve performance of citywide operations across agencies.

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