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**Thinking of City Development Influenced by
Communication Technology:**

Will the Internet Eliminate the Cities?

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ABSTRACT

In human history, the development of communications technology has always been tightly related to people's lives. Researchers have been exploring ways to connect people more effectively and more closely. Not surprisingly, the Internet has infiltrated our daily lives at a rapid rate in our unconscious. Meanwhile, the physical context and running mode of urban also were impacted severely by the Internet technology.

Experts of urban planning, architecture, social science, engineering and computing devoted into the great fervor of using networks and computing technologies to change the city, for example, making the city more efficiency and more sustainable.

Researchers hold different attitudes towards the relationship between city and communication technologies. Some predicated Internet would finally kill the distance among people, and would eliminate the cities. While some suggested that, conversely, the Internet would reinforce the urbanization and improve citizen's living standards.

This graduation thesis is about to start with the researching of communication technology development and smart city approach, then explore the impacts of Internet to the cities, and end with the discussing of prediction of future cities and future urban planners.

KEY WORD:

Information and Communication technology, Internet, Smart city, Everyware, Headquarter

Abstract in Italiano

Nella storia umana, lo sviluppo della tecnologia di comunicazioni è sempre stato strettamente correlato alla vita delle persone. I ricercatori hanno esplorato modi per collegare le persone più efficace e più vicino. Non sorprendentemente, Internet ha infiltrato le nostre vite quotidiane a un ritmo rapido nel nostro inconscio. Nel frattempo, anche il contesto fisico e la modalità di funzionamento urbana sono stati gravemente influenzati da tecnologia di Internet.

Esperti di pianificazione urbana, architettura, scienza sociale, ingegneria e informatica si dedicano al grande fervore dell'uso di reti e tecnologie informatiche per cambiare la città, ad esempio, rendendo la città più efficiente e più sostenibile.

I ricercatori hanno opinioni diversi nei confronti della relazione tra città e tecnologie di comunicazione. Qualcuno ha predetto che Internet avrebbe finalmente ucciso la distanza tra le persone e avrebbe eliminato le città. Invece, alcuni hanno suggerito che, al contrario, Internet potrebbe rafforzare l'urbanizzazione e migliorare gli standard di vita dei cittadini.

Questa tesi di laurea sta per iniziare con la ricerca sullo sviluppo delle tecnologie di comunicazione e l'approccio città intelligente, quindi esplorare l'impatto di Internet sulle città e terminare con la discussione sulla previsione delle città future e dei futuri urbanisti.

Parole chiave:

tecnologie dell'informazione e comunicazione, Internet, Città intelligenti, Everywhere, Sede

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I was interested on the studies of the relationship between Internet and Cities for a long period. When I was listening to a Chinese young talented singer Jackson Yee's song "Unpredictable", there is a sentence touched me: "I live a life, unpredictable." Which inspire me to thinking of the world's changing in a different way. Since the internet and Information and Communication Technology (ICT in short) are developing with an unpredictable speed, then how about our cities? With these question, I started to work on this thesis.

Thanks also go to all the specialists and scholars on the ICT and cities' studies, they are explorer on this field. My research is basic on their contributions.

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CHAPTER 1. REASERCH CONTEXT

Started with the introduction of main characters and changings of people's life in information age, this chapter is about to express the motivation and structure of the thesis.

1.1 Information Age

The definition of telecommunications was used to be “communication by radio, telephone, telegraph, television”, with the word “tele” means “over a distance”. Today, the new meaning of the work is “electronic transmission of information through computer networks.”

After the second industry revolution, some cities were prospered economically by taking advantages of the location. This city addressed along the transportation routes, such as ports and railway nodes, which ensured advantages in freighting. Because of the development of industry, the employment opportunities were higher than other cities, the population was attracted to there and provided the cities with rich labour force.

The new communication technology changed this rule. After nearly two hundred years of ascendancy as a city-builder, Manufacturing has encountered massive declines in developed country. Producer and advanced services, such as marketing, advertising, finance, legal services, accounting, and other business services associated with large corporations, created a mass of new jobs, especially the high-paying jobs. Today's advanced world economies of North America, Western Europe, Japan and Australia had been huge and far-reaching influenced by the Internet.[1]

As the telecommunication aged was substituted by information age, the manufacturing-based economy transformed into information-based. The cities had undergone dramatical changes on all the dimensions, including but not limited to capital activities, international status and physical spatial. Some large cities were suffered from degraded, some were seized the opportunity and rapidly grew. Global cities were emerged with the coming of information age.

According to the Wikipedia, the Information Age (also known as the Computer Age, Digital Age, or New Media Age) is a historic period in the 21st century characterized by the rapid shift from traditional industry that the Industrial Revolution brought through industrialization, to an economy based on information technology.

In this research, I will try to explore the subtle relationship between Internet and city by introducing new technologies infiltrated in cities' development, and smart city (one of the basic symbols of information ages).

1.2 Motivation of the research

The way we work, socialize, create and share information, and organize the flow of people, ideas, and things around the globe is changed by the Internet. Yet the magnitude of this transformation is still underappreciated. McKinsey Global Institute did a research on the impact of Internet on economic growth and prosperity on 2011, and conclude that "The Internet accounted for 21 percent of the GDP growth in mature economies over the past 5 years. [2] In that time, the users of Facebook increased to 800 million people around the world from a few thousand students, including many leading firms, who regularly update their pages and share content. While large enterprises and national economies have gained major benefits from this technological revolution, some of the individual consumers and small, startup entrepreneurs have been the greatest beneficiaries from the Internet's empowering influence. If Internet were a sector, it would have a greater weight in GDP than agriculture or utilities.

Nevertheless, we are still in the early steps of the transformations of the internet to the world. Plenty of technological innovations and enabling capabilities such as payments platforms already has emerged and promoted in some cities, while the ability to connect many more people and things and engage them more deeply will continue to expand exponentially.

Hence, governments, policy makers, and urban planners must recognize and embrace the huge opportunities created by the Internet, even as the arguments on the security and privacy problems the Internet brings are always existed. As a result, governments, policy makers, and businesses must recognize and embrace the enormous opportunities the Internet can create, even as they work to address the risks to security and privacy the Internet brings. [2]

Hence, the main research question is the relationship between internet and city. Will the internet eliminate the city or strength it? How can we get use of the ICT technology to create a better life for citizens.

Specific questions are:

- 1) Will the internet eliminate the city?
- 2) How is the communication technology being used in cities?
- 3) How does the communication technology change human's living?
- 4) What is behind the Choice of location of Headquarter of ICT companies?

1.3 The structure of the research

The research is organized in 6 chapters as below,

Chapter 1, Research Context:

The research context and information age characteristics are introduced in this chapter, as well as the motivation and structure of the thesis.

Chapter 2, Information and Communication Technology:

The communication technology was evolved from unidirectional mass media to bidirectional connective interface of internet, and now coming to the ubiquitous technology era. This chapter illustrate how the communication technology in different era influenced the city. For the ubiquitous computing era, the research emphasizes on the Everywhere system, Information of Things and smartphone as the input device.

Chapter 3, Ubiquitous Computing in City:

This chapter states the integration of ubiquitous computing in city as the Smart City. Starting with the introduction of definition and types of Smart Cities, two representative Smart City projects and the main strategies of how the governments carrying out Smart City approach in different cities and countries are illustrated in the research. Finally, the Smart City problems are revealed, and new civics on the city are demonstrated.

Chapter 4, Internet Changes City Lives:

As the Internet deeply infiltrate in almost all the domains of city, it caused significant changes on our city lives, such as working space transformation, new commercial environment, transportation and logistical modes. The impact of blockchain is about to be introduced to show the new thinking of the prospective evolution of cities and technologies.

Chapter 5, Will Internet Eliminate the Cities:

The phenomenon of Internet enterprises surge booming is introduced in this chapter, and then educe the thinking on the relationship between Internet and cities. In the analysis of the relationship, the various attitudes of scholars are quoted, some of them suggest the Internet will eliminate the city, and some hold the opposite opinions. At the end of this chapter, the current tendency of high-tech Giants headquarters moved to London and Milan from Silicon Valley will be discussed to evident the conclusion of the contends in this chapter.

Chapter 6, The City of Tomorrow

The speed of urban development is beyond people's imagination during the last

decade. Future city is unpredictable, but the future possible city problems are able to be hypothesized. As the urban planner, what we should prepared to face the challenge? Which kind of awareness, knowledge and skills we should possess to build the city of tomorrow?

CHAPTER 2. INFORMATION AND COMMUNICATION TECHNOLOGY

The information and communication technology evolved from unidirectional mass media to bidirectional connective interface of internet, and is about to start the ubiquitous computing era.

By the introduction of the progress of development, we can discover what did the ICT bring to the city in past, and what is the sociological perspective towards it. For the ubiquitous technology, I chose “Everyware”, “Information to Things” and “Smartphone as the input device” to explain the mainstream thinking of Ubiquitous technology and the possibility of the implementation.

2.1 Unidirectional Mass Media

In the early twentieth century, Mass media as a new form of communication expanded the human connectivity at that time, and become a significant force in modern culture. As a communication reaches a large audience, Mass media includes television, radio, advertising, movies, the Internet, newspaper, magazines, and so on. In Unidirectional Mass Media modes, information outputted from privileged content-creators to media and journalists (distributors), and finally was received by the audiences (passive consumers). The information promoted not only products, but moods, attitudes, and a sense of society.

There are three main sociological perspectives on the role of media: the limited-effects theory, the class-dominant theory, and the culturalist theory.

Limited-effects theory originated and was tested in the 1940s and 1950s, which argues that media exerts an inappreciable influence since people can choose the information to watch or read according to their own experience, prior knowledge, and their personal interesting. There are two main criticisms on this theory. First, limited-effects theory ignores the media’s role in framing and limiting the discussion and debate of issues. Second, this theory appeared before the widespread of media, the availability and dominance of which was still limited by then.

Class-dominant theory considers that the media reflects and expresses that view of a minority elite, which control it. These people who own and control the corporations that produce media comprise the elite. Their concern is that when only elite have the ownership, they would have the ability to control the information transfer to people. Critics of this theory persist that local control of

news media largely lies beyond the reach of large corporate offices elsewhere, and the quality of news depends upon good journalists. While most people argue that a corporate elite controls media, and a politically “liberal” elite controls media.

Culturalist theory developed in the 1980s and 1990s, combines above two theories. They insist that, instead of the passive role, the audience play an active role in relation to mass media, since they can choose what to watch among various of options, choose how much information absorb from media, and create their own opinions out of information they received when interacting with media. The theorists suggested that while a few elites in large corporations may control over the production and distribution of information, personal perspective plays a more important role in what the audience choose and how they interpret those messages. [3]

Marsha McLuhan, one of the fathers of social media theory, applied “global village” to describe the mass media paradigm, “An entire planet of people living as neighbors, suddenly given the tools to speak, or shout, around the world. Humanity was connected from any and every location.” Yet in McLuhan’s time, the concept of a global village only accounts for unidirection mass media such as radio and television. Universal communication serves more as a megaphone than a telephone, amplifying society's inherent tensions rather than promoting cohesion. The village is fission, not fusion, all the time in depth. Unidirectional mass media has caused a conflict of controversy around the world [4]

2.2 Bidirectional Connective Interface of Internet

In the 1980s, people begun to widely share ideas, news, thoughts, knowledges and commands on the Internet. The bidirectional connective interface of the Internet was a mix of top-down and bottom-up energy. The media became dialogue rather than monologue, and it was at this moment that people began coming together as a real village to share their culture, ideas, and discussion. [4] The Internet was the fastest-growing sector of the media, which expanded from 20 million users in 1995 to 400 million in 2000. By 2006, the Internet was considered a global medium, occupying more than 15% population in the world. [5]

During the period of bidirectional connective interface of Internet, the two topic was vast discussed by the scholars: Space of Flows and globalization.

2.2.1 Space of Flows

People were integrated by “space of flows”, which described as “the material organization of time-sharing social practice that work through flows.” By the sociologist Manuel Castells. The space of flows refers to a hybrid of virtual

networks and material space – one in which digital and physical configurations actively influence one another. [4]

Before 1990's, mainstream media systems were relatively national dimension in most countries. After the most communication media increased in worldwide dimension, the media system initiate expanded beyond nation-state to worldwide. The development of global capitalism, new technologies and the increasing commercialization of global television assisted the International flows of information to a great degree.

2.2.2 Globalization

One of the main philosophers of cyberspace, Castells (2000) has shown how the Internet has revolutionized international information exchange on accounts of its ability in moving data across borders. He has also pointed out “how the Internet has become well suited for the expanding individualism of contemporary reality, with consumers using the web to create their own content and distribute it to global audiences. The Internet is also seen as strengthening the cultural identities of diasporic peoples, as well as assisting in social networking and in forging ties with like-minded individuals, social groups and various communities across the globe. [6]

The book “Cities in the Telecommunications Age” did a research on the distribution of global cities in the world, and had following finding. “A few large urban centers have emerged throughout the advanced economies of North America, Europe, and Japan that rightly deserve the standing of “global cities” These are not necessarily the largest urban centers in the world, as Mexico City, Sao Paolo, Shanghai, Seoul, Calcutta, and Bombay- among the world's ten largest cities- are not deemed global cities. Global cities, instead, include New York, Tokyo, and London at the top of hierarchy. At a slightly lower level are the global cities of Hong Kong, Singapore, Paris, and Osaka. These large urban centers, as well as others, achieve the designation because of their intense utilization of global interdependent telecommunications, not merely because of their population size.” [1]

2.3 Ubiquitous Technology

Mark Weiser represented on 1996 that, Ubiquitous computing names the third wave in computing, just now beginning. The first wave were mainframes, each shared fades into the background of our lives.

During his talk “Computer Science Challenges for the Next 10 years”, he described ubiquitous computing as: “the purpose of a computer is to help you do something else; the best computer is a quiet, invisible servant; the more you

can do by intuition the smarter you are, the computer should extend your unconscious; Technology should create calm.” (excerpt from Wikipedia)

In the Ubiquitous Computing era, everyware was first mentioned as the dawning age of Ubiquitous Computing by Adam Greenfield. The Information of things can be supported by the Ubiquitous computing and the generally using of smartphone is an important input device.

2.3.1 Everyware- the dawning age of Ubiquitous Computing

Adam Greenfield expressed the beginning of ubiquitous Technology as Everyware, “Everyware is an attempt to describe the form computing will take in the next few years. Specifically, it’s about a vision of processing power so distributed throughout the environment that computers per se effectively disappear. It’s about the enormous consequences this disappearance has for the kinds of tasks computers are applied to, for the way we use them, and for what we understand them to be.” [7]

Everyware has three characters. Firstly, it is a ubiquitous computing. The “ubiquitous” meant not only in every place, but also in everything. Secondly, processing embedded in the objects and surfaces of everyday life. Thirdly, as Naoto Fukasawa speaks of “design dissolving in behavior.”, people’s experience in Everyware absconded from awareness.

Everyware already exists in society in different scale.

Scale	Example	Description
Body Scale	Wearable Body Monitoring Systems	BodyMedia proposed “physiological documentary of your body,” a real-time collection of bodydata.
	Matsushita Electric's prototype Kenko Toware	An instrumented toilet capable of testing the urine for sugar concentration.
Room Scale	AmbientROOM (The MIT Tangible Media Group's 1998 prototype)	The entire space was considered as an interface, using lighting and shadow, sound cues, and even the rippled reflection of light on water to convey activity meaningful to the occupant.
	Smart Floor	Provide a reliable mechanism to identify a person and track his/her location. In addition, the designers are exploring innovative applications of

		this technology, including uses in the home, art and performance applications, and entertainment.
Building scale	Carbon Tower	An all-composite, forty-story high-rise knit, braided and woven from carbon fiber. It dispenses with all internal bracing, able to do so not merely because of the mechanical properties of its textile exoskeleton, but due to the way that exoskeleton is managed digitally ("active lateral bracing": sensors and actuators embedded in its structural fiber cinch the building's outer skin in response to wind load and other dynamic forces).
Street and public space scale	GPS	Global Positioning System
	Lamp with RFID panels	Tokyo's Shinjuku ward is currently tagging some 10,000 lamp posts with RFID panels that give visitors information on nearby public toilets, subway entrances, and other accommodations.

Table 2.1 Everyware in different scale. [7]

The main criticisms on everyware are focus on three problems: [7]

- AI-hard will bring exclusive situations, especially for aged people.
- Relationality: A change anywhere in a tightly coupled system ripples and cascades through everything connected to it, under the right (or wrong) circumstances rendering the whole mesh exquisitely vulnerable to disruption.
- Seamlessness is hard to achieve and undesirable.
- The privacy protection remained unsolved until now.

Even there are criticisms and problems, the everyware is inevitable tendency. Human are already one feet step into the ubiquitous computing world pushed by the technology evolution and marketing activities.

2.3.2 Information to Things- future ecosystem supported by Ubiquitous Computing

An environment of ubiquitous computing could also support a robust ecosystem of machine-to-machine communication across physical space. Information of Things (abbreviate to IoT) suggested that "if individual objects

could be imbued with a digital connective element, collectively they could become a physicalized network. Anything and everything could be tagged and brought online. A world full of interconnected objects would create an unprecedented Internet-like structure in physical space. The ubiquitous geospatial mesh of IoT could have disruptive ramifications in all dimensions of business.” [4]

2.3.3 Smartphone as the input device

Smartphones, which are actually ubiquitous computing input devices and powerful microcomputers, enhance human logic and computing power, especially since they are always available. With a smartphone, the visual world can connect to the physical world at anytime and anywhere. Smartphones can be used as tools for data logging, online operations and real-time navigation, and so forth.

More than individual personal interactions, the global adoption of smartphones – mass mobile communications – equivalent to a collective societal transformation. More than half of the world's population is instantly connected via smartphones.

In addition to social identity, smartphones are also profoundly changing corporeal inhabitation of cities as well. Through smartphones, the daily lives and patterns of perception for an Internet generation have become a situation in the post-human era. with architectural, spatial, and – in particular- urban implications, in this case, every citizens can perceive and process the city. [4]

Even though there are arguments and challenges on the implementation of Ubiquitous technology, the pace of exploration never stops.

In following two chapters, I will introduce how the ICT influenced the city and city lives. Chapter 3 is standing on the perspective of the urban planner and urban constructor to analyze how the ICT implemented in city dimension. Chapter 4 is the study of how the ICT changed our world on the city users' standpoint.

CHAPTER 3. UBIQUITOUS COMPUTING IN CITY

In this chapter, two smart city projects are depicted, one is an earlier project hold in Korea, another one is the new project under construction in Canada. We can notice how did the second project learn from the fail experience in the previous one.

Another important part of chapter 3 is the study of smart city strategy and program in 6 cities, by which we are able to aware the tendency of smart city construction and how the ICT and other technology can be used in smart city programs.

3.1 Smart City

The typical practice of digital integrated urban space is smart city, where ubiquitous technology is suffusing every dimension of urban space. Today's smart cities are engineered as computer chips, designed to address urgent considerations of sustainability and efficiency. [4]

As a computer that people lived in, Smart cities are places where information technology is used to address problems old and new. In the past, the flow of people and goods were shunted by the buildings and infrastructure in rigid, predetermined ways. But smart cities can put readings from vast arrays of sensors, feed that data into software that can see the big picture, and take action. They optimize heating and cooling in buildings, balance the flow of electricity through the power grid, and keep transportation networks moving. Sometimes, these interventions on our behalf will go unnoticed by humans, behind the scenes within the wires and walls of the city. But at other times, they'll emerge and help us solve our shared problems by urging each of us to make choices for the greater good of all. For example, an alert might ask us to drive away from the expressway to avert a jam, or turn down the air conditioner to avoid a blackout. Meanwhile, they will keep a vigilant watch over our health and safety, scanning for miscreants and microbes alike. [8]

The future city research was used to be domain of urban planners, architects, and social theorists. Since the development of information technology, a new plyer- multinational computing giants- attended in to this arena, with the persistent goal of efficiency and well-beings. Outstanding companies like IBM, Cisco, Siemens, HP, and Microsoft are jockeying to build (and program) Smart City, by redesigning the operating system of the last century to cope with the challenges of the coming one.

What is smart city? Townsend, Anthony M. took a more focused view and define smart cities as places where information technology is combined with

infrastructure, architecture, everyday objects, and even our bodies to address social, economic, and environmental problems. Smart cities need to be efficient but also preserve opportunities for spontaneity, serendipity, and sociability. [8]

3.2 Types of Smart City

There are different category schemes on the smart city types.

3.2.1 Canonical and non-canonical.

“The canonical smart cities are putatively urban-scale environments designed from the ground up with information processing capabilities embedded in the objects, surfaces, spaces and interactions that between them comprise everyday life.” [9] They will turn to be forerunners and exemplars of the kind of urban environment we might inhabit once the cities of Earth have been decisively colonized by networked informatics, at some point in the undefined but not-too distant future. Such as the Korean New Songdo, Masdar City in the United Arab Emirates, and a curious settlement in Portugal called PlanIT Valley.

There is, however, non-canonical smart city refers to a drive which is the broader and far more consequential, that could retrofit networked information technologies into existing urban places. Although, it's different from the effort to build places like Masdar or Songdo, many of the same technologies, techniques and practices are involved in this latter body of cultural and intellectual production. [9]

3.2.2 Four distinct types of the smart city

Another example is using two axes or polarities to distinguish four distinct four types of the smart city.

The first axis concerns the polarity of centralized / global versus distributed/local control of the technological infrastructure, whereas the second axis relates to an orientation towards the accumulation or circulation of capital versus an orientation towards the accumulation or circulation of the commons.

The ICT firms on the left quadrants include the corporate smart city and the sponsored smart city where firms and their ambition of profit maximisation are in the forefront. Still, these two types were never to follow same pattern on implemented technological infrastructures. On the other hand, the resilient smart city and the commons-based smart city are oriented towards the production of common value with a focus on either local or global scale.

The four types of the smart city are described through prominent cases of corporations and collaborative spaces which produce technologies that exemplify the characteristics of each quadrant. It should be noted that the positioning of the selected cases in the respective quadrants is according to their aims and activities. All of the smart city types featured here follow a techno-deterministic approach, ignoring that a non-technical solution could be a better option. However, this does not mean that technological solutions are the only viable way to solve urban problems. [10]

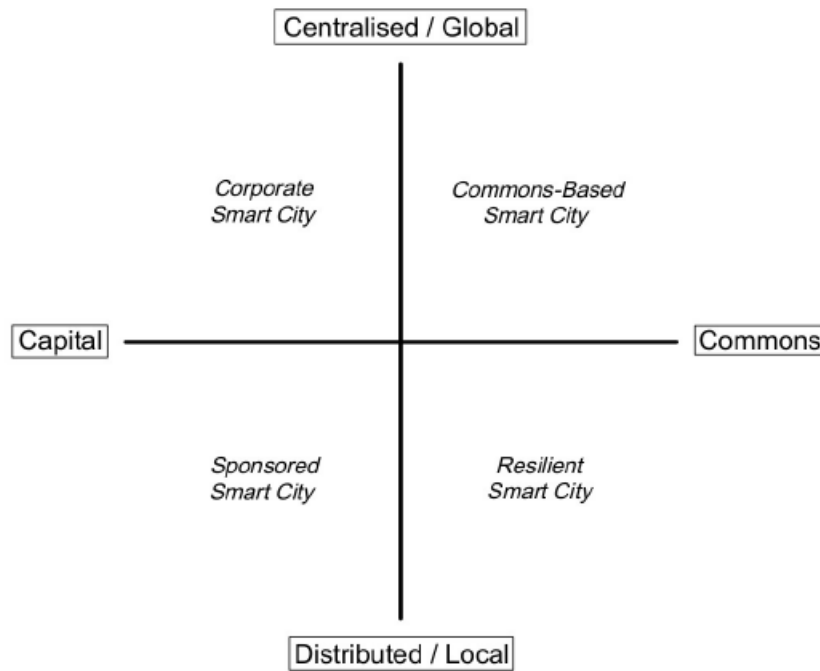


Figure 3.1: A taxonomy of the smart city
(Source: Vasilis Niaros) [10]

3.3 Smart City Project Box

3.3.1 Songdo International Business District



Figure 3.2: An overview of central park in Songdo
(Source: Korea Expose) [11]

Key words: Smart city; Future city; Ubiquitous city; the Aerotropolis; Build from scratch; gateway to Northeast Asia; Global Standard; Eco-friendly; Real estate boom; Expensive; Exclusive; Chernobyl-like ghost town

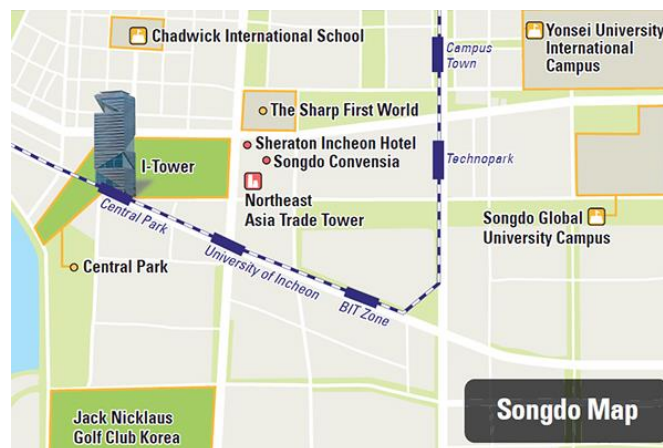


Figure 3.3: Songdo Map
(Source: Korea Joongang Daily) [12]

Basic Information: “Songdo International Business District is conceptualized as the ultimate smart and sustainable city and a testing ground for leading-edge technological infrastructure by Cisco Systems; all dimensions of life are integrated: real estate, utilities, transportation, education, health and government. Built on tidal flats, 64 km from Seoul within the Incheon Free Economic Zone (IFEZ), South Korea’s first FEZ, and

connected to Incheon International Airport by a 12 km bridge, Songdo differentiates itself from previous new towns in and around Seoul, which were public sector developments. One of the key draws of Songdo is its strategic location in the Northeast Asian trading hub, which means residents can reach one third of the world’s population within 3.5 hours.” [13]



Figure 3.4: Songdo Master Plan
(Source: Forbes) [13]

Location: Along Incheon’s waterfront, 65 Kilometres southwest of Seoul, South Korea, and connected to Incheon International Airport by a 12.3 kilometer Incheon Bridge. Along with Yeongjong and Cehongna, it is part of the Incheon Free Economic Zone.



Figure 3.5: Location Map of Songdo (Songdo IBD from 2015), South Korea.
(Source: Gale International 2015) [14]



Figure 3.6: Commuting to Songdo by car.
(Source: Gale International 2015) [14]

Size: 600 hectares (1,500 acres) of reclaimed land.

Estimated cost: USD \$40 billion

Intended population: 252,000 (with 300,000 – 400,000 commuters)

Financing strategies: The project is a joint venture between the City of Incheon, Gale International (61%), POSCO E&C (30%), and Morgan Stanley Real Estate (9%). Stanley Gale, the developer, has invested \$100 million of his own money. Asia Development institute, Arup & Partners, and CISCO Services Korea are also key investors.

Planners / contractors: The initial primary designer was OMA but is currently Kohn Pedersen Fox (KPF, New York), along with Kunwon architects, Heerim, Yooshin, John Portman & Associates and Gansam Partners. MVRDV (Netherlands) and REX (U.S.) have also contributed to the planning and design of the city. The master plan of Songdo International Business District was developed by NSIC, which is co-led by Gale International and the Posco Group.

Time line: [12]

- 4 2005, Start to build with over \$40 billion invested into its construction;
- 5 2009, Songdo IBD opened.
- 6 2011, in a calculated effort to save face, Cisco published a thinly researched white paper frantically touting the social, economic, and environment benefits of smart cities." As Lindsay later explained to me, Songdo had become too big to fail. [8]
- 7 2015, Proposed completion date initially

8 2022, Completion date postponed.

Environmental and sustainability strategies: To minimize its ecological impact by limiting damage to the environment and by achieving energy independence as much as possible.

- 1) All major buildings employed both Korean standards and LEED certification.
- 2) Use the central pneumatic waste disposal system to dispose of the rubbish, and to eliminate the need for garbage pick-up.
- 3) Low U value windows are used in buildings as well as LED lights, a water-cooled air conditioning system, and solar energy, which reduces energy consumption in each building by 30%.
- 4) There are 25 km of bike paths, extensive walking paths, and 40% green space.
- 5) The city is built around a 'central park' that uses indigenous plants.
- 6) Smart city builds upon the principles of New Urbanism, Smart Growth, Transit Oriented Development and Green Growth.
- 7) Electric vehicles' charging stations are provided throughout the city. [12]

Attractivity:

Respond to the overcrowded and expensive conditions in Seoul, Songdo is designed to provide a comfortable place for international business people and their families. Policies to attract residents and businesses include:

- 1) Significant economic incentives to attract foreign investment.
- 2) E-government intended to streamline civil services.
- 3) International schools (70% foreign, 30% Korean), including Songdo Global University and foreign medical facilities.
- 4) Incentives for technology companies, such as tax reduction on royalties, tariff reductions, high-speed wireless, and the ability to access personal data throughout the city.
- 5) Tax incentives for dividends of foreign investors, and income tax exemption for non-Koreans. [12]

Local challenges:

- 1) The location Songdo's is proximity to Seoul, which could be an advantage for business and commuters, but also presents a danger of becoming a bedroom community, as has happened in many other new towns closed to the Seoul area. At present, the city feels rather empty since the occupancy rates are lower.
- 2) Although the city aims to be 'green', any development alters the natural environment and Songdo is a destination for migratory birds. The city has faced challenges balancing its sustainable development goals with environmentalists' calls for preserving bird habitats now. [12]



Figure 3.7: Bird habitats facing challenges
(Source: The Ubiquitous-Eco-City of Songdo) [16]



Figure 3.8: The barrage disrupted a brackish zone.
(Source: The Ubiquitous-Eco-City of Songdo) [16]

Technology:

- 1) Sensors are planted throughout the city to monitor everything, such as temperature and traffic patterns to help alert residents of what their days might look like. [13]
- 2) Instead of having garbage trucks collect trash the waste is automatically "sucked" out of each house into a central system that then uses it to create compost. [13]

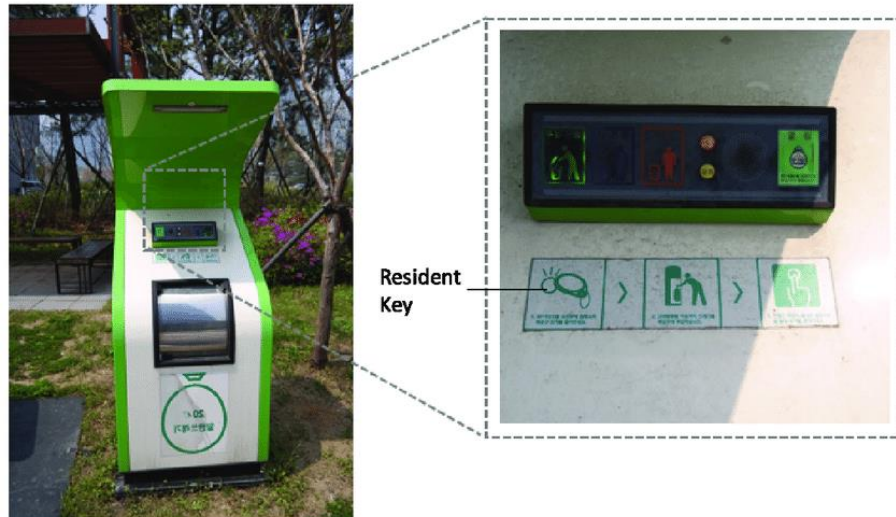


Figure 3.9: Street-accessed waste bin system
(Source: The Ubiquitous-Eco-City of Songdo) [16]



Figure 3.10: Songdo underground system pipes
(Source: The Atlantic) [17]

- 3) Telepresence is outfitted in schools and homes, the buildings themselves are designed to be sustainable and eco-friendly, and the city itself is designed around open spaces. [13]
- 4) The developers have even included the pressure-sensitive flooring for the homes of older residents, where it's once again touted as being able to detect falls and summon assistance. It's quite a comprehensive and audacious vision. [7]
- 5) Driven by the Cisco Innovation Center in Songdo, a living lab called the "IoT (Internet of Things) Cube" debuted to the public in November 2015. Businesses and startups can pilot their developing solutions right to the public on the street. Cisco infrastructure was included in the IoT Cube, including solutions like Wi-Fi, fog computing, and security. This lab is

then able to gather real-time data, feedback and analytics from Songdo's real citizens, making the IoT Cube an essential testing ground for all of the city's future solutions and innovations. This constant influx of information allows for the improvement of the smart city. [13]



Figure 3.11: IoT Cube in Songdo [13]
(Source: Cisco)

Intended influence

- 1) It is the birth of what Michael Joroff of MIT describes as a "new city-building industry," new pattern of partnerships between real estate developers, institutional investors, national governments, and the information technology industry. This ambition to become the archetype for Asia's hundreds of new towns is why scale matters so much for Songdo.
- 2) The national government modernized telecommunications laws, invested in a national broadband network, and launched a volley of new policies to push the use of broadband in education, health care, and delivery of government services. From just 700,000 mostly dial-up Internet subscribers in 1997, by 2002 Seoul was home to some 4.5 million broadband households. That year, as plans for Songdo were only just taking shape, one in every twelve broadband Internet users in the industrialized world was living in Seoul, and one in six was Korean. There were more broadband homes in the single city of Seoul than in the entire nations of Canada, Germany, or the United Kingdom. Over twenty thousand Internet cafes, or "PC bangs" (literally, "PC rooms"), had created a broadband culture unlike anything else on earth. The city was unique in the world, a glimpse into a high speed connected future. [8]
- 3) It was, in fact, the first of a series of "u-cities" conceived by the national government to make Korea a world leader in smart-city technology and construction. [8]

Current situation:

- 1) News on 2012: “Real estate agents say that since Songdo won the bid to be home to the GCF, over 1,000 new apartments have been sold. But not all apartments have increased in price and an analyst reported last week that Songdo apartment prices have in fact dropped over the course of a month by 0.99 percent.” [12]
- 2) News on 2018: “More than a decade on from its inception and the city is less than a quarter full, with just 70,000 residents. It’s an odd mixture of wastelands intermingled with random large-scale development. People aren’t coming and neither are businesses – fewer than 50 big brands have bothered – and public transport is a pain. It’s a laborious two-hour connection to downtown Seoul. The streets, footpaths and cycle lanes and racks are strangely empty for such a large city, there’s no presence of culture – no museums, theatres and just one cinema. On weekends, the cycle racks are empty and the area is desolate. One critic said it had a “Chernobyl-like emptiness” to it...Songdo local Shim Jong-rae tells a different story. The high cost of living in Songdo is driving local people back into Seoul and the city is now being built around foreigners.” [15]
- 3) Far from giving up on the project, Songdo's developers are now going out of their way to entice foreigners, including Brits, with the construction of 'American Town'. [16]



Figure 3.12: Empty Songdo street
(Source: Mail Online) [16]



Figure 3.13: One of the deserted subway station in Songdo
(Source: Mail Online) [16]



Figure 3.14: Abandoned Computers on streets
(Source: Mail Online) [16]

Criticisms:

- 1) Ironically, for a project whose marketers tout it as “one of the world’s greenest cities,” Songdo’s 1,500 acres were manufactured in a massive landfill operation.“ Where shore birds once nested in ecologically critical coastal wetlands, some 22,500 apartments and over 50 million square feet of commercial space are being built, along with a golf course designed by lack Nicklaus. [8]
- 2) Truly poor people can’t even afford the personal gadgets that smart cities take for granted (laptops, smart phones, reliable internet access). This exclusionary city-making exacerbates spatial segregation and leads to fragmented demographics. This in turn leads to higher crime rates and heightened social tensions. Especially in emerging economies, this

seems like something planners might prefer to avoid rather than encourage. [17]

- 3) As a result, the smart city as we encounter it in Songdo, Masdar City and PlanIT Valley seems to lack a certain something. It is not simply that these sites are literally ahistorical. It's that their developers appear to lack any feel for the ways in which cities actually generate value for the people who live in them.
- 4) A typical example is a promotional video for Cisco's efforts in Songdo, in which Jean-Louis Massaut, director of Cisco Services Korea, explains that We connect everything together so that we can bring the benefits of reducing maintenance cost of the building. But Massaut never asserts that the maintenance cost of buildings equipped with the Cisco technology is actually lower than comparable structures. Similarly, IBM's Smarter Cities practice promises that civic administrators will have the tools to analyze data for better decisions [and] anticipate problems to resolve them proactively, but neither specifies better decisions that have actually been made, nor deigns to identify any problems that have, in fact, been resolved proactively through the use of their tools.
- 5) Interestingly, most of the extant smart-city schemes make the selfsame mistake of overspecification at the level of urban planning. Instead of providing residents with parcels and structures flexible enough to permit ready adaptation as their needs change over time, these schemes partition activity into tightly programmed zones.
- 6) Proponents could not possibly be any more forthright about their aspirations. The claims made for the quality of life in the canonical smart cities may be extravagant, verging on absurd, but they are never anything less than explicit; New Songdo developers Gale International, for example, boast that their confection will sport the skyline vistas of New York, the strolling walks of Boston, the reflections of Venice, the kinetic energies of Wall Street, the pocket parks of London the stunning impact of Sydney's Opera House, the street scenes of Paris and Soho, the polish of Park Avenue. This, bluntly, is cargo-cult urbanism. Gale's strategy for Songdo amounts to replicating all these signifiers of great cosmopolitan place¹⁵⁴, assembling them on one site and hoping that something resembling true city magic results. It's just barely possible that their effort will produce impressive pictures for a website or a brochure something staged and static, in other words but it badly mistakes the dynamics that undergird the quality of urban life. [9]

Similar Project:

Masdar City in the United Arab Emirates, and a curious settlement in Portugal called PlanIT Valley.

These are putatively urban-scale environments designed from the ground up with information processing capabilities embedded in the objects, surfaces, spaces and interactions that between them comprise everyday life.

3.3.2 Sidewalk Toronto



Figure 3.15: Toronto Waterfront design sketch
(Source: Betakit) [22]

Key words:

Community; Affordable; Engagement; Privacy; mixed-use; The City of the Future; sustainable neighbourhoods

Basic Information: Sidewalk Toronto is a joint effort by Waterfront Toronto and Alphabet's Sidewalk Labs to create a new kind of mixed-use, complete community on Toronto's Eastern Waterfront, beginning with the creation of Quayside. The project will combine forward-thinking urban design and new digital technology to create people-centred neighbourhoods that achieve precedent-setting levels of sustainability, affordability, mobility, and economic opportunity. [22]

It hopes the project will become a model for 21st-Century urbanism.

But the deal has been controversial, representing one of biggest ever tie-ups between a city and a large corporation. And that, coupled with the fact that the corporation in question is one of the largest tech firms in the world, is causing some unease. [23]

Location: Quayside, located at Parliament Slip, just southeast of Downtown Toronto.

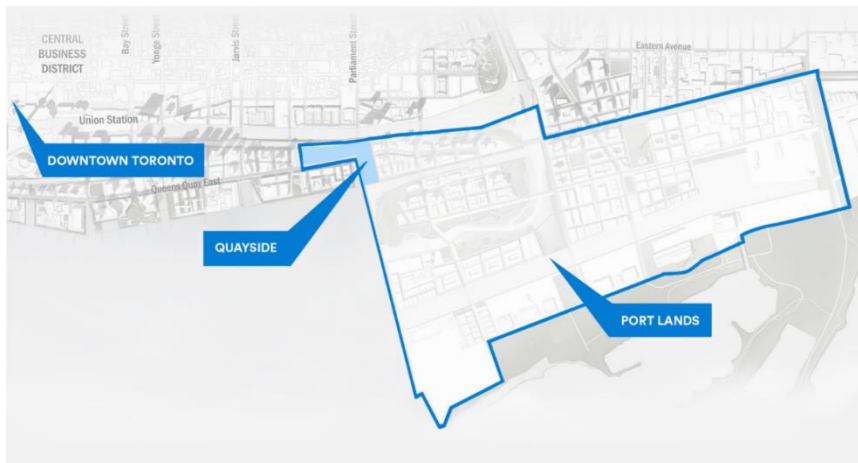


Figure 3.16: Quayside Location
(Source: Sidewalk Toronto) [22]

Size of Waterfront Toronto: more than 325 hectares (800 acres), one of North America's largest areas of underdeveloped urban land.

Size of Quayside (1st Phase): 12-acre

Estimated cost: USD \$50 Million for the 1st Phase.

Time line: In 2014, The project started with an email sent by Eric Schmidt, Google's then executive chairman, to Dan Doctoroff in 2014. The subject line read, "The City of the Future."

In 2015, Sidewalk Labs was announced to the world. Doctoroff and his team spent the next two years studying more than 100 urban initiatives.

In 2017, Waterfront Toronto Launched, the City of Toronto, with support from the Canadian government, was looking for a partner to rebuild and revitalize roughly 750 acres of land along the Eastern Waterfront. The first phase, or pilot, would be Quayside, a 12-acre site close to the central business district. Alphabet-owned offshoot Sidewalk Labs announced that it had won the bid and given the project a new name: Sidewalk Toronto.

Objective:

- 1) Establish a complete community that improves quality of life for a diverse population of residents, workers, and visitors.
- 2) Create a destination for people, companies, startups, and local organizations to advance solutions to the challenges facing cities, such as energy use, housing affordability, and transportation.
- 3) Make Toronto the global hub of a rising new industry: urban innovation.
- 4) Serve as a model for sustainable neighbourhoods throughout Toronto and cities around the world. [22]

Vision:

- 1) The Eastern Waterfront will be a new type of place that combines the best in urban design with the latest in digital technology to address some of the biggest challenges facing cities, including energy use, housing affordability, and transportation.
- 2) It will be a place that embraces adaptable buildings and new construction methods to make housing and retail space more affordable. A place where people-centred street designs and a range of transportation options make getting around more affordable, safe, and convenient than the private car. A place that encourages innovation around energy, waste, and other environmental challenges to protect the planet. A place where public spaces welcome families to enjoy the outdoors all day and all night and where community ties are strong. A place that's enhanced by digital technology and data, without giving up the privacy and security that everyone deserves.
- 3) Knowing that great neighbourhoods aren't planned from the top down, Sidewalk Toronto will create the conditions for a community to be built and innovations launched by people, companies, startups, academic centres, and local organizations over many years. Sidewalk Toronto aims to make the Eastern Waterfront the global hub of a new industry focused on urban innovation to improve the quality of city life, tapping into Toronto's already-thriving tech sector and developing innovations that could benefit communities and neighbourhoods elsewhere in the city. To help get started, Alphabet plans to move Google's Canadian headquarters to the Eastern Waterfront. [22]

Technology and actions:

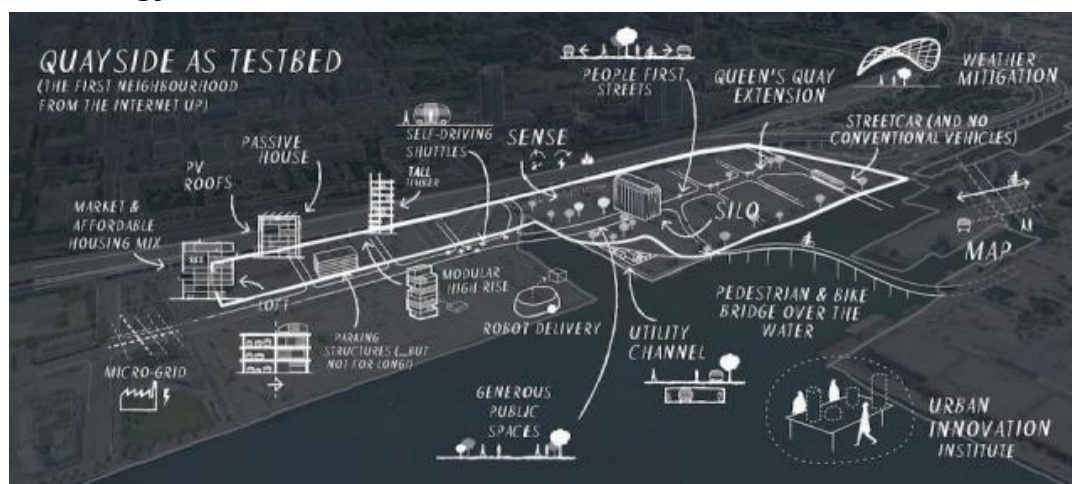


Figure 3.17: A notional map of the Quayside neighbourhood
(Source: Sidewalk Toronto) [22]

- 1) Buildings will be made from eco-friendly buildings materials, including tall timber skeletons and mycelium insulation, and powered by renewable energy sources, including roof and wall-mounted solar panels. They'll be

warmed and cooled by a thermal grid that leverages waste heat from sewers and buildings as well as geothermal sources and nearby lakes. Homes will also be LEED (Leadership in Energy and Environmental Design) certified and meet the energy-efficient Passive House standard developed by two professors in Germany (where it's known as Passivhaus) in the early 1990s.



Figure 3.18: Housing vision for the Quayside neighbourhood
(Source: Sidewalk Toronto) [22]

- 2) The team wants the Eastern Waterfront to be the first district in Toronto where only shared and self-driving vehicles are allowed. Non-emergency vehicles will be banned from "a large portion" of the neighborhood, giving space back to pedestrians and cyclists. A "transition zone" will exist for people who need to travel beyond Quayside, but the idea is to promote a walking, cycling and public transit culture in the center.
- 3) An "adaptive traffic light" concept will be pilots to detect and prioritize cyclists at busy intersections.



Figure 3.19: Mobility vision for the Quayside neighbourhood
(Source: Sidewalk Toronto) [22]

- 4) Quayside is envisioned as a series of layers. At the bottom is a network of

tunnels, or utility channels, which serves as the city's near-invisible infrastructure. Above is the public realm, or street level, which serves as a foundation for its mobility and building concepts. At the highest level is the digital layer, which combines a network of sensors, a detailed map of the neighborhood, simulation software and a platform where citizens can log in and manage their public and private data.



Figure 3.20: Utility channel concept art
(Source: Sidewalk Toronto) [22]

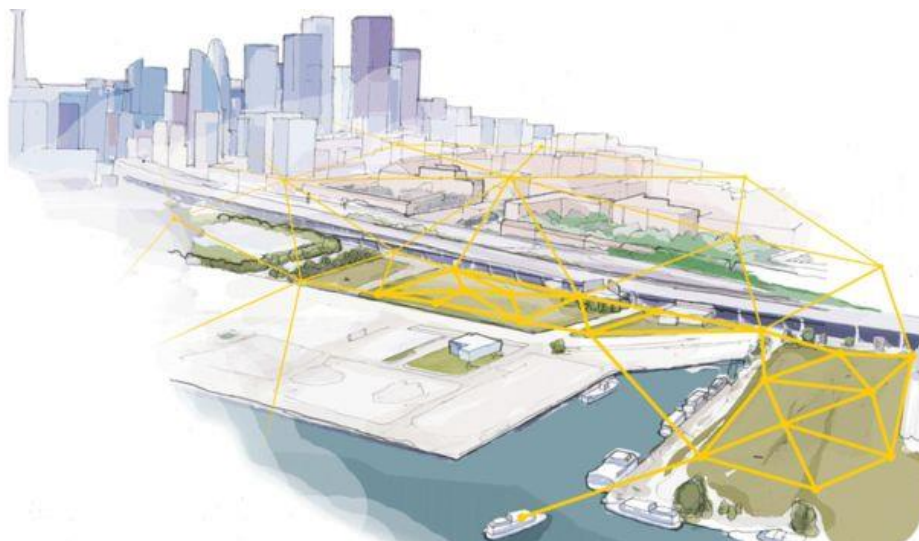


Figure 3.21: The city would collect data from a range of sources
(Source: Sidewalk Toronto) [22]

- 5) The company is thinking about a Smart Chute system, for instance, that tracks how much waste people are throwing away. It would then be possible to charge residents per bag, promoting waste reduction and generating cash for city refurbishments. Such a move would also help Quayside to reduce its environmental impact and the amount of traffic running through its underground tunnels. [24]

- 6) “Weather mitigation” tools such as awnings and heated paths to get people outside more in the winter. [28]
- 7) A close-knit community, promote the medical treatment and aged service, and future reduce cost by using the collected data. Create a vibrant community that people with different income and age are able to find a sense of belonging.



Figure 3.22: Concept art for the Quayside neighbourhood
(Source: Sidewalk Toronto) [22]

Strength:

- 1) Cooperation between different field; Public engagement, with a variety of events, activities, and opportunities designed to get Torontonians involved in the co-creation of Sidewalk Toronto.



Figure 3.23: Public realm vision for the Quayside neighbourhood
(Source: Sidewalk Toronto) [22]

- 2) Their commitment to meaningful public engagement, collaboration, and co-creation puts people at the centre of Sidewalk Toronto.
- 3) Embracing diversity across the Greater Toronto and Hamilton Area.
- 4) A belief that every resident should have a voice.
- 5) Working in good faith in service of the public good.
- 6) Ensuring our work is inclusive of and accessible to all.
- 7) Respect for continuous learning and the expertise of lived experience.
- 8) A belief that solving complex issues requires genuine collaboration [22]

Current situation

In many respects, Sidewalk Labs is building Quayside from scratch. The coastline area already exists, but the company is imagining a complete revamp that includes roads, buildings and public areas. [24]

Challenges:

- 1) Google makes its money by tracking internet users and serving them highly targeted ads. It's the revenue engine for Alphabet that, in turn, allows Sidewalk Labs to operate so freely. As a result, people are worried about Quayside and how residents' data will be treated. Will Sidewalk Labs have full access to the information collected by its sensors? How will data be shared with the company's partners? Will citizens be able to opt out of certain programs, and if so, how will it affect their quality of life in the city? Privacy and security problem.

Solving:

- a. Limiting data capture to the "bare minimum" throughout the city. The company's internal Sense Lab, for instance, is developing a camera system that strips surveillance footage down to a series of faint outlines.
 - b. When that happens, the company will have to survey Quayside residents or ask them for approval, just like developers do now with user agreements in the App Store. Cerrudo suspects the company will introduce an "end-citizen" agreement that includes automatic approval for all technological changes in the city. The organization will, therefore, create an independent Digital Strategy Advisory Panel to assist on the project. Members will be plucked from the academic, legal and civic technology communities and help Waterfront Toronto shape its digital-governance requirements.
- 2) If the Eastern Waterfront has a complete ban on private vehicles, that will make it a difficult place to visit -- a futuristic but isolated community.

Solving: the company is thinking about a transition zone.

- 3) Many wonder how Sidewalk Labs will make money on Quayside. The company's insistence on privacy by design suggests it won't be harvesting data like its sister company Google.

Solving: The company has some time to figure it out. It will spend most of this year developing ideas, listening to the public and crafting a Master Innovation and Development Plan. There will be opportunities, though, for Sidewalk Labs to charge a fee for its services.

- 4) Sidewalk Labs found it "difficult" to balance these two cultures (Urban planner and engineer) in its first year of operations. "It led to some conflicts," said Rit Aggarwala, chief policy officer at Sidewalk Labs. "It led to a bunch of misunderstandings where it wasn't an intentional conflict. We just realized we weren't speaking the same language with each other."

Solving: The urbanists had to be more explicit about the risks they were

identifying, and the technologists had to be more attuned to where something could go wrong. Similarly, the developers needed to retain their enthusiasm and speed while protecting the values that urbanists believe are important. [24]

Difference with Songdo

- 1) Sidewalk is committed to affordability and avoiding Songdo's reputation as a half-empty city for the rich. It's banking on a blend of simple and old-fashioned pricing models, including social tenants, private renters, subsidized renters and full-fledged homeowners. "A partial homeownership program might be a perfect fit for a family looking to settle down, whereas a retiree on a fixed income may require a rental subsidy," the company explained. "Sidewalk proposes to make Quayside a living laboratory for housing policy innovation that delivers a mixed- occupancy community that mirrors Toronto's socioeconomic diversity."
- 2) It's part of an old, established city that has its own culture and expectations. With Quayside, Sidewalk Labs wants to build a neighborhood with a strong sense of community.
- 3) Doctoroff knows how important it is to win the public's support. On November 1st, 2017, he participated in a community town hall with Will Fleissig, CEO of Waterfront Toronto, which was open to the public and streamed online. Fleissig was keen to stress that nothing about the project is set in stone. "It starts tonight," he said. "We're having this discussion, and we're listening. There is no plan in place. We can actually co-create by bringing together a lot of different partners, and together, we'll figure out what should happen on the Waterfront."
- 4) Sidewalk is committed to affordability and avoiding Songdo's reputation as a half-empty city for the rich. It's banking on a blend of simple and old-fashioned pricing models, including social tenants, private renters, subsidized renters and full-fledged homeowners. "A partial homeownership program might be a perfect fit for a family looking to settle down, whereas a retiree on a fixed income may require a rental subsidy," the company explained. "Sidewalk proposes to make Quayside a living laboratory for housing policy innovation that delivers a mixed- occupancy community that mirrors Toronto's socioeconomic diversity." [24]

3.4 Smart City Development in Different Cities

3.4.1 Cities in USA

1) Philadelphia

The smart city contribution in Philadelphia was started on 2004, when the mayor of the city was Jane Street. The aim was to develop a wireless Philadelphia, that blanket the city's 135 square mile with low-

cost, ubiquitous, citywide coverage Wifi to make it a cooler place to live (according to the Jone Street). Network as an engine of rejuvenation for the economically depressed city, and the power of technology and getting it into the hands of the neighborhood.

Even Philadelphia had tremendous political support and private capital driving its expansion, it had tremendous degree of public engagement, and even strong media support, one of the first battles over the smart city took place at there. The development of this project turned being tough. The Greg Goldman who was the project's former CEO mentioned that "Everything that the project had going for it, turned against it."

The wireless Philadelphia was facing plenty of problems: deployment challenging, Wi-Fi technology limitation, telecommunications companies' obstruction.

At beginning of the project, the formula of wireless Philadelphia was rapidly copied by other cities, however, at the end, only Philadelphia in Pennsylvania was privileged and allowed to complete its project to build a public broadband network. In the end, Philadelphia did get its wireless network after all with mere \$2 million.

Goldman believes that it is unfair to depict Wireless Philadelphia as an utter failure. "This was a beta project for all that cities are trying to do today," he says. Philadelphia's wireless network which linking up video surveillance cameras and city workers' handheld devices, was then be repurposed for public safety and government operations. After so much turmoil, it was a fire-sale bargain for the city; the lessons of Philadelphia have led to more successful efforts in dozens of other communities around the United States. Communities that pursue Wi-Fi today, like Chattanooga, Tennessee, are doing it in a more systematic, targeted, and understated manner- and it is often an add-on to a more robust fiber-optic network rather than a substitute for wired connectivity. [29]

The government document Philadelphia. Smart City. Smart Choice was published on 2010, under the Mayor Michael A. Nutter 's leadership. On 2016, the document was released again by new mayor James F. Kenney. In the document, Philadelphia would be smart in three aspects, which are Smart Location, Smart Company and Smart Living. For the Smart Location, Philadelphia is at the center of a dynamic and thriving region. Philadelphia delivers a robust market for business from the scale of the region, to the national and global

access of the East Coast location. Fortune 1,000 companies and the next wave of emerging companies will move to there because of its economic growth, cost of living, innovative culture and highly educated, diverse workforce. With approximately 60% of downtown residents holding a Bachelor's Degree or higher, Philadelphia offers a broad range of experience and talent. [28]

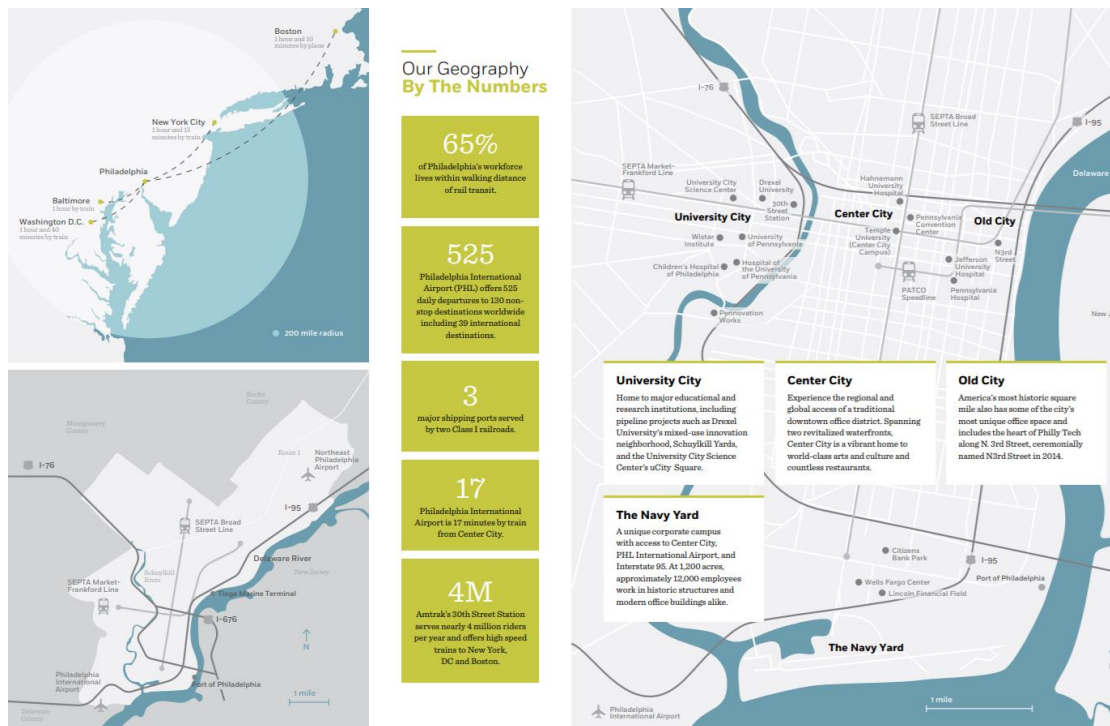


Figure 3.24: Smart Location of Philadelphia
(Source: Philadelphia. Smart City. Smart Choice) [28]

For the Smart Company, a culture of innovation is in Philadelphia's DNA. The regions' growing population has sparked an inspired creative culture that is cooperation with future-focused, innovative business and education institutions. All business sectors are benefiting from regional innovation, new opportunities and economic growth. There are over 300 healthcare facilities are in this region, including four children's hospitals, Six medical schools, and 197 hospitals. The visionary medical research and life science organizations in Philadelphia attract internationally recognized thinkers and investors to develop life changing products technologies.

On the other hand, Philadelphia is home to many global market leaders and innovative companies, especially in financial and professional services. Collaboration between the thriving tech, design, Science and art communities is fueled by the drive for innovation and commercialization with the region's VC investors,

higher education institutions and the business community. [28]

For the Smart Living, Philadelphia has a vibrant and celebratory nature energized by the second largest residential downtown in the country. Streets are lined with independent shops, world-class restaurants, art galleries and music venues. A central part of peoples' daily lives is Fairmount Park, one of the largest urban parks in the world. Biking and walking trails weave through the city unlike other cities in the U.S. Living in Philadelphia is convenient because of its extensive public transit network, used by a third of the region's population, includes buses, subways, trolleys, and regional rail lines. Northeast corridor offers short distance travel and easy access to neighbor cities. Compared to residents of other northeast markets, Philadelphians enjoy an exceptional living experience at a highly affordable coast. A seemingly endless variety of unique neighborhoods allow individuals and families to choose what is right for them, from historic row homes to condo-living. Warm and inviting Philadelphia communities from South Philadelphia to Kensington and University City to Old City, welcome new residents seeking to build careers and raise families. [28]

In February 2017, Philly was one of five U.S. cities awarded a Smart Cities Council Readiness Challenge Grant for its potential to use technology to solve citywide problems. The City has already made investments to support growth in technology while adopting innovation as a core value. As the City moves forward in using technology to improve quality of life, environmental stewardship, and economic development, working towards becoming a Smart City is the next step in continuing to strengthen Philadelphia's functioning.

After receiving the SCC grant, through the Office of Technology and Innovation, Philadelphia has issued a request for proposals (RFP) for a comprehensive and strategic Smart Cities roadmap. This roadmap will guide the city in its efforts to develop and utilize interconnected information, communication, and Internet of Things (IoT) solutions to strengthen its ability to serve Philadelphia's residents and businesses. This plan, set to be released in 2018, will outline the city's major initiatives, tailored to each neighborhood's specific needs.

In designing this roadmap, certain projects have gained more traction, falling into three predominant categories: firstly, Open property data, streamlined and available on one platform. Currently this is being done through Atlas, a city app that compiles information including property history, zoning, and recent activity including 311 service

requests and reported crime. Secondly, Parking solutions that utilize camera technology to guide drivers to the nearest available parking spots. This would decrease traffic and pollution from idling, while increasing efficiency through the use of smart traffic lights and accident detection. Finally, Digital inclusion to ensure that smart city projects are not based exclusively in downtown city centers. Through "hyper-local economic initiatives," developers hope to provide smart utility and street meters, and more affordable housing options, to all neighborhoods. Furthermore, the use of smart metrics would also increase access to virtual healthcare, by connecting Philadelphia residents to care professionals.

According to Mayor Jim Kenney: "We have been building a coalition of city, community, business and educational institutions. They are all enthused and ready to help with smart city projects focused on the built environment, telecommunications and basic public services. We know the technology behind us is important for our citizens and businesses alike, and the expertise that the Smart Cities Council brings will help us realize those opportunities." [29]

2) Washington DC

With the aim of restructuring the city's schools and expanding community policing, driving down crime. Technology played an important role, allowing informants to send text message to the police department anonymously. Challenged the local tech community to create software that would exploit new public resource by a contest: Apps for Democracy, which launched in October 2008.

Low-cost combination was an irresistible tool for mayors facing growing demand for interactive services from smartphone-toting citizens, and an economic recession that decimated their budgets. The needed data was already mostly online in many cities, but scattered across a constellation of government websites. All a city had to do was assemble it in one place. The World Bank was exporting the model to the developing world through its own Apps for Development contest held in 2010.

The success of apps contest comes from their ability to quickly assemble technical teams that can repackage government data in novel way that are valuable to citizens and local businesses. As good as they were for brainstorming and stretching the notion of the possible, apps contests have produced few scalable, sustainable successes over the long run.

The real problem with apps contests driven by new government data, as we have seen, is that they rely on programmers to define problems, instead of citizens or even government itself. It leaves both user needs and likely user behavior out of the equation, instead beginning with an enormous data dump and asking developers to make something cool out of it." The data-centrism of city apps contests is all the more curious because it ignores the key incentives of the wildly successful philanthropic grand challenges that inspired them, not until the fourth annual BigApps contest in 2013 did New York City finally engage a variety of partner organizations with deeper knowledge of its citizens' most pressing problems to define briefs on what it called BigIssues in four categories- jobs, energy, education, and health. And none of the apps contests to date have dictated that entrants hand their code over to government or even open-source it -in the end, it has been up to cash-strapped developers to maintain the software and any server infrastructure it requires. In addition, the apps contest highlighted the gap between haves and have-nots in smart cities, since the attending people since a lot of applications that are designed for smartphones and devices that aren't necessarily used by the large populations that might need to interact with these services on a regular basis, according to the Washington's new chief technology officer Bryan Sivak's assessment.

Initially, the contest won a success. However, the vast majority of apps entered into contests are quick abandoned. Apps contests are having a positive long-term economic impact, regardless of whether they deliver useful technology. They have catalyzed a community of technologists inside and outside government who are committed to improving the lives of residents and visitors.

Winning entries ranged from Point About, an iPhone app for receiving real-time alerts on crime, building permits, and other essential city operations, to DC Historic Tours, a Google Maps mash-up for making customized tourist itineraries out of Wikipedia entries and Flickr photos of historic places.

Unlike most contest-generated apps, transit apps have a huge preexisting market, making it possible to build variable businesses that leverage open government data: improving the apps rather than abandoning them and good public policy; the hilly city of Bristol England, commissioned "Hills Are Evil!", an app that "provides people with restricted mobility, cyclists, skateboarders, the elderly, and people pushing pushchairs, the ability to identify the most appropriate route between two places."

In 2015, the state and city of Washington announced the implementation of technology initiatives across the Pennsylvania Avenue called as 'PA 2040'. The first phase began with the deployment of LED street lights and installation of gigabit public WiFi in the avenue. The LED street lights are the motion sensing lights that turn on/off considering the time when it gets dark and the time when people are around. A smarter feature of these lights is, it collects data that will be used in improving the district operations through tailor-made applications. Moreover, the lights are equipped with gigabit public WiFi that can be used in the proximity. In the long run, DC aims to replace all 70,000 lights of the city with smart LED. So, with the phase 1 accomplished and the Cisco's partnership already in motion, Cisco declared Washington as the first 'Lighthouse City' of US.

The PA 2040 project will provide a better, more rewarding experience to everyone who uses the west Pennsylvania Avenue corridor—visitors, workers, residents, and businesses, as well as the local and federal governments.

Moving forward, the company will also invest in phase 2 of PA 2040 which includes: Outfitting new technology trend in smart parking project; Installation of sensors in trash cans (part of waste management project); Equipping energy and environment projects with the latest technology; Along with Cisco's technology contribution, the company has promised to establish network education centres and innovation centres for the evolvment of startups and growth of students.

With ample of projects under progress, DC's partnership with Cisco will prove to be beneficial in opening new channels of opportunities that will create new economic infrastructure, boost up a number of jobs and improve education combined with innovation and knowledge keeping public as well as private sectors in consideration.

Phase II of PA 2040 PoC focuses on adding smart city technology to develop scalability, sustainability, and interoperability models and frameworks. Some of the initial technologies and applications that are being evaluated include Environmental Sensing, Water Quality Sensing, Smart Parking, Movement Analytics and other applications enabled through video nodes. [30]

On February 4th 2016, DC government submitted the document

“Smart DC, Making the District a Smart City” in response of the U.S Department of Transportation’s Notice of Funding Opportunity. The document expressed that a new Smart DC is needed to address a multitude of challenges, including recent and future growth pressures, income disparities, and persistent congestion across modes of transportation. Smart DC focuses on collaboration across agencies and sectors in a strategic and inclusive way to address challenges and capitalize on the opportunities presented by 21st-century technology and best practices for city governance and management.

Smart DC connects transportation with the city’s other system, such as communications, the built and natural environments, and the economy. The vision for Smart DC build upon three key elements: Smart infrastructure, Smart users, Smart agencies.

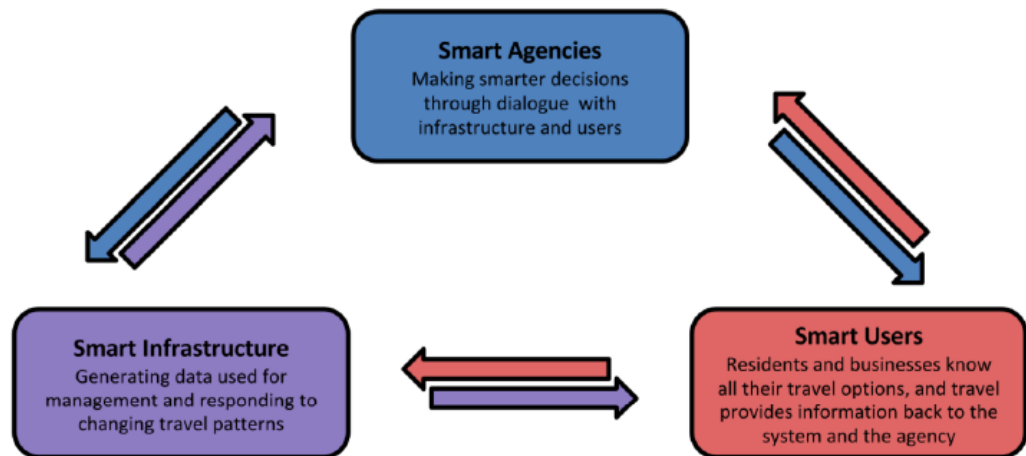


Figure 3.25: Smart DC Elements
(Source: Smart DC) [31]

The elements interacted together, to construct a city not only “smart” but also “connected” through several components.

To initiate Smart DC, pilot projects will be executed concentrating on the USDOT’s three top technology priorities for the Smart City Challenge—urban automation, connected vehicles, and intelligent, sensor-based infrastructure—across targeted geographic areas. The pilot projects will be focused in the core area, as well as other key corridors around the District, chosen according to following criteria: building on existing capital projects or planning initiatives; identified in the District’s Long-Range Multimodal Transportation Plan, moveDC, as supportive of high-capacity transit; identified in the District’s Vision Zero Action Plan as “high fatality” corridors; representative of geographic, demographic, and economic diversity through inclusion

of all eight Wards of the District.

Based on these criteria, Smart DC will focus on the downtown area and the following corridors: 16th Street, Georgia Avenue, H Street/Benning Road, New York Avenue, Martin Luther King Avenue/Minnesota Avenue, Pennsylvania Avenue, Wisconsin Avenue. The Smart DC pilot area includes 36 of 40 Metrorail stations in the District as well as diverse residential and business areas. In addition, the George Washington University (GWU) campus, the Southwest Ecodistrict, and the St. Elizabeths East campus will serve as “Smart Hubs,” hosting Smart DC applications, as well as other smart city elements beyond transportation, addressing sustainability, health, and other fields. Smart city deployments in these locations have already begun and they possess institutional support for further research and testing.

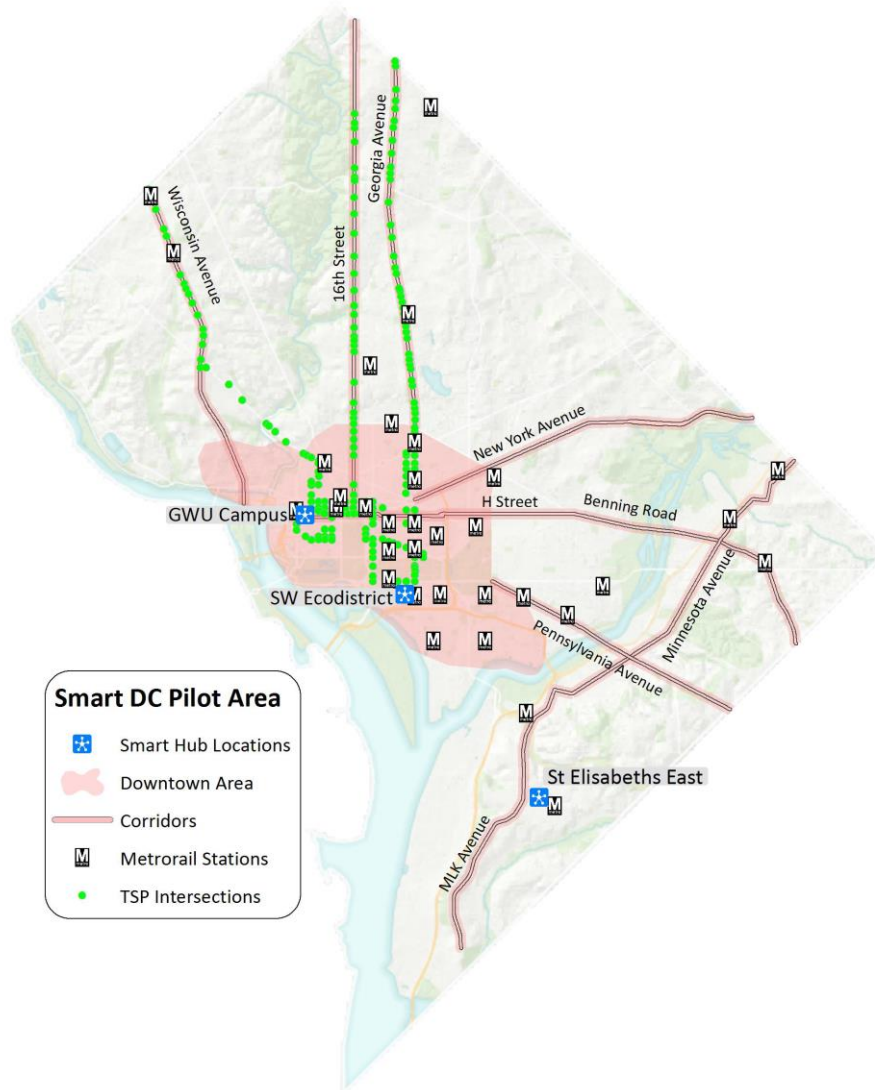


Figure 3.26: Smart DC Pilot Areas
(Source: Smart DC) [31]

The goal of Smart DC is for the District to become a connected city that benefits all components of the transportation systems—agencies, users, and infrastructure—and that the transportation systems support the District’s systems and broader goals. The objective of Smart DC is to build the foundation to integrate 21st-century technology into the District’s transportation systems. The District will deploy a platform that will provide all users the ability to provide feedback, test new technologies, and improve movement of people, goods, and services within the city. The District will build subsidiary goals and objectives to feed into the overall goal. This will be an iterative process forming a foundation for broad participation. With this foundation, the District will leverage the newest technologies and provide feedback on existing and emerging technology. [31]

In 2017, Washington welcomed a wealth of new, smart developments: It installed North America's first "intelligent" wastewater pumping system, equipped city trash cans with sensors, adopted five dockless bike-share pilot programs, installed free Wi-Fi across 17% of the city and was even named the world's first LEED Platinum city. These projects and more are what have motivated DC Chief Technology Officer Archana Vemulapalli to push toward a "smarter DC.

"We have taken a multi-pronged approach toward how we want to push out the smart city vision," Vemulapalli explained. She said focusing on the city's core values — to be resilient, sustainable, equitable, transparent and collaborative — has helped the city guide the investments and decisions that are made for smart growth.

Moving into 2018, Vemulapalli has highlighted three main drivers for development: mobility, public safety and the environment. She hopes for DC to become more strategic in how to leverage data in order to reach Vision Zero; to drive more resiliency efforts through the NIST public safety innovation program; and to work with the DOEE on "next level" planning now that the city is LEED Platinum certified. [32]

3) Chicago

A late convert to the smart city agenda, Chicago was lagging behind local rivals New York and Boston, and international leaders Barcelona, Amsterdam, and Singapore. But in 2011, Chicago’s new Mayor Rahm Emanuel outlined the important role technology needed to play, if the city was to address its main challenges.

In 2012, Mayor Rahm Emanuel issued an executive order establishing the city's open data policy. The order was designed to increase transparency and accountability in the city, and to empower citizens to participate in government, solve social problems, and promote economic growth. It required that every city agency would contribute data to it and established reporting requirements to ensure agencies were held accountable.

Chicago's application took the form of a platform called SmartData. Designed by Chicago's Chief Information Officer and Chief Data Officer Brett Goldstein, the project calls for an open-source predictive analytics platform that will help leaders make more efficient, informed decisions to help address and even prevent problems before they develop.

The SmartData platform could query data on traffic patterns and pedestrian activity for a certain section of the city, and then compare it against a host of other city data, such as weather patterns, traffic signal times, and streetlight access. By doing so, SmartData could then uncover meaningful correlations that, once revealed, would call for specific actions that help reduce pedestrian-traffic collisions. The City would be able to optimize city services of all kinds, benefitting citizens and reducing costs. Furthermore, by analyzing millions of lines of data, the City could then use these correlations as a predictive measure to determine where city resources would be needed most in the future. [33]

In 2013, the City of Chicago Technology Plan was released. This brought together 28 of the city's technology initiatives into one policy roadmap, setting them out within five broad strategic areas: Establishing next-generation infrastructure; Creating smart communities; Ensuring efficient, effective, and open government; Working with innovators to develop solutions to city challenges; Encouraging Chicago's technology sector.

The Array of Things is an ambitious programme to install 500 sensors throughout the city of Chicago. Described by the project team as a 'fitness tracker for the city', the sensors will collect real-time data on air quality, noise levels, temperature, light, pedestrian and vehicle traffic, and the water levels on streets and gutters. The data gathered will be made publicly available via the city's website, and will provide a vital resource for the researchers, developers, policymakers, and citizens trying to address city challenges.

A series of community meetings was held to introduce the Array of Things concept to the community and to consult on the city's governance and privacy policy. This engagement ranged from holding public meetings in community libraries to providing online forms, where citizens could provide feedback anonymously. In addition, the Urban Center for Computation and Data and the School of the Art Institute of Chicago ran a workshop entitled the "Lane of Things", which introduced high school students to sensor technology. The workshop is part of the Array of Things education programme, which aims to use sensor technology to teach students about subjects such as programming and data science. For eight weeks, the students were given the opportunity to design and build their own sensing devices and implement them in the school environment, collecting information such as dust levels from nearby construction and the dynamics of hallway traffic. The Array of Things project is funded by a \$3.1 million National Science Foundation grant and is expected to be complete by 2018.

With sensors and IoT, added data can be collected at 270,000 points in the city. The city already has 600 data sets on its open data portal for planners and app partners. Rich in data, the city has the foundation for a smart city platform.

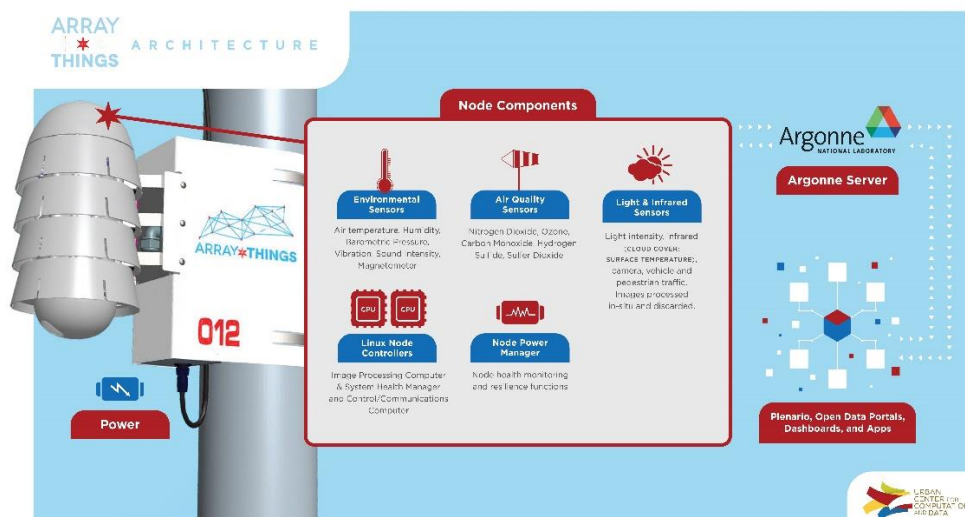


Figure 3.27: Array of Things Architecture (Source:GITHUB) [34]

Potential applications of data collected by the Array of Things include: Sensors monitoring air quality, sound and vibration (to detect heavy vehicle traffic), and temperature can be used to suggest the healthiest and unhealthiest walking times and routes through the city, or to study

the relationship between diseases and the urban environment;
Real-time detection of urban flooding can improve city services and infrastructure to prevent property damage and illness;
Measurements of micro-climate in different areas of the city, so that residents can get up-to-date, high-resolution "block-by-block" weather and climate information;
Observe which areas of the city are heavily populated by pedestrians at different times of day to suggest safe and efficient routes for walking late at night or for timing traffic lights during peak traffic hours to improve pedestrian safety and reduce congestion-related pollution.

Array of Things data and technology will also be available for educational purposes, engaging local students and training them on important job skills. Read about Lane of Things, our curriculum with Lane Tech High School in Chicago.

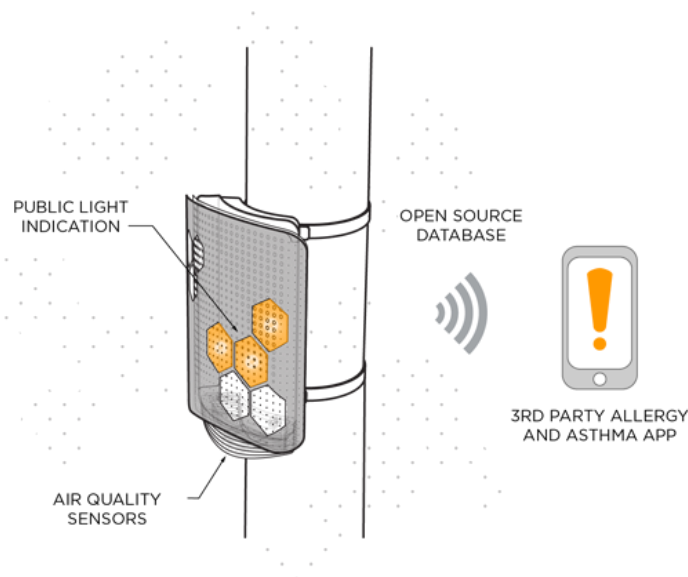


Figure 3.28: Array of Things Application
(Source: GITHUB) [34]

In 2016, the City of Chicago is working with local technology firm, City Digital, to produce a 3D map of the underground infrastructure, such as water pipes, fibre optic lines, and gas pipes. The project will involve engineering and utility workers taking digital pictures as they open up the streets and sidewalks of Chicago. These images will then be scanned into City Digital's underground infrastructure mapping (UIM) platform, and key data points will be extracted from the image, such as width and height of pipes, with the data being layered on a digital

map of Chicago.

In January 2017, Mayor Rahm Emanuel and Chicago Police Department commanders announced the expansion of ShotSpotter – a system which uses sensors to capture audio of gunfire and alert police officers to its exact location. The expansion will take place in the Englewood and Harrison neighbourhoods, two of the city’s highest crime areas, and should allow police officers to respond to incidents more rapidly. ShotSpotter will also be integrated into the city’s predictive analytics tools, which are used to assess how likely individuals are to become victims of gun crime, based on factors such as the number of times they have been arrested with individuals who have become gun crime victims. [34]

For the smart mobility, rich in local data, with apps and web services, people can find stores, restaurants, and child care. They can map safe walks, bike-friendly rides, and park paths for winter cross-country skiing. Smart city technology can dynamically adjust parking pricing to demand, allow people to find the best available and lowest cost parking, and give apps data to guide people to the least cost parking. Reduced driving and congestion result.

Chicago Transit Authority makes bus travel faster by using transit signal priority (TSP) on priority corridors. With TSP lights turn green sooner as buses approach and stay green until the bus has cleared the intersection. In the future, more sophisticated vehicle to grid and to vehicle to vehicle (V2X) will enable autonomous cars and shuttles to move faster and safer through the city, reducing congestion. These vehicles could be routed along roads with inductive charging and parked remotely off-peak. Smart mobility will be dimension in making Chicago a smart city.

Like most other cities, Chicago needs faster broadband networks for V2X success. Broadband may come from Wi-Max or 5G networks. Fast networks with low-latency response are needed by all cities for full smart city implementations. [35]

4) Boston

Boston was one the first cities to launch experimental smart initiatives in 2010. Led by then Boston Mayor Thomas M. Menino, the vision for city was to be a host for innovation, rather than having innovation just come from research firms or universities. Mayor Menino would come to identify Boston’s Seaport as the Innovation District, and became

the first official US city among 80 innovation districts around the world.

The year 2010 arrived with the most innovative plan for the City of Boston, Waterfront Innovation District. An idea of creating an innovation district was given ground existence in a 1000 acres land situated on the South Boston's waterfront peninsula. This initiative was led by Thomas M. Menino with a vision to host experimental innovation that will take place right in the heart of Boston. After having constructed the waterfront innovation district, Boston was officially recognised as the first US city amidst 80 other innovation districts across the globe. Leading companies work and collaborate with start-ups, business incubators and accelerators, bringing together the best leaders in business and the best minds in academia to socialize, experiment, and innovate.

In just three years' span, the innovation district became a success story. When the initiative was launched, the city was just recovering from the period of recession. It was a time when startups and companies were looking for space to work and grow. The innovation district with a wide variety of space including research centre, convention centre, offices, industrial sector, study campus and real estate became the perfect place for these companies to begin their innovative journey. On the other hand, for the City of Boston, it was a welcome opportunity that could sustain and enhance the innovation economy. [37]

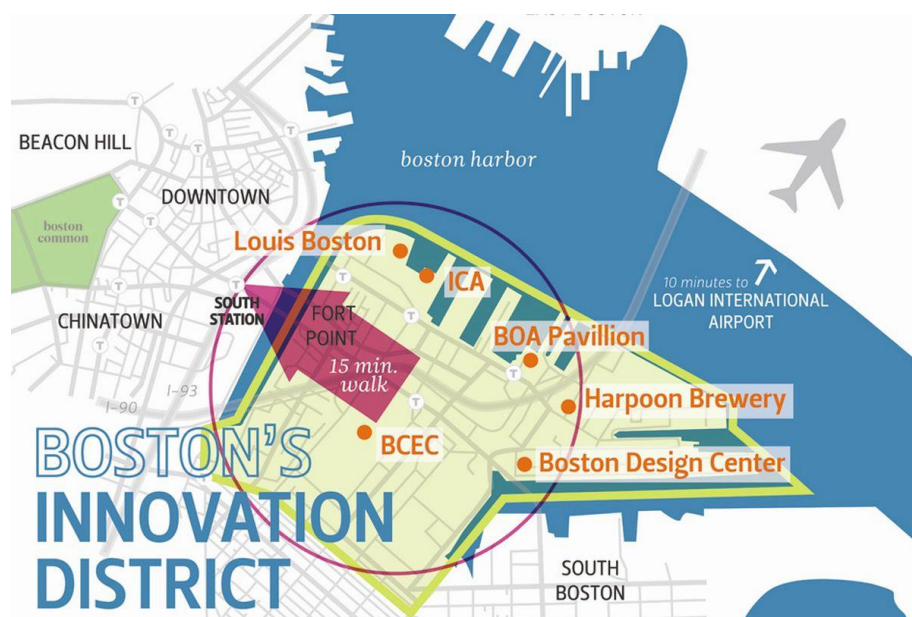


Figure 3.29: Boston's Innovation District
(Source: CURBED BOSTON) [38]

With the Aim of building a smart city by using technology to hack new solutions to address the everyday problems of citizens, Tom Menino focused on building tools for citizen engagement and insisted that technology is not part of their mission. Ensuring that the apps New Urban Mechanics built were both useful to Boston residents and "piloting something interesting and creative" perhaps results in fewer apps, he says, but apps that will be "sustained evolved and resonate more." It's the first approach to smart cities that feels as though it was designed by a political scientist rather than a software engineer. Take a web app "Adopt-A-Hydrant" example, it allowed neighborhood volunteers to claim local fireplugs as their own winter ward. In future snowstorms, "Adopt- A –Hydrant" will send text and e-mail alerts to let people know when and how to properly remove the snow from the fire hydrant they've "adopted. However, the system hasn't yet been truly tested due to lack of snow the previous winter. [8]

In 2014, Mayor Marty Walsh, the new Mayor of Boston appointed Jascha Franklin-Hodge as the Chief Information Officer (CIO). With this, he made an official announcement of creating a Citywide Data Analytics team with the vision to improve and manage the city services. The making of the team was executed by the CIO and Mayrl, former chief of staff of Boston's Department of Public Works. The team was chosen based on their capability to comprehend the needs of citizens, to build strong acquaintanceship and configure data on the right track that could lead to its efficient use in transforming the services offered to citizens. At its commencement, the team had only 6 members including data scientists, business analysts, and visualisation professionals. Over the years, the team has evolved making room for more experts and professionals.

Since the time team took the position in 2015, dozens of projects have been launched in diverse departments located in the city. One of the foremost projects the team worked on was the creation of a dashboard. The dashboard was developed on mayor's request to draw an inference on city's performance and activities. The team updates the dashboard regularly which displays an array of information starting from occurrences of potholes to the extreme criminal activities hitting the city. Subsequently, as a dashboard was made for the mayor's office, similar dashboards were created for other departments with a goal specific to each (example: customer experience, equity etc).

The evolution of dashboards leads to another notable data-driven

development by the analytics team which is known as 'CityScore'. Cityscore is an advanced method of gathering data from every department and putting standardised scores up on key metrics in a manner that is viewable to everyone including the mayor, head of the departments, employees and the public. The Cityscore is timely updated by the team. It has proved to be a very important tool in measuring the city's progress in every aspect. In future, Cityscore will be a great tool guiding the city in developing city initiatives and projects.

The City of Boston is ready to revamp the streetscapes with the 'vision zero initiative. The aim is to reduce the fatal accidents and serious crashes on the roads to zero level. This will be achieved through data and technology enabling the city to understand how people go about on the roads and to analyse public behaviour in the traffic.

"Zero deaths. Zero Injuries. Zero disparities. Zero emissions. Zero Stress. This is Boston's vision for our transportation future" – As per the government of Boston. This initiative is a part of 'Go Boston 2030' plan (published on 2017) – the target to reshape the transport system for better living in the next 10 to 15 years. [37]

With five unprecedented city projects underway, Boston is set to become a "smart" metropolis of the future.

(1) Smart Streets.

Though many of Boston's digital companies are putting the city on the map as an influential tech hub, the city itself is also hard at work embedding technology along — and under — its streets.

Using high-tech materials, innovative science and sensor networks, planners and architects are transforming Boston, connecting its residents as they work, commute and use public spaces.

(2) Hubway

Hubway is Boston's public bike share system that spans Boston, Brookline, Cambridge and Somerville. It launched in 2011 as a fun, healthy and affordable way to get around the city. A mobile app lets users see real-time availability, and you simply pick a bike at any of the stations around the aforementioned municipalities and take as many short rides as you want while your pass and membership is active. A 24-hour pass is \$6 per day, while an

annual membership costs just \$85 per year. Once you've gotten to your destination, return your bike to any station. In total, Hubway has 1,600 bikes spread across 180 stations.

(3) Self-driving cars

In 2016, the City of Boston gave the greenlight to Cambridge-based startup nuTonomy Inc. to begin testing self-driving cars in a small section of Boston in 2017. NuTonomy Inc. recently began testing its driverless car on the roads of South Boston's Raymond L. Flynn Marine Park with the stipulation that a person must be in the car ready to take manual control as needed.

Though the program is currently confined to the 191-acre park during daylight hours and in good weather, the tests will expand after hitting various milestones, per nuTonomy's approved application. The startup is the first company to be approved by the city for experimentation with self-driving cars, which many urban planning experts believe will transform public transportation as we know it.

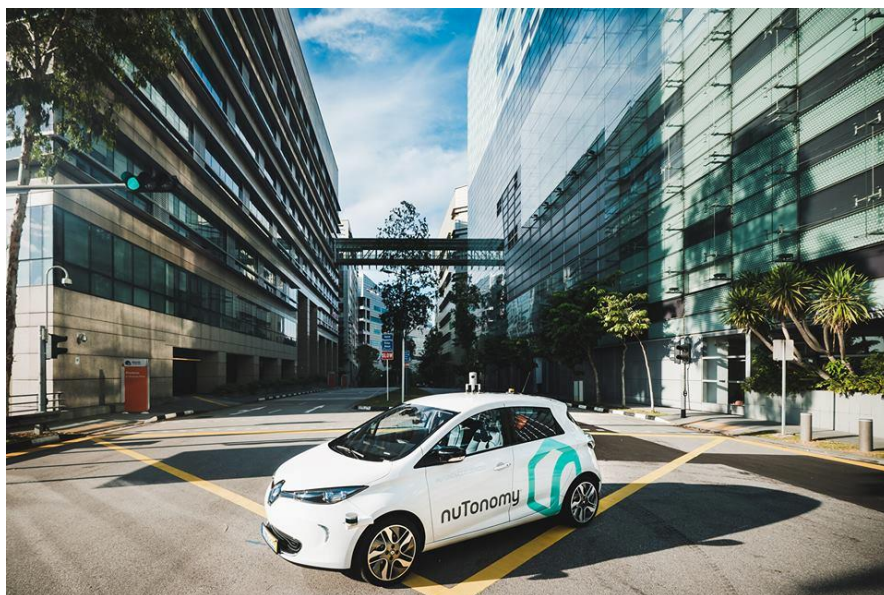


Figure 3.30: Self-driving car
(Source: built in boston) [38]

(4) Wicked Free Wi-Fi

Wicked Free Wi-Fi is Boston's outdoor wireless network, which you can use to find places to shop, eat, or connect with other inhabitants in the city. Wicked Free Wi-Fi is not designed to work

inside buildings or homes, so there are occasional drops in coverage during bad weather. The city plans on expanding the network over the next several years, eventually connecting Boston's 20 neighborhoods and creating an estimated 130 access points.

(5) App Showcase

In recent years, the City of Boston has unveiled numerous apps to serve many of its residents' biggest pain points. Need to pay a parking ticket? There's an app for that. Need to report a pothole? There's an app for that. Want to know where your child's school bus is? You guessed it – there's an app for that too. Between BOS:311, which lets residents report non-emergency issues, like damaged signs and graffiti, and ParkBoston, which lets you pay for parking meters from your smartphone, the city's apps make it easy to stay in the loop and feel connected to your community. [38]



Figure 3.31: Bos311 App
(Source: Bos311)

3.4.2 Zaragoza in Spain

In 2003, Zaragoza embarked on an ambitious process of social and economic transformation aimed at turning it into one of the European cities best adapted to the digital economy. With this goal in mind, it launched a programme of Knowledge Society development actions, the main aims of which were to: Create and set up innovative businesses to foster economic growth and the creation of skilled jobs; Use the new technologies to provide more efficient public services; Guarantee all citizens, entities, companies and institutions the

exercise of their full rights of access to the communications networks; Make the most of technological change to develop a new, cohesive city planning and create economic opportunities; make Zaragoza a national and international reference point in the light of its approach to technological change and innovation.

From 2003 to 2011, during the course of this process - a strategy which began under the slogan of “Zaragoza towards a Knowledge Society”- the government have made some notable progress, such as: Improvements to telecommunications networks by way of one of the most extensive WiFi networks in our country; Implementation of free software, with respect to which I believe we are a reference for city councils nationwide; Development of electronic Administration (It is the third Spanish city with the most services provided over the Internet) and of the open data policy; Promotion of the Digital Mile project. [40]

DATOS ABIERTOS DE ZARAGOZA

CATÁLOGO DE CONJUNTOS DE DATOS RSS

Consultar

NÚMERO DE RESULTADOS: 103 Obtener resultados en: XML JSON [Más información](#)

Paradas de Taxi
Actualizado el 20-02-2012
Materia: Tráfico y Transporte geoRSS JSON JSON geoRSS

Datos Demográficos de Zaragoza por Junta Vecinal
Actualizado el 14-02-2012
Materia: Datos Demográficos CSV Excel

Datos Demográficos de Zaragoza por Junta Municipal
Actualizado el 14-02-2012
Materia: Datos Demográficos Excel CSV

Datos Demográficos Totales de Zaragoza
Actualizado el 14-02-2012
Materia: Datos Demográficos Excel CSV

Impresos
Actualizado el 14-02-2012
Materia: Gestión Ayuntamiento de Zaragoza Solr

Censo de Asociaciones
Actualizado el 14-02-2012
Materia: Participación Ciudadana Solr

Equipamientos
Actualizado el 14-02-2012
Materia: Equipamientos de Zaragoza Solr

Desarrollo de Planeamiento
Actualizado el 24-01-2012
Materia: Urbanismo Excel Excel Excel Excel Excel Excel Excel ODS ODS ODS ODS ODS ODS

Presupuesto Municipal 2011
Actualizado el 24-01-2012
Materia: Datos Económicos PDF Excel PDF PDF Excel PDF Excel PDF Excel PDF Excel PDF ODS

TEMAS

- Urbanismo (18)
- Cultura y Ocio (14)
- Tráfico y Transporte (10)
- Datos Económicos (8)
- Medio Ambiente (7)
- Noticias Municipales (7)
- Vía Pública (7)
- Cartografía (6)
- Gestión Ayuntamiento de Zaragoza (6)
- Administración Pública (3)

TIPO DE ACTUALIZACIÓN

- anual (16)
- instantaneo (15)
- diario (13)
- mensual (10)
- trimestr (4)
- seman (2)

FORMATO

- geoRSS (27)
- JSON (24)
- RSS (20)
- RDF-N3 (15)
- RDF-XML (15)
- SPARQL-JSON (15)
- SPARQL-XML (15)
- RDF-Turtle (14)
- Excel (12)
- XML (12)

Figure 3.32: Open data platform
(Source: Open Government Strategy in The Digital City) [40]

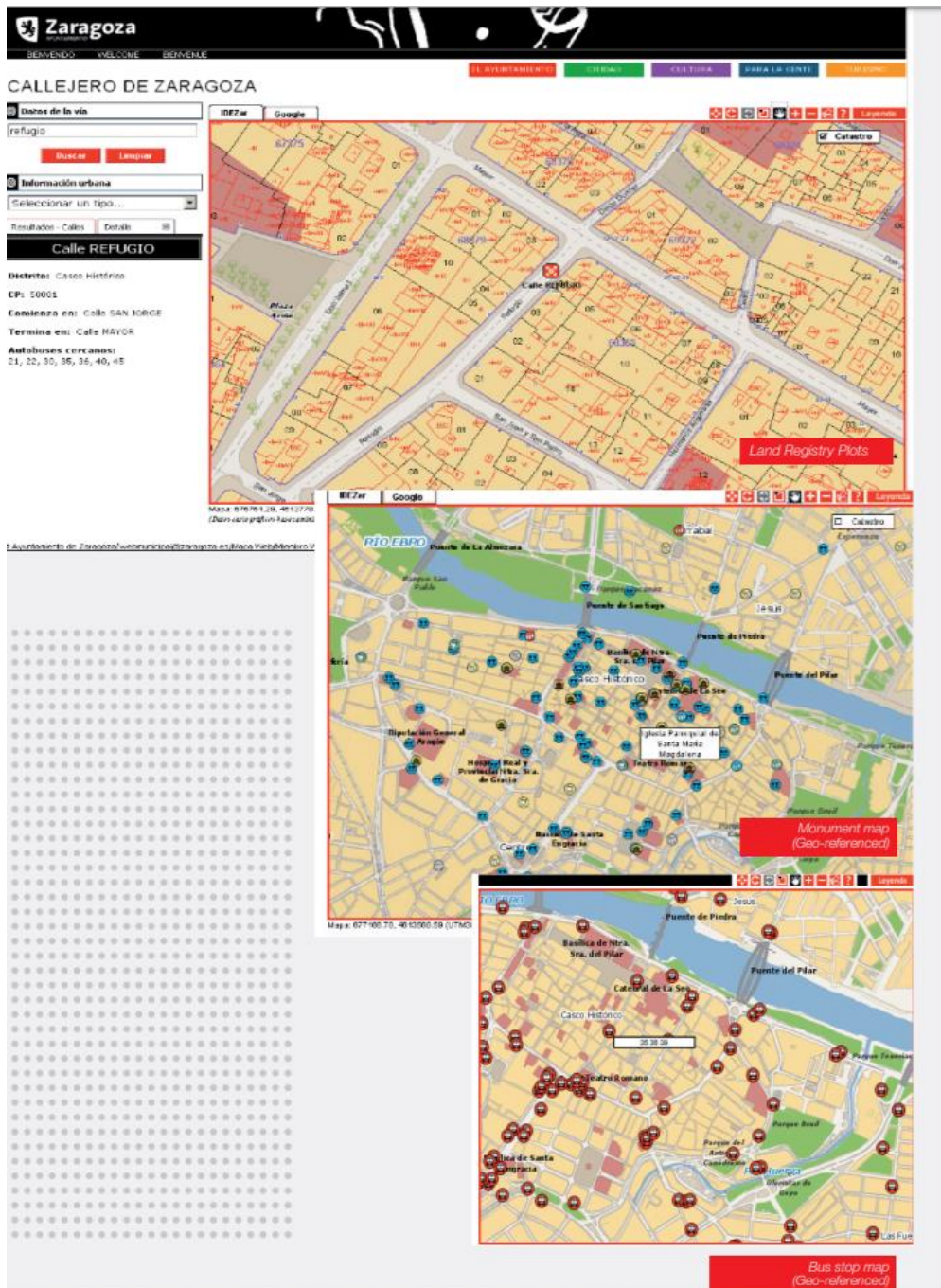


Figure 3.33: IDEZAR platform for geography information (Source: Open Government Strategy in The Digital City) [40]

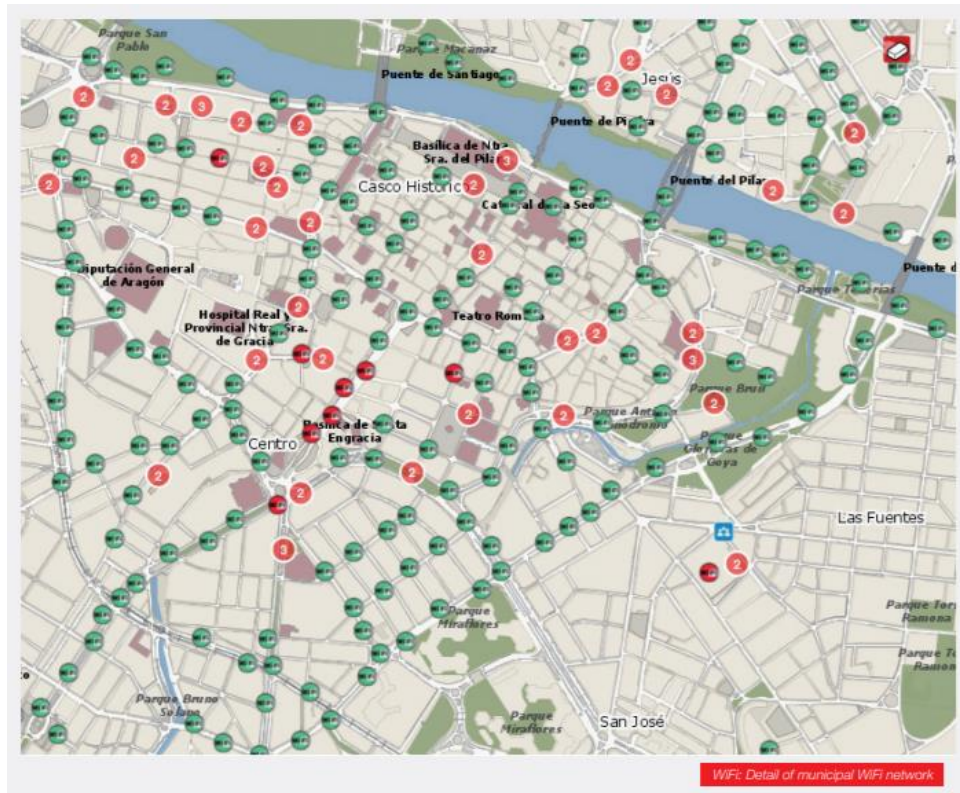


Figure 3.34: WIFI network
 (Source: Open Government Strategy in The Digital City) [40]

Since then, the city has developed an impressive portfolio of smart city projects and new urban services. According to Daniel Sarasa, Urban Innovation Planner in Zaragoza and internationally recognized smart city innovator, one of Zaragoza's unique strengths is its culture of citizen involvement and participation.

From 2008 on, when fully built out Zaragoza's Wi-Fi network will involve over two hundred hot spots blanketing a zone dubbed the Digital Mile, which is the centerpiece of a broad effort to turn Zaragoza into what Daniel Sarasa, the MIT urban design professors, describes as an "open-source city."

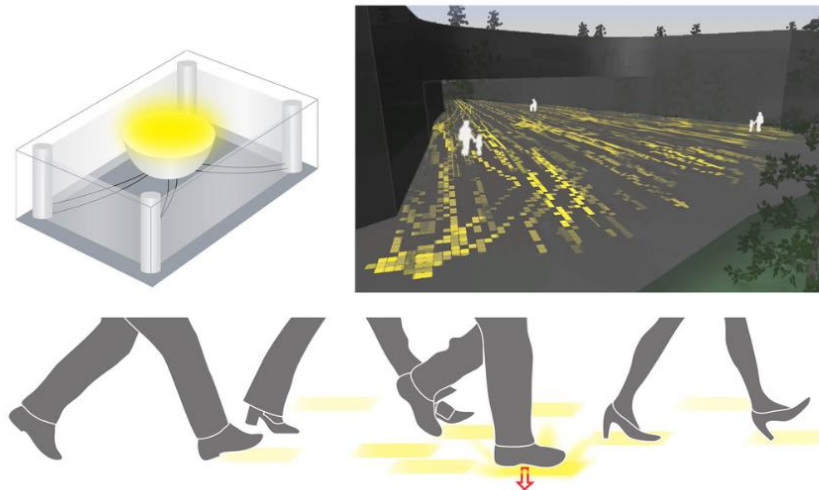


Figure 3.35: Memory Pavement in Digital Mile project
(Source: Zaragoza Milla Digital) [41]

Center of Art and Technology will be the kind of place where artists, technologists, and citizens come together to explore the possibilities of smart technologies to reshape the city. It is to be not merely a think tank but a "think-do tank." The hope is that it will be a source of bottom-up innovations, an open-source department of civic works. The smallest of the three buildings, a business incubator, is already open.

A stunningly simple innovation for a world of face recognition and predictive modeling, the citizen card is a key that unlocks Zaragoza both online and in the real world. The same card that unlocks a bike share will get you on the Wi-Fi, check out your books at the library, and pay for the bus ride home. Shops and cafes offer cardholders discounts, which has made the program wildly successful-over 20 percent of the city's 750,000 residents signed up in the first year. The card creates a sense of belonging. The citizen card promises to fundamentally change how the city works. There are plans to create a kind of game, a frequent-user program that offers "digital miles" as rewards to heavy users of the bus system and Wi-Fi network. "The card generates a lot of data on activities, and is a powerful tool for planning," Sarasa points out. Patterns in card use allow city managers to see how people use public services in great detail, allowing those services to be managed in a more holistic way.

Although many cities throughout the world embraced the largely undefined concept and potential benefits of being smart cities, the planning focus was usually on big data, high-tech solutions, the Internet of Things (IoT), and a top-down approach to smart city solutions. However, Sarasa and his colleagues understood that "data

by itself cannot drive your government". They recognized that connectivity involves more than broadband networks, big data and the IoT. The potential of smart city connectivity depends on a cohesive society of citizens, local government and local companies. In Sarasa's view, the value of a cohesive, connected society—and the return on the city's smart investment—will derive from enabling citizens at the local level to co-create and adopt smart city services.

Zaragoza certainly is one to beat in the emerging world of smart cities. Its physical transformation has been bold but carefully measured. It is building world-class facilities that will enable smart-city innovation and economic growth in the future, but has balanced it with upgrades to community centers and public spaces. The citizen card has enormous potential to change the nature of citizenship. None of these pieces alone is a silver bullet. But together they are "platform for innovation," as Daniel Sarasa describes it.



Figure 3.36: Citizen Card and it's 12 service
(Source: Open Government Strategy in The Digital City) [40]

Sarasa sees the city as the best possible referee in a world of urban sensing, "There is a Big Brother aspect we are aware of. But we think the City can be a very good keeper of citizens' privacy." Given the hand-wringing debates around the proliferation of individually identifiable data online, and the near-total lack of good ideas about how to deal with it, the idea of local governments as custodians of citizen's personal data is intriguing. It is a power grab by government or inspired leadership? Adam Greenfield feeling leans to the latter. But the thought of American cities stepping into this role seems, sadly, unlikely given the enormous responsibility it would entail.

The stakes in this gamble on smart couldn't be higher. Zaragoza's gamble on the Center for Art and Technology campus is far from certain. But it is an inspiring example of how different a smart city can emerge when civic leaders craft a big vision that reflects the needs and aspirations of an entire community and mobilize the resources to deliver it. Corporate smart cities chase the Holy Grail of efficiency, while the grass roots explore the possibilities of social technology, but in Zaragoza- as in most real cities today- citizen engagement and economic development are the pressing challenges. [8]

According to government document "Open Government Strategy in The Digital City 2012-2015", four strategies was implemented:

1) Open public services

Pivotal to open public services are actions dedicated to developing and extending more efficient and transparent electronic administration and to promoting new City Council governance that enables the open participation of citizens in the management of the city.

2) Smart Citizens

Zaragoza has its own Smart City model, focused on citizens, thus enabling us to speak of Smart Citizenship as well. This is due to the fact that the most profound change that Zaragoza has undergone in recent years has not been that of its infrastructures, but rather the change that has come about in the profile of its inhabitants. Citizens are now more active, more committed and more participatory than ever before.

Consequently, changes in technology, in process and in services have to be aimed at meeting a sole direct interest: that of the citizen. And this will only be 100% possible if open platforms and tools, "bottom-up" designs and transparent assessment systems are used.



Figure 3.37: Zaragoza tram with traffic light priority
(Source: Open Government Strategy in The Digital City) [40]

3) Digital Engagement

A smart city is one in which the community has learnt to adapt and to innovate. This approach, and one that is truly relevant to the subject in hand, must guide the government's judgement when it comes to developing Open Government policy. It is necessary, therefore, that programmes be developed that are aimed at the public's use of ICTs, the new electronic tools made available to them and the new relation channels that have been opened. In this way Zaragoza will be providing a basis on which to develop a full and open communication between the citizen and the administration, and a better understanding of the city and how it works. All of these elements are essential to being able to take part, decide, improve and, ultimately, to innovate.

4) Digital Industries

These industries are intensive knowledge activities whose aim is to produce services and products in areas such as ICT, multimedia technologies, the audiovisual sector, etc. This is a sector of growing importance in our production system and is especially suited to urban areas, given that it feeds off the abundant university talent to be found there. It does not generate waste or noticeable disturbances and has a high innovation content, giving rise to relatively well paid professions and jobs. Since transforming the production model: a long-term strategy, Zaragoza city decided to play a leading role in the change of model to these types of activities when it set up the Digital Mile project. Today, the Digital Mile still represents that same idea,

although the slowdown in the property sector has prevented the private initiative from carrying out its role as the developer of building and promoter of activity in the area. Notwithstanding, public initiative has enabled the building of a series of infrastructures (networks, buildings, applications and services platforms) by means of which an intensive line of knowledge and innovation promotion activities are being carried out. Using the infrastructures efficiently and intelligently, cooperating with other innovation agents, and also counting on the dissemination of the knowledge to be had in the municipal technical services themselves, the City Council will play the part expected of it in this difficult stage of the economic transformation of Zaragoza. [40]

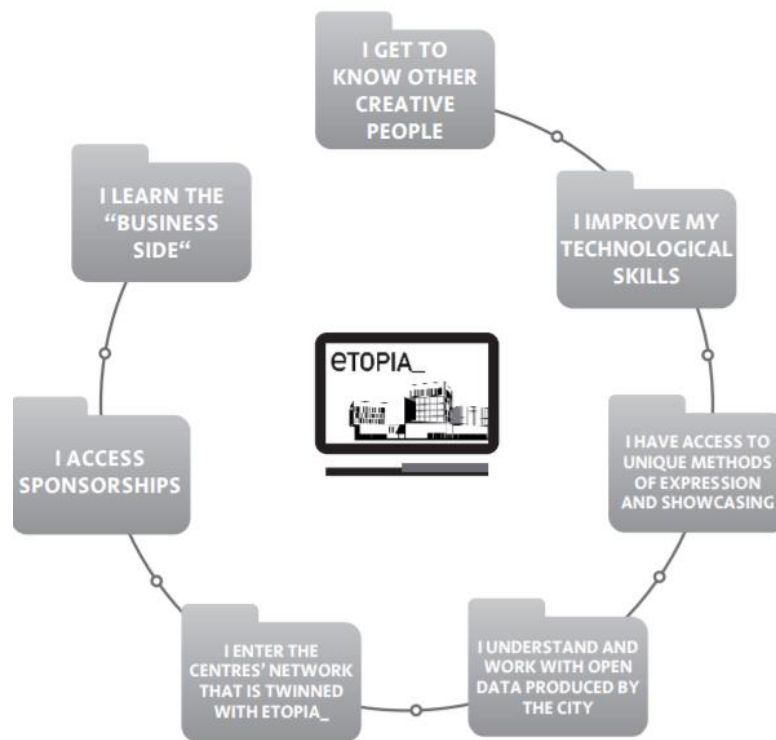


Figure 3.38: Project Generation Cycle in Etopia
 (Source: Open Government Strategy in The Digital City) [40]

On the 2018 Smart City Innovation Accelerator conference, Daniel Sarasa Funes represented Zaragoza City Hall to introduce the innovation vision of Zaragoza. He called on citizen’s attention on the smart city projects since it would improve the communities. With the circular economy of ideas, they will build the city as zero (talent) waste city. The Citizen Card will link the citizens with the Zaragoza digital project. In addition to the open data, dark data is going to come to the surface to create value. Instead of sharing data, the knowledge of

these data is proposed to be shared. They will improve the self-governance, in order to put data in hands of people.

Besides Zaragoza, Barcelona, Madrid and Malaga are the principal large cities in Spain where there is an increased presence of smart city projects and where there is greater interaction between cities and companies for the development of smart city planning.

The study "The geographies of the smart city in Spain: analysis of networks and actors", led by the Urban Transformation and Global Change Laboratory (TURBA) research group of the IN3-UOC, focuses on the cities that make up the Spanish Network of Smart Cities (RECI) and provides evidence on the functioning of networks of cities and companies within the smart sector in Spain. The researchers analysed the data, collected between July and September 2016, of the 65 cities that participate in the RECI, which represents the vast majority of cities operating in the smart sector in Spain. The analysis has made it possible to identify 553 Spanish companies involved in the development of smart cities. Among the most active companies, resulting from their participation in smart city projects in 5 or more cities, Telefónica is clearly the most prominent company within the RECI.

Although international studies consider that the roll-out of smart cities favours American technology giants such as Cisco, IBM and Microsoft, in Spain the situation is different: the majority of key companies in the network are Spanish-owned and of Spanish origin. "The active participation of Spanish companies within this sector in Spain could help the international expansion of the Spanish smart industry", the director of the research project points out. [43]

3.4.3 Singapore

Singapore has its ambition to make its country the world's first true Smart Nation by harnessing technology to the fullest with the aim of improving the quality of life, strengthening businesses, and building stronger opportunities. The country has already begun its journey to bring about the vision it calls 'E3A': Everyone, Everything, Everywhere, All the time. The Smart Nation Platform seem to enable greater connectivity, better situational awareness through data collection, and efficient sharing of collected sensor data.

Now Singapore is pushing towards the vision of being the world's first Smart

Nation under the Smart Nation Program developed in 2014, which ideally seeks to harness ICT, networks and data to support better living, create more opportunities, and to support stronger communities, as a response to growing urban challenges of aging population, urban density and energy sustainability. While various cities around the world are experimenting with the concept of 'smart city' by making the use of technologies to tackle wide range of urban challenges, Singapore has a much more ambitious and whole-of-nation vision. Various stakeholders such as technology builders and entrepreneurs around the world are invited to be involved in this vision to use the nation as a 'living lab' to try out new ideas and smart solutions with global potential. A critical role of ICT standards is to enable the integration and interoperability of different ICT systems that is in place for Smart Nation initiatives. Achieving such integration is expected to facilitate the optimal use of resources across different systems.

To drive pervasive adoption of digital and smart technologies throughout Singapore, 5 key Strategic National Projects are key enablers in the Smart Nation drive.

- 1) National Digital Identity - for citizens and businesses to transact digitally in a convenient and secure manner;
- 2) e-Payments - to allow everyone to make simple, swift, seamless, and safe payments;
- 3) Smart Nation Sensor Platform - deployment of sensors and other IoT (Internet of Things) devices that will make our city more liveable and secure;
- 4) Smart Urban Mobility - leveraging data and digital technologies, including artificial intelligence and autonomous vehicles, to enhance public transport;
- 5) Moments of Life - bundling government services, across different agencies, to the citizen at different moments of his life.

Towards Being World's First Smart Nation

Singapore is building a Smart Nation that functions beyond the capabilities of a Smart City. With an ultra-high speed, pervasive, intelligent and trusted ICT infrastructure, as well as a vibrant ICT ecosystem with a ready pool of tech talent, which are achievements of the iN2015 masterplan, Singapore is ready to be a Smart Nation.

WHERE SINGAPORE STANDS TODAY

 <p>DELIVERING E-GOVERNMENT</p> <p>1st in the use of "digital government", a comparative study by Accenture in 2014.</p>	 <p>DOING BUSINESS IN SINGAPORE</p> <p>2nd most competitive economy and most networked country in the World Economic Forum's "Global Information Technology Report 2014"</p>	 <p>LIVING IN SINGAPORE</p> <p>1st in Asia with the highest quality of living in 2014 report by Mercer Survey.</p>
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DIGITALLY-ENABLED POPULATION

 <p>DRIVE SOCIAL INNOVATION WITH DATA</p> <p>8,800 datasets released to public on data.gov.sg and OneMap.</p>	 <p>USEFUL E-SERVICES FOR CITIZENS</p> <p>Receive and read government letters all in one digital mailbox.</p>	 <p>RAISE THE ADOPTION OF INTERNET ACCESS</p> <p>S\$8million Digital Inclusion Fund to benefit 6,000 low-income households and individuals.</p>	<p>ACCESS TO COMPUTER</p> <p>97% of resident households in Singapore with school-going children have access to a computer at home.</p> <p>ACCESS TO BROADBAND</p> <p>87% of resident households in Singapore have access to a computer at home, and 87% have access to broadband.</p>
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SKILLED TECH TALENT

Singapore is home to more than **146,000** Infocomm professionals, with a wide range of training and development opportunities.



NATIONAL INFOCOMM COMPETENCY FRAMEWORK (NICF)

Continual Education Training Centres to develop and launch NICF accredited courses in areas such as strategic IT risk management and enterprise business analytics.




CORPORATE PARTNERS FOR PROFESSIONAL DEVELOPMENT


Centres of Attachment and Company-Led Training Programme to equip both young and experienced tech talent with expertise to take on higher-value ICT roles.

VIBRANT TECH INDUSTRY & STARTUP ECOSYSTEM

Key IDA Initiatives – IDA Labs, Accreditation and Accelerator – to boost the tech ecosystem.




IDA LABS support the collaboration of individuals, companies and government agencies to generate innovative IP from ideation to productisation.



STARTUP INVESTMENT

S\$1.7 billion in venture capitalists' funding for Singapore-based technology companies in 2013*.



ACCREDITATION@IDA aims to help innovative tech product start-ups build their credentials as qualified vendors to government and large enterprise buyers.

*Data from Asian Venture Capital Journal


TECHNOLOGY-ENABLED SECTORS

Singapore continues to drive adoption of tech to enhance innovation and productivity among the various economic sectors.

<p>NATIONAL ELECTRONIC HEALTH RECORD</p> <p>has been deployed to 36 healthcare centres, including hospitals, specialist clinics and polyclinics.</p>	<p>ICT FOR PRODUCTIVITY AND GROWTH (IPG) PROGRAMME</p> <p>S\$500 million for small and medium enterprises (SMEs) to step up on the adoption and innovative use of ICT.</p>	<p>COMPREHENSIVE ONLINE GOVERNMENT SERVICES</p> <p>Nearly 98% of public services in Singapore are available online, the majority of them being transactional in nature*</p>	<p>EFFECTIVE LEARNING AND TEACHING</p> <p>All schools have implemented Infocomm Competency Training in their curriculum. 50 applications rolled out from the Futureschools programme.</p>
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*WASEDA e-Government ranking survey 2014.

SEAMLESS & PERVASIVE CONNECTIVITY




SINGAPORE'S WIRED NETWORK

NGNBN achieved nationwide fibre coverage since mid 2013. More than **550,000** subscribers served by 27 different service providers.

Wireless @SG

Hotspots to increase to **10,000** by 2015, and to double to **20,000** by 2016.



FOURTH GENERATION

Telecommunication services deployed nationwide since June 2013.

TRUSTED REGULATORY FRAMEWORK

PERSONAL DATA PROTECTION

Do Not Call Registry launched on 2 January 2014, with **> 600,000** numbers and about **3,000** organisations registered.



ENABLING SPECTRUM EFFICIENCY

To regulate use of TV White Space spectrum band, increasing capacity and data connectivity, and allowing consumers to access more options for wireless services.

Figure 3.39: Building Blocks of Smart Nation Vision (Source: Towards Being the World's First Smartest Nation, iDA) [44]

The Government has been engaging in a meticulous attempt over the years; every 10 years since 1971, Singapore issued a concept plan with a long term (40- to 50-) year time frame and every 5 years, more detailed plans on smart growth. As a result, Singapore is already an intelligently advanced city, equipped with integrated ICT technology to its city features. A network of sensors, cameras and GPS devices are embedded in taxi cabs tracking traffic, predicting future congestion and informing all drivers to alternative routes. The use of special RFID cards is common and the city's water management system is among the world's most advanced system.

So far, the most developed smart services in Singapore is within the Transportation and urban mobility sector; the development of Intelligent Transport System (ITS) has been progressing for more than 10 years. Utilizing ITS components, Singapore provides a number of smart transport services for citizens. For example, One Motoring is able to provide citizens with traffic information collected from surveillance cameras installed on roads and taxi vehicles with GPS, as well as current ERP rates (Electrical Road Pricing), sections where road works are in progress, traffic images of major expressways, traffic news, travel time calculator, road maps and street directions, and parking information.

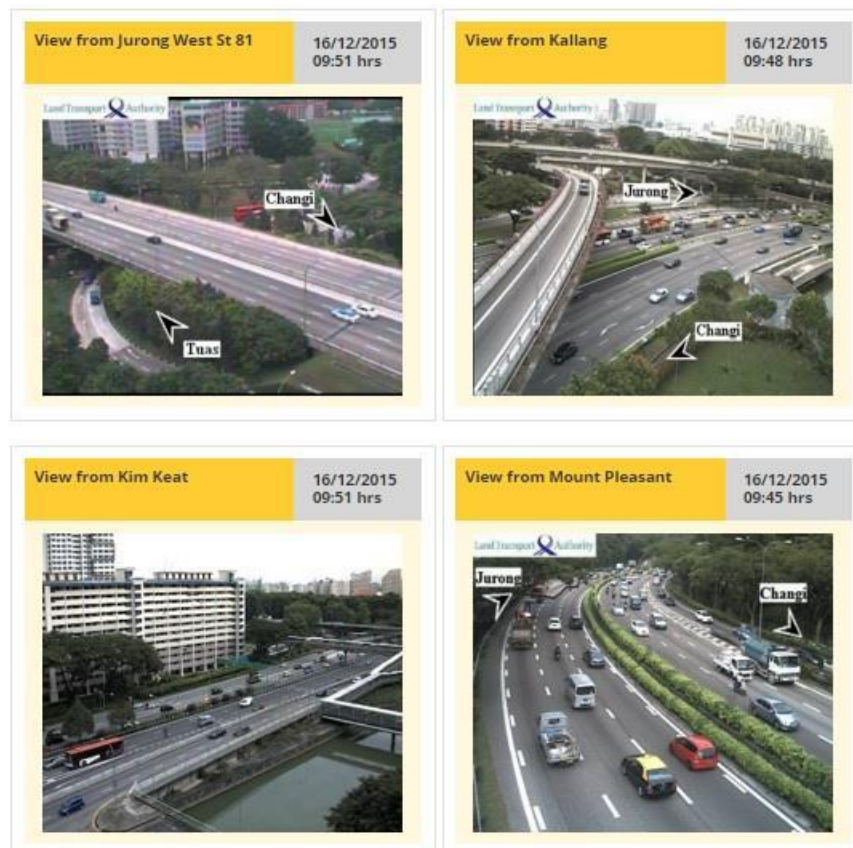


Figure 3.40: One Motoring traffic cameras, Pan-island Expressway (Source: One Motoring official website) [44]

Singapore also has a strong e-governance foundation, which they have been incubating since the early 80s. There is a broad spectrum of smart services that Singaporean Government wish to provide for the public but their journey is still at an early stage as most of the services have been launched (many of them as trials) in the early 2010s, and many service are on their planning stage, to be implemented along with cross-cutting efforts of the Smart Nation initiatives. The Police Force of Singapore also provides webbased electronic police centre (through Electronic Police Centre, ePC) for citizens to conveniently gather information, file police report online, and handle administrative affairs such as applying for certified copy of police reports, criminal records, etc. For example, CrimeStopper on ePC provides an alternative online avenue for citizens to make less urgent reports, or submit information to help Police in combating crime. E-Government Programmes are divided into as three categories, programmes for citizens, programmes for businesses, and programmes for Government.



Figure 3.41: Electronic Police Center
(Source: Singapore Police Force official website)

As a connected nation with extremely impressive wireless broadband connection rate and smart phone penetration rate, Singapore has emphasized the importance of connectivity between the Government, industries and its people. Most of Singapore Government's main websites have developed more citizen-central contents and much of information are transferred to citizens through social media and mobile applications.

Plan	Objectives
e-Government Action Plan (2000–2003)	To provide as many public services online as possible.
e-Government Action Plan II (2003–2006)	Improvement of the service experience of customers
Improvement of the service experience of customers	Focus on creating an integrated Government that works behind the scene to serve users better. Mobile services were introduced to work with the high mobile phone penetration rate, providing citizens with an additional channel for accessing public services.
eGov2015 Masterplan (2011–2015)	Aim to become a collaborative Government that facilitates greater co-creation and interaction between the Government, the citizens, and the private sector to bring greater value for Singapore. This plan aims to shift from a “Government-to-You” approach to a “Government-with-You” approach in delivery of the online services. The goal is to encourage for more interactions

Table 3.1: E-Gov in Singapore
(Source: Singapore eGove official website) [44]

One of the most interesting characteristics of Singapore’s Smart Nation is its method of integration among different Governmental agencies. The Smart City configuration is distributed into a number of databases, control operations centres, and a number of applications. Singapore has plans to connect implementing agencies through some sort of data pipes to connect individual governmental agencies into a single data platform.

Smart Nation Platform is divided into two layers: Smart Nation Operating System (SN-OS) and Communications & Sensor Network. Communications & sensor Network is foundational infrastructure for deploying essential field facilities such as smart meters, CCTVs, flood sensors, etc. As shown in following figure field facilities installed around the city are linked both by wired and wireless connections to form communication and sensor network as a whole. Information gathered from the devices are then shared among agencies for appropriate responses.

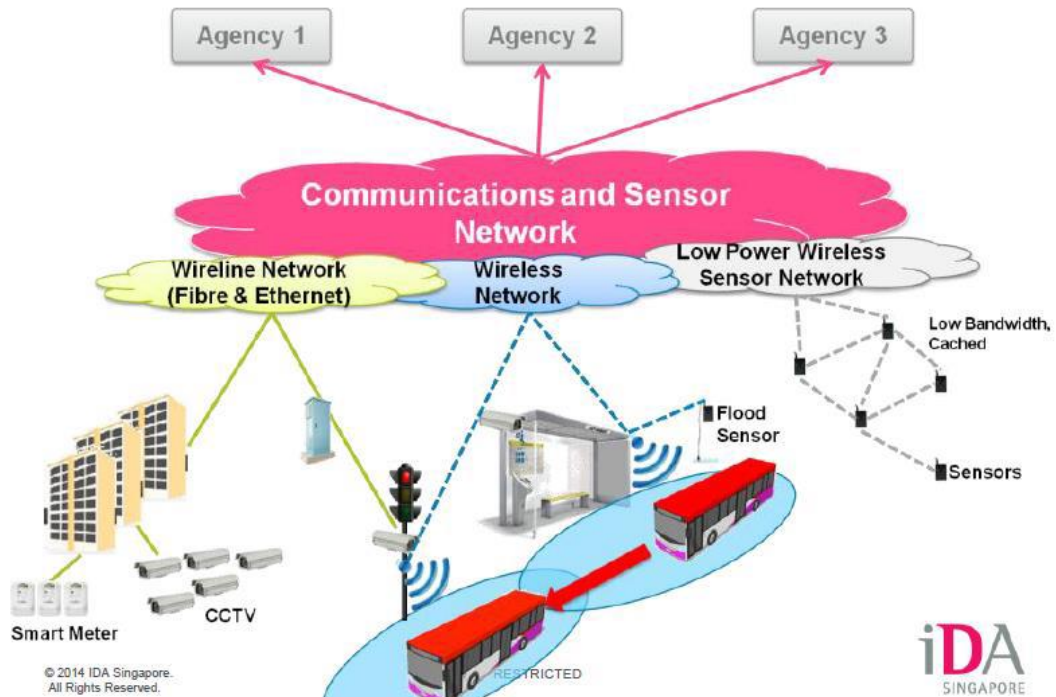


Figure 3.42: Communications and sensor network
 (Source: iDA Smart Nation Platform Industry Briefing, 2014) [44]

Based on communication & sensor network, Smart Nation Operating System operates in three layers: sensor management, data exchange, and sense-making platform.

Through sensor management, for both video and non-video sensors, field facilities should be regularly monitored for their well-functioning (state of charge, gateway status, sensor network performance, etc.) and be checked upon their remote controls (activation, de-activation, sensing mode, sensor-specific configuration, etc.). For data exchange, within SN-OS, open standards, protocols and data security policies are established and applied to harmonize Government agencies and private enterprises in the use of data. Finally, data are processed, integrated and analyzed for relevant information to be delivered for end users in this sense-making platform.

Smart Nation Operating System (SN-OS)

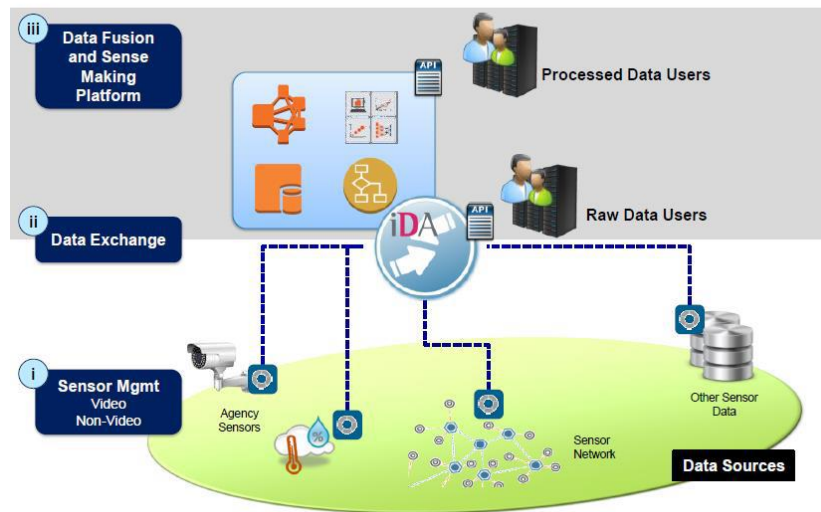


Figure 3.43: SN-OS platform

(Source: iDA Smart Nation Platform Industry Briefing, 2014) [44]

Although specific formation of integrated platform is yet to be fully developed, the underlying idea is to avoid physically integrated platform and instead, to agree on rules and regulations for data integration. Singaporean Government only sees the needs to develop an integrated data sharing platform, where all agencies can access commonly shared information, collected from shared smart sensor network. An interest for Integrated Operation and Command Centre (IOCC) is not there and in fact, this is perceived to have higher risks due to variations in the sensitivity of data. Gathering very senior level of each governmental agency at times of large-scale emergencies is observed to be more safe, efficient, and effective way of managing the city. Therefore, governmental agencies function and continue to function in a rather discrete manner, operating and managing their own operations centre.

Singapore's future success as a Smart Nation may depend on a number of factors. First is the Government's control over the Smart Nation Vision. Currently, Smart Nation initiatives are completely funded by the Singaporean Government with no external source of funding from private firms. It is still uncertain whether or not this will lead to more effective, fast, and efficient implementation of smart systems with no external motivations, and whether all high-costing initiatives can be sustained under such method of funding. Second factor is regarding the manner of integration among implementing agencies. There is yet no consensus in how to integrate these agencies and it is still being developed, but so far, the underlying idea is to avoid physically integrated platform but to agree on rules and regulations for data integration. Singaporean Government only see the need to develop an integrated data sharing platform, where all agencies can access commonly shared

information collected from shared smart sensor network. An interest for Integrated Operation and Command Centre (IOCC) is not there and in fact, this is perceived to have higher risks due to variations in the sensitivity of data. Utilizing data is key to the success of any smart city and hence, how they manage data integration platform would become the deciding factor for their success. [44]

The Smart Nation initiative looks to turn the island into a "living laboratory" -- a kind of playground for testing smart solutions to urban issues. Part of that plan is a network of sensors placed across the island that officials hope can solve the fundamental issues of Singapore's high-density living.

Dr. Vivian Balakrishnan, the country's minister for foreign affairs and minister-in-charge of the Smart Nation Initiative, was alluding that, rather than being about talk, Smart Nation is about action. It's pushing forward with trials across many sectors, focusing on "areas with high impact on residents and citizens." For now, that means housing, health and transport.

1) At home

In Singapore, More than 80 percent of residents (3.2 million people) live in affordable apartments maintained by the country's Housing and Development Board (HDB). This huge pool of public housing provides an unparalleled testing ground for some of Smart Nation's ideas.

In the Yuhua estate, one of the first neighborhoods to "go smart," thousands of sensors have been installed to keep tabs on individual apartments. In partnership with private companies, authorities are able to measure energy draw, waste production and water usage in real time. The latter is a real issue for an island that, although making strides toward water independence, still imports tens of billions of gallons of water from neighboring Malaysia each year. As part of the pilot, Yuhua has also "gone green," with a new vacuum waste-management system, solar panels and water-reclamation efforts.

Through smart applications, the sensors provide residents with feedback on their behavior, helping them to use less water, electricity and so on, driving down household costs. The government, in turn, is able to aggregate this data, using analytics and computer simulation to improve the planning, design and maintenance of public housing estates. And that pattern -- programs benefiting both individuals and the country as a whole -- repeats itself throughout Smart Nation's myriad initiatives. [44]

2) Health

When it comes to health care, Smart Nation is centered on reducing that burden. For the past two years, Singapore has been testing an "Elderly Monitoring System" (EMS), a noninvasive program that uses sensors on doors and inside rooms to monitor movement. If there's a lack of activity or the system detects some other incident, the caregiver, be it a family member or a professional, is alerted instantly.

The trial is opt-in and, as Dr. Balakrishnan explained, is meant to "ensure peace of mind for those with elderly family members." As beneficial as it may be for families of at-risk people, the effort seems as much about reducing the cultural stigma of not "doing your familial duty" by constantly checking up on people.

Another health-care pilot revolves around "Tele-health" -- the idea that you don't need to leave your house, or even see a doctor, to get medical treatment. A "tele-rehabilitation" trial began in late 2014 and is nearing completion. It aims to offer stroke patients the chance to rehabilitate without traveling to hospitals or health centers. "Tele-health allows you to receive treatment in the comfort of your home, to remain longer with your family and community without going to the hospital, or to provide greater peace of mind for caregivers of loved ones while freeing up hospital beds for those who really need them," Dr. Balakrishnan said. [44]

3) On the road

Transport is the obvious poster child for the "living laboratory" strategy. Singapore has been at the forefront of autonomous-vehicle testing, opening its streets to self-driving cars and buses.

Sensors are at the heart of Smart Nation, and the government has been using them to track its bus fleets. By crunching data, it's able to identify problem areas and formulate solutions to work around them. Dr. Balakrishnan said that by identifying where more buses were needed this initiative has already "resulted in a 90 percent reduction in crowdedness" and reduced wait times on popular services three to five minutes. The next step is private transport.

Again, this tech is being sold on its immediate benefits to citizens: "The next-generation ERP system can also provide value-added services that are beneficial to motorists," Dr. Balakrishnan said. Roadside parking meters will be scrapped, as fees will be generated and paid automatically, just like road tolls. This ties into another government push, away from cash and towards electronic payments. The traffic system will also aggregate data to provide "timely and accurate traffic information to motorists."



Figure 3.44: Next Generation ERP System
(Source: engadget) [44]

The National University of Singapore is testing drone fleets that carry urgent documents. The program could expand if successful. Helicopter manufacturer Airbus Helicopters is assisting with the project, which will have fleets of drones carry the documents to different parcel stations on the college's campus. If everything pans out, there will be a second trial that uses the drones to carry goods like urgent medicine to ships anchored along the Singapore coastline. [44]

4) Virtual Singapore

Each of these initiatives is small, but the sensors all come together to form a platform called "Virtual Singapore." Being built, again, through a public-private partnership, Virtual Singapore is a model of the island built not just to scale, but with fastidious detail. It contains the exact dimensions of every building, where the windows are located, and even what it's built out of. Think of it like Google or Apple Maps' 3D modes, but with the ability to enter every building and see its layout. On its own, the model will be impressive, but it's when sensor data is fed in that things get interesting,

offering an unparalleled view of the city, and it'll be open to everyone -- to an extent.

Dr. Balakrishnan explained that Virtual Singapore is intended to be a "collaborative data platform where researchers, citizens and businesses may contribute." It'll help visualize all the data being collated and allow for complex simulations. Plug the plans for a new building development in, and the model might reveal how it would affect airflow, telecommunications signals or plant life in the nearby areas. It could show where more buses are needed, or which transit stops are being underused. In health care, it could be used to predict how disease might propagate -- Singapore has the third-highest population density of any city, and protecting against a pandemic is a high priority.

Some of this information is already available to the public; Singaporeans can access traffic and parking data, security cameras and other public data online. With Virtual Singapore, there will be better data, and much more of it. [44]

According to The Global Smart City Performance Index 2017 released on March 12th, 2018, Singapore topped the index in all four areas (Mobility, Health, Safety, and Productivity), ahead of other major cities like San Francisco, Seoul, London and New York in the study sponsored by tech firm Intel. It was conducted from July to September last year.

The report noted that in the area of mobility, Singapore has applied "smart, connected traffic solutions" together with a very strong policy curtailing car ownership in an effort to reduce the number of vehicles on its roads.

It also highlighted Singapore's focus on addressing healthcare service provision for elderly citizens through a range of technologies, including digital service platforms as well as remote monitoring devices. In the area of safety, the report noted that Singapore has started trials using smart video surveillance to detect criminal activity. In addition, Singapore is a leader in allowing citizens to access digital services and city information with its "large open data stores" and "strategies to encourage private innovation" through specialised test-bed environments, the report stated.

The study noted that Singapore's "Smart Nation" initiative and its position as a city-state makes the country unique in its ability to execute its smart city vision. Singapore was lauded for its rapid transformation since independence into the world's leading smart city and was held up as an example which other cities can learn from. [45]

3.4.4 Comparison in Different Cities

According to above information, the time line of the smart city implementation in different cities as below:

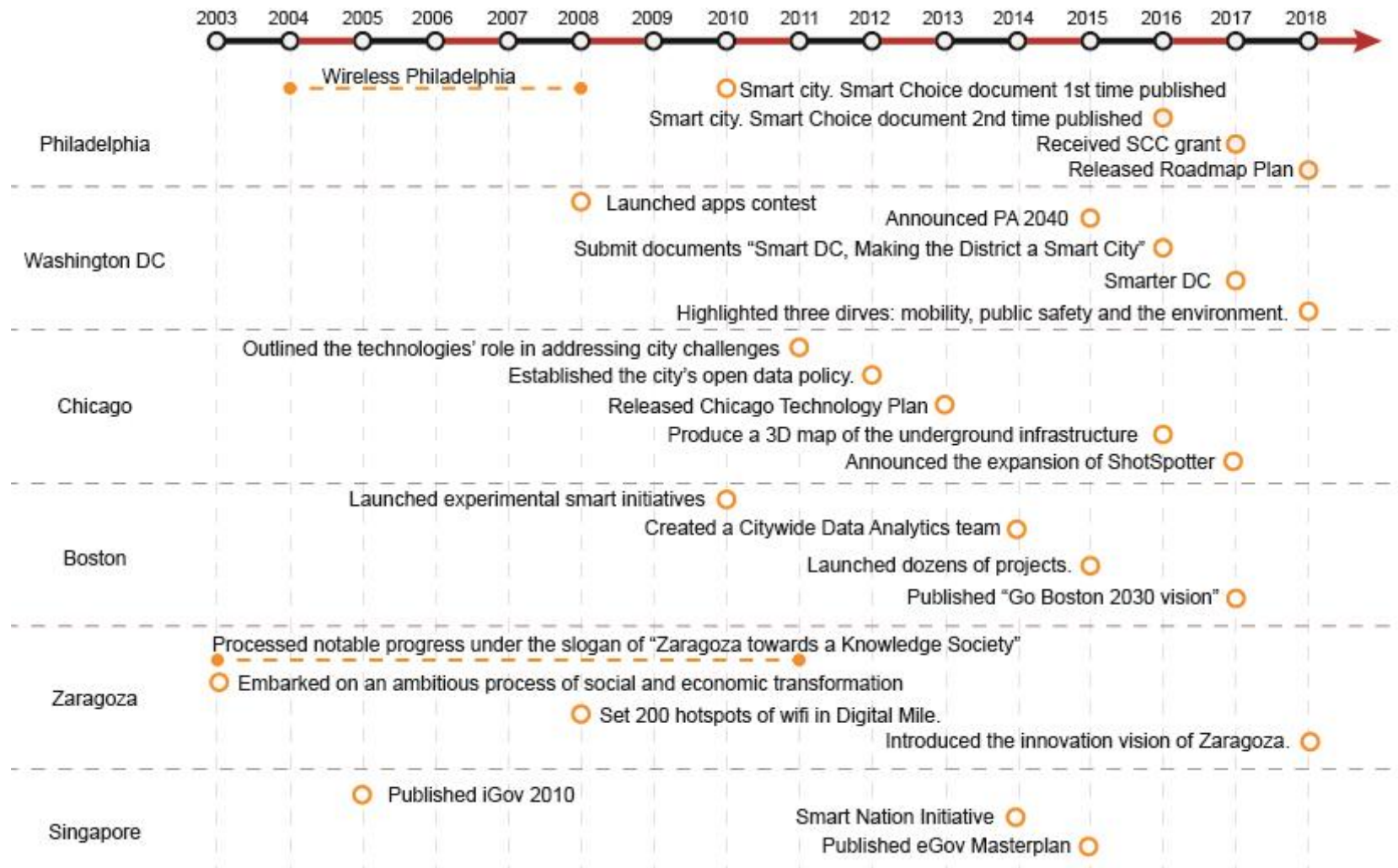


Figure 3.45: Time line of smart city program in different cities

The smart city approach in different cities is analyzed from 6 aspects:

	Starting point	Strategies(or Visions)	Problems proposed to be solved	Key point	Data treatment	Technology/Platform/App/Projects
Philadelphia	wireless Philadelphia	1) Smart Location; 2) Smart Company; 3) Smart Living (Year 2016)	Improve quality of life, environmental stewardship and economic development	Smart city projects focused on the built environment, telecommunications and basic public services.	Build strong acquaintanceship and configure data on the right track that could lead to its efficient use in transforming the services offered to citizens.	Technology: Parking solution; Digital inclusion; virtual healthcare.
						Apps: Atlas
Washington DC	Contest of Apps for Democracy	Smart city technology leverages intelligent city infrastructure, including connected devices, sensors, and data analytics, to improve quality of life for residents, enhance economic growth, and address city challenges. (Year 2017)	Solve multitude of challenges, including recent and future growth pressures, income disparities, and persistent congestion across modes of transportation.	Focus on collaboration across agencies and sectors to address challenges and capitalize on the opportunities presented by 21st-century technology and best practices for city governance and management.	Leverage data in order to reach Vision Zero, to drive more resiliency efforts, and to work on "next level" planning.	Technology: LED street lights and installation of gigabit public WiFi; Smart parking ; Sensors in trash cans; North America's first "intelligent" wastewater pumping system
						Platform: network education centres and innovation centres ;
						Apps: Transit apps

Chicago	Open data policy	<p>1) Establish next-generation infrastructure;</p> <p>2) Create smart communities; Ensure efficient, effective, and open government;</p> <p>3) Working with innovators to develop solutions to city challenges;</p> <p>4) Encouraging Chicago's technology sector.</p> <p>(Year 2013)</p>	<p>Reduce the gun crime probability;</p> <p>Ensure safe walks, bike-friendly rides, and easily parking; Reducing congestion;</p>	<p>Use data and technology to address cities' main challenges.</p>	<p>The data gathered will be made publicly available via the city's website, and will provide a vital resource for the researchers, developers, policymakers, and citizens trying to address city challenges.</p>	<p>Technology: Array of Things; 3D map of the underground infrastructure; ShotSpotter; Transit signal priority; Wi-Max or 5G networks</p> <hr/> <p>Platform: Smart Data platform</p>
Boston	experimental smart initiatives	<p>Vision for transportation future:</p> <p>Zero deaths. Zero Injuries. Zero disparities. Zero emissions. Zero Stress.</p> <p>(Year 2017)</p>	<p>Use technology to hack new solutions to address the everyday problems of citizens.</p>	<p>Build tools for citizen engagement; Ensure that the apps New Urban Mechanics built were both useful to Boston residents and "piloting something interesting and creative".</p>	<p>Build strong acquaintanceship and configure data on the right track that could lead to its efficient use in transforming the services offered to citizens.</p>	<p>Technology: Vision Zero Initiative; Surveillance cameras, LED street lights, Road and traffic sensors; Dashboards,</p> <hr/> <p>Projects: The Boston Waterfront Innovation District; Union point project; 5 public projects: Smart Streets; Hubway (Bike share system); self-driving cars; Wicked Free Wifi; app showcase</p>

Zaragoza	Knowledge Society development actions programme	1) Open public services 2) Smart Citizens 3) Digital Engagement 4) Digital Industries (Year 2012)	Foster economic growth; Create skilled jobs; Provide more efficient public services; Guarantee all citizens, entities, companies and institutions the exercise of their full rights of access to the communications networks; Develop a new, cohesive city planning and create economic opportunities.	Focus on culture of citizen involvement and participation.	Local governments as custodians of citizen's personal data; In addition to the open data, dark data is going to come to the surface to create value. Instead of sharing data, the knowledge of these data is proposed to be shared. They will improve the self-governance, in order to put data in hands of people.	Technology: Wifi network; Free software; Electronic Administration; The citizen card
						Platform: Datos Abiertos De Zaragoza; IDEZAR platform for geography information.
						Projects: Digital Mile project
Singapore	Smart Nation initiative	1) National Digital Identity 2) e-Payments 3) Smart Nation Sensor Platform 4) Smart Urban Mobility 5) Moments of Life (2014)	Support better living; Create more opportunities; Support stronger communities; Response to growing urban challenges of aging population, urban density and energy sustainability.	Connect implementing agencies through some sort of data pipes to connect individual governmental agencies into a single data platform; The Smart Nation initiative looks to turn	Open standards, protocols and data security policies are established and applied to harmonize Government agencies and private enterprises in the use of data.	Technology: Equip with integrated ICT technology to its city features; Special RFID cards; City's water management system; Intelligent Transport System (ITS); Web-based electronic police centre; Elderly Monitoring System; Tele-health;Virtual Singapore

				the island into a "living laboratory" -- a kind of playground for testing smart solutions to urban issues.	Finally, data are processed, integrated and analyzed for relevant information to be delivered for end users in this sense-making platform.	Smart Nation Platform: Smart Nation Operating System (SN-OS) and Communications & Sensor Network ;
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Table 3.2: The implementation of smart city in different cities

3.5 Smart City Problems and New Thinking

3.5.1 Problems

1) Buggy

In 2007 a Washington Metro rail car caught fire after a power surge went unnoticed by buggy software designed to detect it! In the old systems with more reliable code, the engineers took just twenty minutes per car to test and debug methodically. However, when some bugs took place in city-scale, the systems will ripple across networks with potentially catastrophic consequences. A bug in the control software of San Francisco's Bay Area Rapid Transit (BART) system forced a system wide shutdown not just once, but three times over a seventy-two-hour period.

The troubles brought about by the automation of transportation systems are a precursor to the problems we might see when entering smart cities. However, they are actually the benchmark for reliability. Current smart systems are carefully designed and extensively tested. They have multiple layers of fail-safe. They will strive to achieve the gold standard of reliability, with only a few short, occasional failures each year.

The smart system of a city-scale alone has a series of problems. Interlacing them with equally complex information processing only increases the chances of bugs and unexpected interactions. As Kenneth Duda, a high-performance networking expert told the New York Times, "the great enemy is complexity, measured in lines of code, or interactions."

Bugs in smart cities will be more insidious, living in many critical, interconnected systems. Sometimes there may be no way to predict interdependencies.

Counterintuitively, buggy smart cities might strengthen and increase pressure for democracy.

This public reaction to disasters of our own making, Wade Roush argues, has spurred the development of "a new cultural undercurrent of 'technological citizenship' characterized by greater knowledge of, and skepticism toward, the complex systems that permeate modern societies." If the first generation of smart cities does truly prove fatally flawed, from their ashes may grow the seeds of more resilient, democratic designs. [8]

2) Brittle

After few times the Internet has been bombed, its nuke-proof design creation myth has only been strengthened, because of the surprisingly resilient of internet.

However, despite the Internet's efforts to maintain its chaotic integrity, the

smart city's infrastructure is much more fragile. As we add increasingly fragile networks and single points of failure to the still resilient core of the Internet, major disruptions in service arcs can be common. As more and more key economic, social and government services operate through these channels, the risks become more complex.

The most worrying thing is that we are increasingly relying on unconstrained networks, which makes our last fragile wireless transmission between our equipment and the tower become precarious.

Cellular networks do not have the resilience of the Internet, and its biggest threat is population density. Because wireless operators are trying to maximize the profit potential of their expensive spectrum licenses, they usually only build enough infrastructure to connect a subset of customers at the same time. Cellular disruptions during the crisis have become so common in modern urban life that we no longer question why this happens and no longer question how to solve this problem.

The disruption of the public cloud computing infrastructure highlights the vulnerability of relying on web applications. Cloud far is not as reliable as most of us realize, and its error-proneness may begin to cause real damage to the economy. The disruption of cloud computing may turn a smart city into a zombie. (For example, biometric authentication is a complex task that requires access to remote data and calculations.)

Continuous authentication is a technology that uses biometrics (your gestation or typing style) that constantly verifies your identity and may eliminate the need for passwords. Such systems will rely heavily on cloud computing, and will break down when it does. [8]

3) Bugged

"Total Information Awareness" (Abbreviated as TIA) was a virtual market for trading predictions about geopolitical events, which people believed terrorists might use to profit from their own crimes. Congress defunded the project just as it was ramping up in 2003. In the meantime, however, much of the technology agenda of Total Information Awareness has been implemented by other governments and private firms around the world.

But while TIA's grand database sought to find traces of terror cells in big data, the real value of all this covert watching is more mundane. It's about money.

Despite Congress's objections to TIA, law enforcement is finding the attractive of personal data wireless carriers is accumulating irresistible.

As the New York Times reported, "the widened cell surveillance cut across all levels government-from run-of-the-mill street crimes handled by local police departments to financial crimes and intelligence investigations at the state and federal levels."

In many parts of the world, mass urban surveillance is overt and often welcomed. In recent years Chinese authorities have implemented two of the largest urban surveillance projects ever been attempted. One is Peaceful Chongqing by November 2010; another project is tracking 17 million mobile phones for real-time traffic managed in Beijing on March 2011. Both of this two projects are invasion of privacy.

The tolerance of smart cities for large-scale urban surveillance will vary from place to place around the world. With varying levels of citizen input, the government needs to strike a balance between the cost of intrusion and the benefits of early detection.

Large-scale surveillance designed to protect smart cities can actually expose their residents to huge risks. Once established, the stored personal data becomes a honeypot for criminals.

A private monitoring system connected to the cloud is also an open goal. Take Cisco's vision for Songdo (further, it's a vision for New China), a city civilization driven by a ubiquitous two-way video screen that incorporates the latest biometrics. technology. Peaceful Chongqing is just a warm-up for Cisco. China's surveillance product market is growing at double-digit rates. This is a future that police, bureaucrats, employers and hackers can see on every screen we staring at.

Government, who ought to be the ones drawing a line to protect us, can't keep themselves away from the stuff.

As the Brookings reports on Peaceful Chongqing concluded, "Governments with a history of using all of the tools at their disposal to track and monitor their citizens will undoubtedly make full use of this capability once it becomes available." [8]

3.5.2 New Civics

If the history of city building in the last century tells us anything, it is that the unintended consequences of new technologies (including the digital technology) often dwarf their intended design.

We need to completely rethink our approach to the opportunities and challenges of building smart cities. We need to question the confidence of tech-industry giants, and organize the local innovation that's blossoming at the grassroots into a truly global movement. We need to push our civic leaders to think more about long-term survival and less about short-term gain, more about cooperation than competition. Most importantly, we need to take the wheel back from the engineers, and let people and communities decide where we should steer. [8]

After a glance of different projects and implantation in various cities, the scholars have detected the main problems of smart city. The constructors in some cities used to get into the technology trap, and let the high-tech giants

take the initiative. In recent years, people was slowly calm down from the high-tech and efficiency fanaticism, and decided to return to the concern of citizens.

CHAPTER 4. INTERNET CHANGES CITY LIVES

As a city user, not all of people have the forward vision on what is the changing in the world, on the opposite, they always are the receiver of the results and process of the integration of ICT and physical world. I choose the 3 aspects-working space, commercial environment and transportation & Logistic modes-for the research, to analyze how the internet impacts the city lives. At the end of the chapter, the blockchain which is the hot topic recent years was introduced to divergent the thinking of the new methodology of ICT using on the physical world in future.

4.1 Working Space

4.1.1 Telecommuting Influence

A recent report (by FlexJobs) -the 2017 State of Telecommuting in the U.S. Employee Workforce- highlighting the growth of telecommuting in the U.S. workforce suggests that more Americans will be working from home in the future. One of the report's key findings is that between 2005 and 2015, the number of U.S. workers who do at least 50% of their work either at home or some location other than their office grew by 115%. As of two years ago – when the latest data were published – the number of telecommuting professionals stood at nearly 4 million nationwide.

According to the data, telecommuters earn about \$4,000 more than non-telecommuters. Savings they enjoy include money that would spent on commuting to work via car or public transportation, paying for lunch outside the home and generally keeping up a wardrobe of clothes to wear at the office. [46]

1) Virtual office

A virtual office provides address (and sometimes communication) services for a fee, without providing dedicated office space. According to Business Dictionary, the definition is Mobile or remote work-environment equipped with telecommunication links and basic office furniture, but without a fixed office space. See also hoteling.

There are plenty of advantages of virtual office, such as free working phenomenon, lower carbon footprint, bigger talent pool, cost saving, and so on. At the same time, the backwards are trust problems, reducing team collaboration and social isolation problem. [47]

2) Agile Working

The European Union published EPSC Strategic Notes: The Future of Work on June 2016. In the reports, the European Political Strategy Center mentioned that “in the digital economy ‘precarious’ or ‘temporary’ do not necessarily mean sub-optimal: more people voluntarily check out of the traditional ‘9 to 5’ job routine to pursue more independent and flexible work arrangements. Autonomy can be experienced as more

empowering and satisfactory. This rise in freelancing runs parallel to the growth of the gig economy, where digital technologies enable teams to be assembled around a given project – and often across borders – while platforms seamlessly connect buyers with sellers. Much of the latter takes place under the heading collaborative economy, which is offering opportunity not only for people seeking more flexibility but also to those who have often had fewer chances of landing a permanent job.” [48]

Flexible working is the term used to describe the different ways in which staff can change their working pattern including part time hours, job sharing, annualised hours and term time only working as some examples, While Agile working is the term used by the Trust to describe how employees can work flexibly from different locations, at different times and using mobile devices. [49]

The Agile Organisation gave the glossary “Agile Working” a definition: “Agile working is a way of working in which an organisation empowers its people to work where, when and how they choose- with maximum flexibility and minimum constraints- to optimise their performance and deliver best in class value and customer service. It uses communications and information technology to enable people to work in ways, which best suit their needs without the traditional limitations of where and when tasks must be performed.”

It is based on the concept that work is an activity we do, rather than a place we go. With the technology available to modern business, there are numerous tools to help us work in new and different ways, to meet customer needs, reduce costs, increase productivity and improve sustainability. Agile working is a transformational tool to allow organisations to work smarter by eliminating all barriers to working efficiently. [50]

3) Co-working

According to Wikipedia, “Co-working is a style of work that involves a shared workplace, often an office, and independent activity. Unlike in a typical office, those co-working are usually not employed by the same organization. Typically, it is attractive to work-at-home professionals, independent contractors, independent scientists or people who travel frequently who end up working in relative isolation. Co-working is a social gathering of a group of people who are still working independently, but who share values and who are interested in the synergy that can happen from working with people who value working in the same place alongside each other. Co-working offers a solution to the problem of isolation that many freelancers experience while working at home, while at the same time letting them escape the distractions of home. It generally costs money in the form of membership dues, though some spaces are free of charge.”

Co-working space owners provide a work environment and generally,

office equipment and services characteristic of a typical workplace. The features of such an office space typically include the following: Shared space to work; 24/7 access to work place; Conference and board rooms that can be reserved or rented on need basis; Wi-Fi; Shared printing, copying, faxing and/or scanning facilities; PBX equipment; Common kitchens, restrooms and/or lounges.

UK has recently seen a massive growth in the number of co-working office spaces, with their prominent presence in all the big cities like London, Manchester, Glasgow and Birmingham. Among these, London has become a hub of co-working spaces, not only in terms of large number of such spaces it offers, but also for the variety of services these offer to cater to different needs. One of the largest and trendiest co-working office space opened in London about a year ago, is the Google Campus. It consists of seven floors of office space for freelancers and new companies, built right at the heart of the Tech City in East of London. It offers a gamut of services in a hip working environment that boasts of modern digital features such as a garden with plants that tweet about their water needs.

The growth in the number of such co-working spaces has been fostered primarily due to a rising number of online start-up firms and freelancers, who require office space and services to expand their business without paying massive amounts in rent and bearing other expenses needed to set up a conventional office.

The key idea behind offering co-working spaces is not only to aid start-up ventures to grow, but also to bring professionals working from home together, and build an intellectual community that can share ideas and knowledge, and in turn grow together. Also, small businesses can enjoy all the facilities of an actual office space without owning one. [51]

Recently much larger tech firms have been jumping in. Over the past year, larger companies are now looking for the benefits of locating in these shared office environments. As a result, big media conglomerates and newly crowned tech giants have been moving employees to co-working and incubator spaces. These spaces are set up so that Fortune 500 tech companies now have better access to innovators, innovations, talent, and reduced real estate costs. Large corporations are partnering with co-working spaces to support innovation and idea exchanges. Tech giants such as Verizon, IBM and Microsoft are now testing co-working spaces to be near innovative startups. One trend coming out of co-working spaces, like Galvanize, The Alley and Rise in NYC is integrating incubators into their business development strategies. By offering space and an environment with resources, they are able to cater and retain members who are launching startups. Corporations are forming partnerships with co-working spaces, thereby making it easier for them to stay on top of technological innovations and top talent. They want to keep an ear to the ground when it comes to potential disruptions in their industry, and they need to closely monitor potential acquisition targets.

Renting space in co-working spaces can help them check all of the boxes: Attract top talent, monitor competition, and find acquisition targets. [52]



Figure 4.1: Google Campus London
(Photo by Bobbi Lee Hitchon) [53]

4.1.2 Office Design Trends

The working space design, culture, technology and environment has evolved over the past years. We will get through from 1950's till now in US, to express how the office designing changed as the development on the technology and communication.

- 1) In 1950's: Large heavy filing cabinets filled with paperwork could be seen as large pieces of furniture taking up space in small workspaces. It was common to find two people sharing a desk with an interior that consisted of chunky desks, carpet flooring, the odd picture on the wall and cream coloured décor. [54]

So for the most part, the typical office of the 1950s had an open layout, while boss had his own office. This was before the advent of the Internet, the mobile device, and the MP3 player. Suffice it to say, these open offices were considerably quieter than the ones we deal with today. The following photo shows a secretary filing documents in a rather hefty filing cabinet sometime in the 1950s. Thanks to computers, it's easier than ever to file documents in relevant (digital) folders today. As an added bonus, many organizations don't need anywhere near as many filing cabinets as their counterparts of yore used to. They can get by with less office space. [55]



Figure 4.2: Office in 1950's
(Source: LOC) [54]

- 2) In 1960's: The rise of G-Plan furniture in the home and office allowed workspaces to become more colourful, playful and contemporary. Offices moved from carpets to wooden floors with slightly more comfortable chairs. Desks were designed to allow easier cleaning in and around the workspaces. Large filing cabinets were still popular but the rise of personal desk storage and filing meant workers had more freedom and trust. [54]

Office design became more political since then. Many designers looked to create a more socially-democratic office layout, which would encourage interaction between employees. However, also during this time, some designers rejected modernist office design in favour of more traditional layouts. The cubicle, a cheap way to provide workers with their own makeshift offices, gained much popularity. [56]



Figure 4.3: The Cubicle in 1960's
(Source: COFCO) [57]

- 3) In 1970's: Major office developments in the 70s included wall colours and personal workstations. Workers had more space to themselves and were often at their desk most of the day using the typewriter. As you can see in this office they have opted to go back to carpets but the desk

designs still allowed cleaning to happen easier. Office plants and telephones are the other two new additions to offices in this era. Offices were still full of paperwork and storage cabinets. [54]

During this time, work councils also became increasingly influential in office design. Some countries implemented regulations that prescribed a minimum amount of space per employee. They insisted on access to daylight, open windows and views for all office workers. The response to this was a pattern of narrow buildings, with offices arranged along a corridor. [56]

There were computers in the 70s, but these whirring leviathans occupied whole rooms, and were only available for the titans of industry.



Figure 4.4: Office and computer in 1970's
(Source: Flashbak) [58]

- 4) 1980's: Some would say the best decade to have been alive in. As you can see the 80s didn't really deliver on office design innovation. The introduction of personal computers on each desk along with more ergonomic chairs and slightly more private working spaces summed up this era. Personal storage space was important and workers often brought in photos of their friends and family which were left in the office. People had their own desks which allowed for personalization. Due to the increase of technology, offices were full of wires and health & safety began to creep into people's conscience. Orange chairs were very trendy during this time! [54]
- 5) Although many cooperation had adopted open plan work spaces over previous decades, many looked to gain back a degree of privacy in the eighties. The cubicle made a big comeback. Many businesses saw it as a cheap and flexible way to create division and privacy, while still keeping the offices somewhat open. [56]



Figure 4.5: Office in 1980's
(Source: LOC) [54]

- 6) In 1990's: With the recession of the 1990s, computers were still big and heavy taking up a large amount of space on a desk. Telephones, keyboards, mobile phones and integrated personal storage in desks with the odd plant, photocopier, fax machine and more wires on and along with very unstylish carpet sums up the 90s work environment. [54]



Figure 4.6. Office in 1990's
(Source: LOC) [54]

- 7) In 2000's: The technological advancements had a massive impact on office design. Computer became thinner and more light weight taking up less desk space. Offices became slightly more casual with people hanging their personal items on the backs of their chairs. [54]
Many internet companies embraced smaller, more colourful and more casual offices, where the boundaries between private and public space, as well as between work and play, were blurred. Following in the footsteps of companies such as Google, Yahoo! and Tesla, many employers saw the merits of creating a fun and appealing space for their workers. The result was office spaces that featured pinball machines, slides, basketball hoops and other recreational activities. [56]



Figure 4.7: Office in 2000's
(Source: LOC) [54]

- 8) In 2010's: Creative, casual, fun, engaging, colourful, interactive, inspiring, comfortable office environments can be found in every city across the country. Furniture that doesn't match or is upcycled has become cool and contrasting colours are the norm. The introduction of the internet, laptops and mobile phones allowed employees to work away from their desks. Mobile phones were smaller and emails were the main form of communication meaning less paperwork for the first time. The integration of plug sockets in the floor, walls, ceilings and sofa's mean people can charge their phones and computers anywhere whilst hot desking. Having a fixed formal desk and workspace is seen as old fashioned. If you're working in a co-working space then it is likely you will be working next to someone from a completely different company with clients in a completely different time zone. [54]

The most modern workplaces of the 2010s are "high concept", aesthetically pleasing spaces, designed to encourage a sense of community and inspire collaboration. One of the most popular trends is the introduction of nature into workspaces, for example with more natural lighting, green walls and plants.

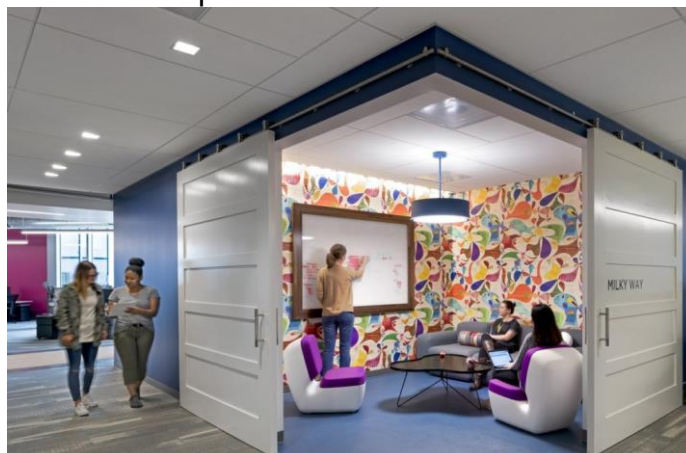


Figure 4.8: Collaborative Meeting Spaces in 2010's
(Source: Office Snapshots) [59]

4.1.3 Office table evolution

Since the 1960s, desks have changed drastically, as the technology development. From your traditional desk, complete with typewriter and rolodex, to the modern table with its endless scope for customisation of space, the main aim has been to find a desk that helps improve efficiency so you can focus on the important things. The following figure show the evolution of desk for the passing 40 years.

1960^s

'Bürolandschaft' - An open office landscape littered with ferns and soundcreens.

Desk
Knoll Model 1500

Computer
IBM Selectric typewriter

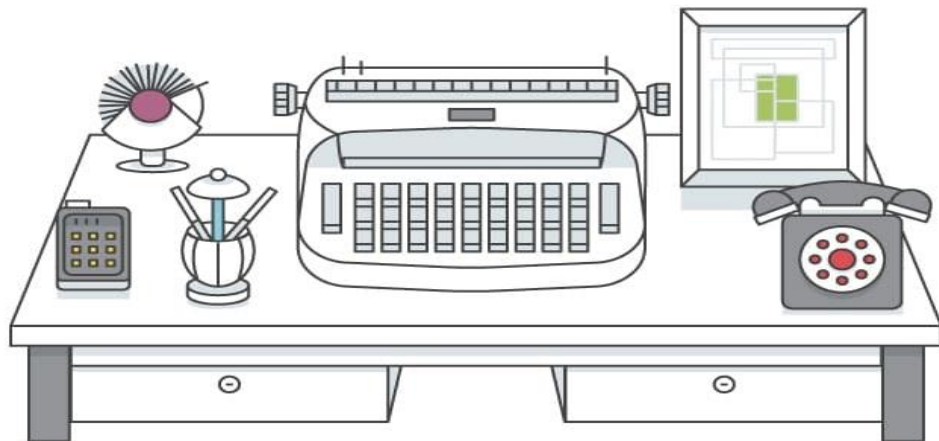
Electronics
Rotary dial phone

Tools
Rolodex

Tools
Cigarette dispenser

Tools
Calculator

Decoration
Expressionist prints



1970^s

'Action Office II' - A hive of fold-out walled cubicles.

Desk
The Caffero Desk

Computer
IBM Magnetic Card Selectric Typewriter

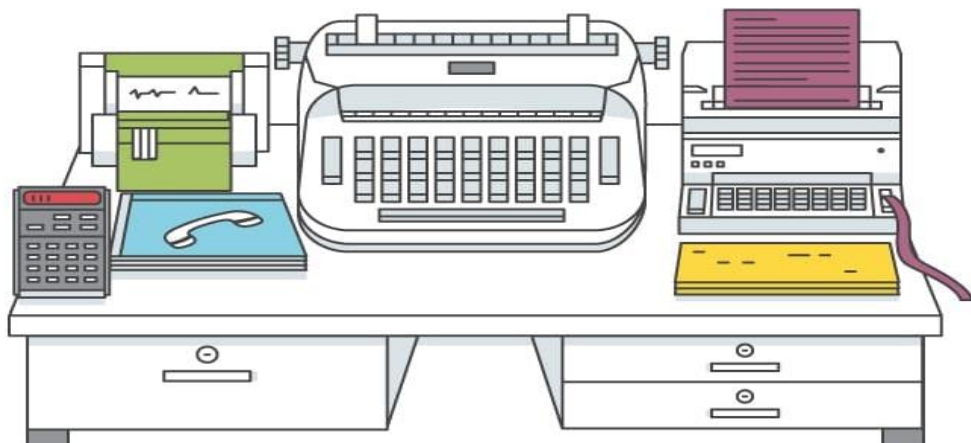
Electronics
LCD calculator

Electronics
Telex machine

Tools
Telephone directory

Tools
Carbon paper

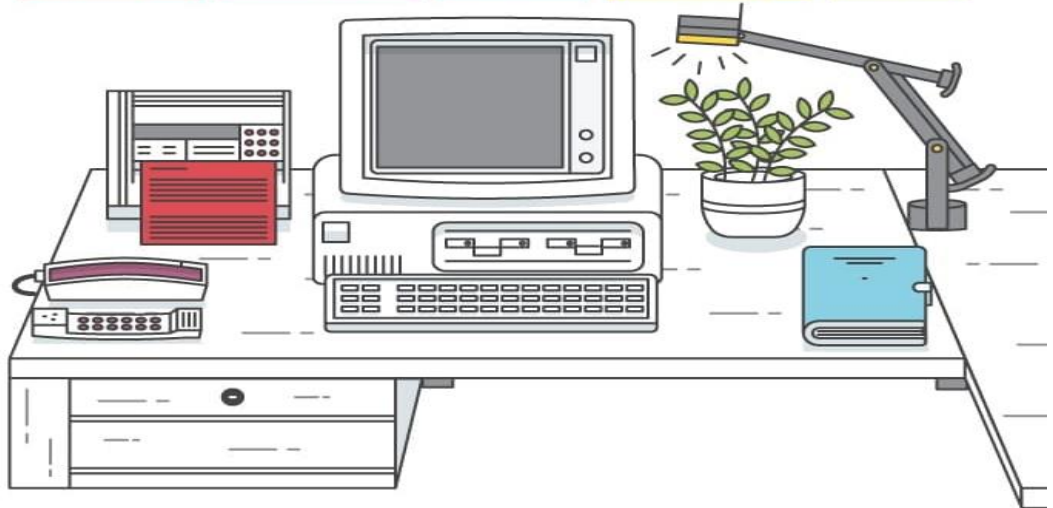
Tools
Mimeograph



1980s

'Cubical Farm' - The organic Action Office, gave way to an inhumanly regimented grid.

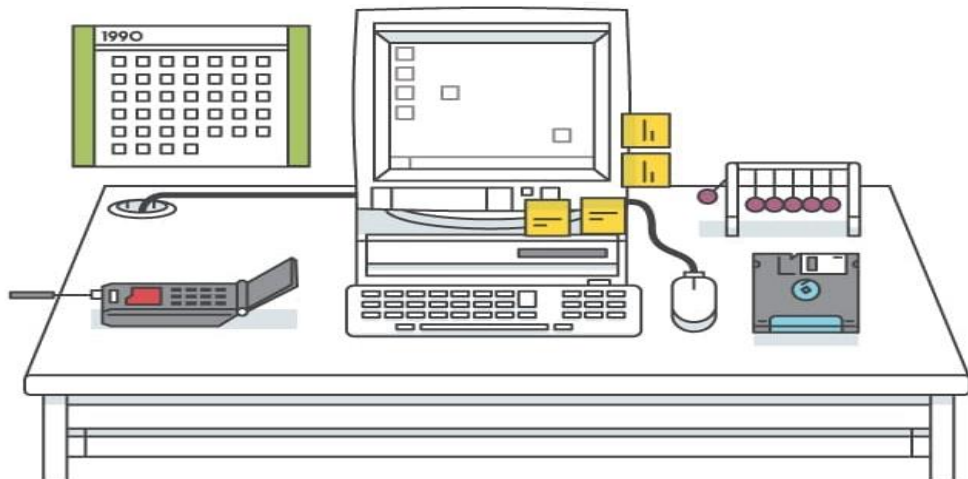
- Desk: The Morrison workstation
- Computer: IBM Model 5150 Personal Computer
- Electronics: Fax machine
- Electronics: Cordless phone
- Tools: Filofax
- Tools: Tizio Table Lamp
- Decoration: Potted plants



1990s

'Virtual Office' - The grab-a-lap-top-and-sit where-you-like feel, AKA 'hot desking'.

- Desk: The Knoll Propeller Table System
- Computer: IBM Ambra
- Electronics: Motorola MicroTAC cell phone
- Tools: Desk games
- Tools: Floppy disks
- Tools: Post-it
- Decoration: Wall planner



2000^s

'The Casual Office' - Semi-enclosed spaces allow for both privacy and open communication.

Desk: The Crinion Open Table System

Computer: iMac

Electronics: BlackBerry 5810

Electronics: Webcam

Tools: USB Stick

Tools: Eyedrops

Decoration: Whiteboard walls



2010^s

'The Play Room' - Multi-purpose spaces dotted with games and relaxation activities.

Desk: The standing desk

Computer: MacBook Pro

Electronics: iPad

Tools: Noise-cancelling headphones

Tools: Keychain fob

Tools: Free fruit

Tools: Additional Monitor

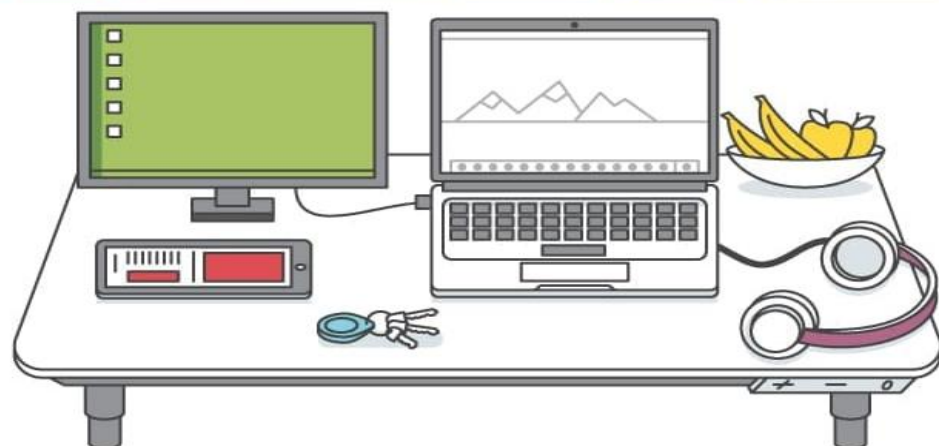


Figure 4.9: The evolution of the office desk
(Source: make it cheaper) [60]

As shown in the evolution figure, the office desk was with the tendency of Contracted design, with the computer getting smaller and occupying less

table space in recent years. The electronics put on the table was transformed from single function electronics (Dial phone, Calculator, fax machine, Motorola cell phone) to flexible and multifunctional electronics (Blackberry 5810, Ipad). The other tools was changing from the functional tools to the personal items.

4.1.4 Future office

There are a great many of innovation ways that companies are changing the workplace. If we focus on the development of communication technology and internet aspect, the following innovation is able be used on the future working space.

- 1) Hot-desking: Thanks to wireless internet, laptops, and tablets, employees are finding they don't necessarily need to be chained to a single desk. Instead, they can move around their space more, technology in tow. And some companies have taken this to the next level by eliminating personal desks and opting for a configuration called "hot-desking." [61]
- 2) Movable Desks: Employee could do what Skullcandy did at their international office in Zurich, Switzerland, and use desks that can be reconfigured to work individually or collaboratively. Desks there fit together like puzzle pieces and can be moved, reworked, and reattached as employees see fit -- a nod to the values of modern office design, which include mobility, flexibility, and collaboration. [61]



Figure 4.10: Movable desks
(Source: Office Snapshots) [61]

- 3) Overlap Zones: Another alternative to help encourage spontaneous collaboration among employees is designing the space to allow for "overlap zones," which make it more likely your employees will run into each other. Another alternative to help encourage spontaneous collaboration among your employees is designing your space to allow for "overlap zones," which make it more likely your employees will run into each other. The main staircase at ad agency Grupo Gallegos' office

is another great example of a zonal overlap. [61]



Figure 4.11: The main staircase at ad agency Grupo Gallegos' office
(Source: Office Snapshots) [61]

- 4) A "Superdesk": To represent their collaborative approach to work, the folks at the Barbarian Group built a 4,400-square-foot desk that weaves through their 20,000-square-foot office headquarters in New York City, which can sit up to 170 people at once. For employees who want to work in a quieter space or have more private discussions, the desk lifts into large arches that have seats built underneath them. [61]



Figure 4.12: Superdesk
(Source: Architecture Magazine) [61]

4.2 Commercial Environment

4.2.1 Retail Apocalypse

Traditional retailing has had a tough time lately. Traffic in shopping centres in Europe's biggest markets has been declining. A great number of retail shops forced to stop the business in recent years.

In England, the retail shops on High street (the central shopping drag in towns, villages, and cities across the country) used to be British's favorite. But these shops are closing, sales are down and fewer people visiting. [62]

Tobacconists, estate agents and jewellers are taking over high streets across Britain as the number of shops in the country falls at its fastest rate for four years. There were 15 shop closures a day across the UK in the first half of 2016 and the number of new openings has fallen to the lowest level for five years, according to a report that highlights the pressure on the retail sector. Fashion shops are struggling, with 206 closing in the first half of the year and only 119 opening, leading to a net decline of 87. In contrast, tobacconists increased by a net of 28, with 60 openings and 32 closures, while estate agents added 26 sites and jewellers 24. High Street-focused retailers BHS, Jaeger, and Austin Reed have all gone bust in 2016, leaving empty shops on streets up and down the country. A failure to invest in digital has been blamed for their collapse.

Matthew Hopkinson, the director of the Local Data Company, said: “The spaces left by the traditional occupants of our high streets are being increasingly filled by health care operators, food and beverage operators and the ongoing rise of the discounters.”

High streets across the UK are under pressure from a shift in spending from physical shops to online, a squeeze on household income, and increases in business rates and the national living wage, which has increased costs. [63]



Figure 4.13: High street shops closed
(Source: The Guardian) [63]

The same story was happening in US, retailers are closing thousands of stores following years of declines in sales and customer traffic. Dennis Green and Anaele Pelisson compiled a list of the 6,403 closures that have been announced in September 2017. [64]



Figure 4.14: Number of retail stores closing in 2017
(Source: Businessinsider) [64]

More than 300 retailers have filed for bankruptcy so far this year, according to data from BankruptcyData.com. That's up 31% from the same time last year. Most of those filings were for small companies. Most of these stores are suffering from the same thing: A shift away from traditional storefronts to online shopping. Not all of these chains will eventually go out of business. Most of them filed for Chapter 11 (A chapter of Title 11, the United States Bankruptcy Code, which permits reorganization under the bankruptcy laws of the United States.), which allows a company to keep operating while it restructures its debt. But the sector is already on course for a record number of store closings this year. [65]

4.2.2 E-commerce

1) Definition: According to Wikipedia, "E-commerce is the activity of buying or selling of products on online services or over the Internet. Electronic commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems."

2) The development of E-commerce

1971 or 1972: The ARPANET is used to arrange a cannabis sale between students;

1989: In May, Sequoia Data Corp. Introduced Compumarket, the first internet based system for e-commerce;

1995: Jeff Bezos launches Amazon.com and the first commercial-free 24-hour, internet-only radio stations, Radio HK and NetRadio start broadcasting. eBay is founded by computer programmer Pierre Omidyar as AuctionWeb;

1999: Alibaba Group is established in China. Global e-commerce reaches \$150 billion.

2000: The dot-com bust.

2001: Alibaba.com achieved profitability in December 2001.

2004: DHgate.com, China's first online b2b transaction platform, is established, forcing other b2b sites to move away from the "yellow pages" model.

2014: US e-commerce and Online Retail sales projected to reach \$294 billion, an increase of 12 percent over 2013 and 9% of all retail sales. Alibaba Group has the largest Initial public offering ever, worth \$25 billion.

2015: Amazon.com accounts for more than half of all e-commerce growth, selling almost 500 Million SKU's in the US. [66]

4.2.3 E-commerce Influence:

1) On people's consumption habits:

The infatuation with instant gratification, and decrease in delay discounting nowadays, has led to an increase in consumerism, as individuals seek out other forms of instant gratification. A consumer society considers consumption a route to personal happiness and enjoyment of life, and the consumption produces instant gratification (McGregor). The lack of a future oriented mindset allows individuals to ignore the need for savings, and instead seek out more instant gratification via consumption. We no longer purchase commodities just for their need; our purchases are therefore an important way in which identities are explored and projected to others (Government Office 33). Also adding to the problem for consumerism is big data and ecommerce. One could argue that the demand for more online shopping has made it quicker and easier, or one could argue that the quick and easy route of online shopping created an increase in demand, but either way e-commerce is a booming business. Companies, such as Amazon, are now offering same day delivery for some items, and it is difficult for a retail company to compete without an online ordering platform. Big data has a direct effect on consumerism because retailers are now able to custom tailor advertisements and products directly to the consumer, and this must be increasing purchase habits. [67]

At the same time, E-commerce brings convenience for customers as they do not have to leave home and only need to browse website online, especially for buying the products which are not sold in nearby shops. It could help customers buy wider range of products and save customers time. Consumers also gain power through online shopping. They are able to research products and compare prices among retailers. Also, online shopping often provides sales promotion or discounts code, thus it is more price effective for customers. Moreover, e-commerce provides products detailed information; even the in-store staff cannot offer such

detailed explanation. Customers can also review and track the order history online. E-commerce technologies cut transaction costs by allowing both manufactures and consumers to skip through the intermediaries. This is achieved through by extending the search area best price deals and by group purchase. The success of e-commerce in urban and regional levels depend on how the local firms and consumers have adopted to e-commerce. However, e-commerce lacks human interaction for customers, especially who prefer face-to-face connection. Customers are also concerned with the security of online transactions and tend to remain loyal to well-known retailers. In recent years, clothing retailers such as Tommy Hilfiger have started adding Virtual Fit platforms to their e-commerce sites to reduce the risk of customers buying the wrong sized clothes, although these vary greatly in their fit for purpose. When the customer regrets the purchase of a product, it involves returning goods and refunding process. This process is inconvenient as customers need to pack and post the goods. If the products are expensive, large or fragile, it refers to safety issues. [66]

2) On Markets and retails:

The Cowen and company did the research on products sales online in US. It is illustrated in the line chart that E- commerce penetration in different sector was getting higher from year 2000 till now, and the tendency would continue in future. Over 60% Media products was sold online since 2013, on the contrary, consumables and food & beverages are not so deep penetrated compared to other products.

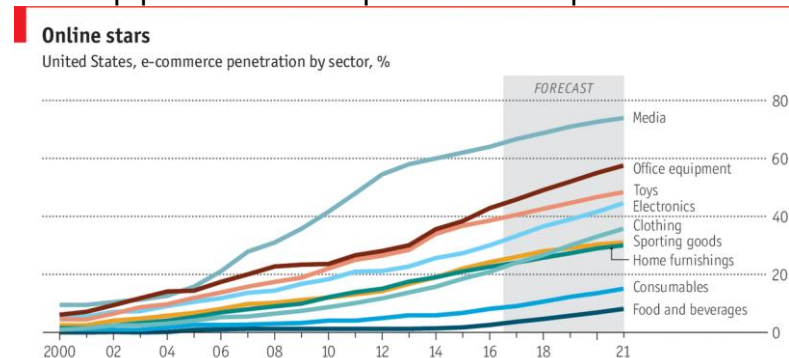


Figure 4.15: E-commerce penetration by sector (Source: Cowen and Company, Economist) [68]

E-commerce markets are growing at noticeable rates. The online market is expected to grow by 56% in 2015–2020. Traditional markets are only expected 2% growth during the same time. Brick and mortar retailers are struggling because of online retailer's ability to offer lower prices and higher efficiency. Many larger retailers are able to maintain a presence offline and online by linking physical and online offerings.

E-commerce allows customers to overcome geographical barriers and allows them to purchase products anytime and from anywhere. Online and traditional markets have different strategies for conducting business. Traditional retailers offer fewer assortment of products because of shelf space where, online retailers often hold no inventory but send customer

orders directly to the manufacture. The pricing strategies are also different for traditional and online retailers. Traditional retailers base their prices on store traffic and the cost to keep inventory. Online retailers base prices on the speed of delivery. [66]

Some retailers have come to the reality that brick and mortar shopping today is much more about the experience than for purposeful shopping. Walking through a mall and window shopping can be entertaining and fun for people. The smart retailers are creating a more experiential environment rather than stocking their stores with every item possible. [69]

Startups, tech firms and consultants are offering tools to help smaller retailers adjust. Some of the more interesting ones promise to narrow the gap between what e-commerce sites and physical stores know about their customers. Floor mats can measure store traffic, video analytics will track shoppers' age, sex and mood, and beacons can gather data about what customers do in the shop once they have signed up for free Wi-Fi. For now, though, many American firms are reluctant to invest in such expensive new technology for shops that may not be there for much longer.

In China, those offering to remedy retailers' woes include some of the big e-commerce firms, and retailers may be happy to work with them because their platforms are so pervasive. In the West, small merchants already pay Amazon to list products on its site and store goods in its warehouses. The small sellers can reach more consumers more easily; Amazon earns fees and, thanks to sellers' listings, can offer a broader selection.

Big retailers, on the other hand, seem much less likely to team up with Amazon. Target and Toys"R"Us chose Amazon to handle their e-commerce businesses in the early 2000s, but both ended the partnership, with Toys"R"Us doing so in court. Unlike Alibaba, Amazon owns much of the stuff it sells, so competes directly with any seller that uses its services. Despite such troubles, there are examples of how bricks-and-mortar shops might thrive. One strategy is to offer distinctive products that are not available elsewhere (as does Zara, a clothing chain owned by Inditex), or which are difficult to sell online. A second is to give shoppers a great deal. TJX, an American firm, offers manufacturers' surplus goods at bargain prices. Another option is a great experience: champagne at Louis Vuitton, perhaps, or personalised advice at Nike. The most difficult route is to try to match Amazon's retail standards and offer more.

Walmart, once the undisputed king of American retailing, is mounting the boldest counteroffensive. It can no longer simply open stores to boost growth; 90% of Americans already live within ten miles of a Walmart. So the company is seeking to protect its margins by making stores even more efficient—saving \$7m by printing shorter receipts, for instance—while investing online. Last year it spent \$3.3bn buying Jet.com, an e-commerce site founded by Marc Lore, who now oversees Walmart's

suite of online businesses. He is not trying to match Amazon's breadth. "We are focused on being a retailer," he declares. But Walmart is trying to catch up with Amazon in other ways. The company now offers free two-day shipping. Just as JD's integration with Tencent is helping it challenge Alibaba, Walmart may succeed by partnering with tech giants. In August it said it would sell through Google's voice assistant, in a bid to counter Amazon's Alexa. [68]

4.3 TRANSPORTATION AND LOGISTIC

The transportation mode and logistic system was promoted by the vast change of the communication technology, such as the rise of social networking and peer-to-peer networking, the spread of smartphones, and the development of connected vehicle technology.

4.3.1 Transportation mode

The Digital Age has begun, and technology has brought us smart phones, real-time planning, open traffic data, and social customer service. For the first time, the passenger now has more information than the operator. This fundamental shift offers consumers real choice based on a picture of alternative routes, comparative pricing and current network status. As transport operators adapt and new entrants arrive, new business models will transform the use of user information, payments, integration and automation.

These changes will form five disruptive trends for transport and smart mobility services:

- 1) User-centred Mobility services put travellers in control; public transport will become personal. This changes the approach to operations and planning based on users' choices, priorities, data flows and dynamic response to disruption. Staff will adopt 'digital uniforms', so that they have the information to support customers.
- 2) Integrated and intelligent transport networks will sense demand, measure performance, and monitor the health of physical assets. Intelligent systems will respond in real-time to manage capacity and predict and avoid disruption.
- 3) Pricing and payments will see a revolution over the next five years. Digitisation of tickets and payments will transform metro services and allow all rail operators to follow airlines by adopting e-tickets. Beyond contactless payments, pay as you travel will be based simply on location.
- 4) Automation and safety will benefit from the exponential potential of cognitive technology, with the potential to save millions of lives worldwide, particularly on the roads. Increases in safety and changes to the nature of liability will have a fundamental impact on the insurance industry.

5) Public and private innovation will work together to meet the mobility challenges of the 21st century. The role of the public sector will be critical to stimulate advances and protect citizens. New private sector entrants will take advantage of peer-to-peer models, digital and mobile technology, and low costs to scale globally.

Each of these five themes can be applied to road, rail, and air transport in order to achieve smart mobility and improve the individual's travel experience. [70]

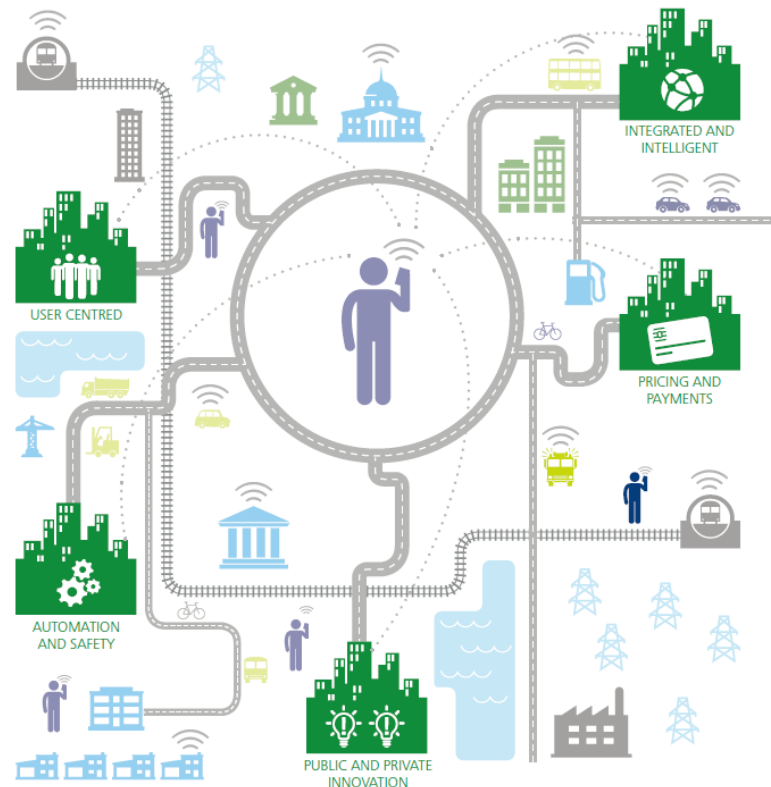


Figure 4.16: Five disruptive trends for transport and smart mobility services
(Source: Deloitte.) [70]

1) Vehicle development

Plenty of scholars discussed how the digital transformation has revolutionized the vehicle technology. Many new car technologies are either specifically built for safety or at least have some sort of safety focus to them. Some of the latest car innovations we've found are some truly exciting technologies that could revolutionize not just the automotive industry but human transportation in general.

- Augmented Reality Dashboards

GPS and other in-car displays are great for getting us from point A to point B, and some high-end vehicles even have displays on the windshield, but in the near future cars will be able to identify external objects in front of the driver and display information about them on

the windshield.

Augmented Reality dashboards, AR for short, will function in a similar way for drivers. BMW has already implemented a windshield display in some of their vehicles which displays basic information, but they're also developing augmented reality dashboards that will be able to identify objects in front a vehicle and tell the driver how far they are away from the object. The AR display will overlay information on top of what a driver is seeing in real life.

BMW is also researching the use of augmented reality for automotive technicians. They produced a video where a BMW technician uses AR glasses to look at an engine, identify what parts need to be replaced and then shows step-by-step instructions on how to fix it.

AR is also being researched for passengers as well. Toyota has produced working concepts of their AR system that would allow passengers to zoom in on objects outside of the car, select and identify objects, as well as view the distance of an object from the car using a touch-screen window.

Augmented reality may not be here yet, but if these car companies have their way, we'll be seeing it in our future cars a little way down the road.



Figure 4.17: Augmented reality on GPS
(Source:ICTBAS) [71]

- Self-driving cars

The idea of a self-driving car isn't a new idea. Many TV shows and movies have had the idea and there are already cars on the road that can park themselves. But a truly self-driving car means exactly that, one that can drive itself, and they're probably closer to being a reality than you might think.

In California and Nevada, Google engineers have already tested self-driving cars on more than 200,000 miles (321,869 kilometers) of public highways and roads. Google's cars not only record images of the road, but their computerized maps view road signs, find

alternative routes and see traffic lights before they're even visible to a person. By using lasers, radars and cameras, the cars can analyze and process information about their surroundings faster than a human can. If self-driving cars do make it to mass production, we might have a little more time on our hands. In some of Google's tests, the cars learned the details of a road by driving on it several times, and when it was time to drive itself, it was able to identify when there were pedestrians crossing and stopped to let them pass by. Self-driving cars could make transportation safer for all of us by eliminating the cause of 95 percent of today's accidents: human error

Although self-driving cars may seem far off, GM has already done its own testing and some people believe that you'll see some sort of self-driving car in showrooms in the next decade.

- Cars That Communicate with Each Other and the Road

Car manufacturers and the U.S. government are seriously looking into and researching two technologies that would enable future cars to communicate with each other and with objects around them. One is called Vehicle-to-Vehicle communication, or V2V, which is being tested by automotive manufacturers like Ford as a way to help reduce the amount of accidents on the road. V2V works by using wireless signals to send information back and forth between cars about their location, speed and direction. The information is then communicated to the cars around it in order to provide information on how to keep the vehicles safe distances from each other.

Another technology is vehicle-to-infrastructure communication, or V2I, which would allow vehicles to communicate with things like road signs or traffic signals and provide information to the vehicle about safety issues. V2I could also request traffic information from a traffic management system and access the best possible routes. [72]

These technologies could transform the way we drive and increase automotive safety dramatically. Car companies and the government are already working to try to make this a reality.

- Maas

“Maas is a mobility distribution model where the transportation needs of individuals are satisfied by a service provider over a single interface”- Hietanen, 2014

The digital age has opened up new opportunities to improve the customer experience in using public transport. Specifically, we see the role of smart technology in the hands of customers as the new rubric to deliver services that are individualised to the needs and preferences of current and future public transport users. This frontline of service delivery has become known as mobility as a service (Maas) whereby an individual can book a service delivered through a range

of possible modes of transport. [75]

The conceptual embrace of MaaS by transportation planners and operators is, in many ways, a natural evolution of two key trends. First, increasingly, people no longer view transportation through the prism of either/ or: Either you fall into the more roads camp or you favor more transit. As urban density continues to grow, MaaS provides an alternative way to move more people and goods in a way that is faster, cleaner, and less expensive than current options. By adding more variability into the supply side of transportation, MaaS could transform a relatively inflexible transportation system into one that is significantly more pliable. Second, consumers have increasingly embraced new mobility options and apps over the last decade. Journey planning apps, which help users identify and compare different modal options for getting to their destinations, have become commonplace, with local and global offerings available in every city. The natural next step would be to bring all of these options together on a common platform. This would enable journey planning across a range of transportation modes, offering flexible payments and personalization based on user preferences regarding time, comfort, cost, and/or convenience. With so many more choices available, customers should have the ability to seamlessly plan and pay for multiple services as they travel. [76]

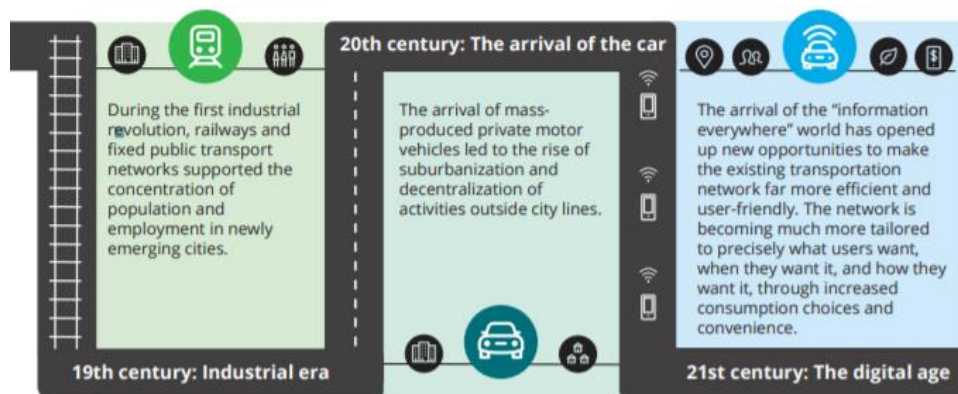


Figure 4.18: Mobility through the ages
(Source: Deloitte analysis.) [76]

4.3.2 Logistic system

Digital technologies have permeated and disrupted almost all sectors, and logistics companies are no exception. Optimization and efficiency, combined with speed and seizing the moment are the keys to success in today's highly competitive advantage. Technology is the key enabler allowing companies to realize these aspects.

- 1) Here are the five most important trends impacting the logistic industry.
 - The Modern Consumer
The modern consumer who have grown up in the age of Amazon have an inherent desire to receive goods and services instantly—

putting increased pressure on transportation and logistics companies to deliver goods exceptionally fast, and at the lowest price. Consumers now demand unprecedented visibility into order status, tracking and delivery, forcing the industry to invest in new technologies and partnerships.

- **A Rise in Ecommerce**
Increasing consumer demands are fueled by the explosive growth of ecommerce. To compete, retailers must employ an omnichannel logistics strategy to deliver a seamless shopping experience. This inevitably introduces new supply chain, fulfillment and shipping challenges.
- **Supply Chain Innovation**
Omnichannel logistics lends itself to another trend that will be prevalent in 2017: the digital supply chain. Harnessing the power of IoT and data driven insights at various points along the supply chain offers huge potential to improve customer service and maximize efficiency. Big data and predictive analytics are empowering event-driven logistics that can account for external factors like natural disaster and war hazards which can help significantly reduce risk along the supply chain.
- **Delivery by drones**
In addition, the movement toward automation is drastically improving productivity. Amazon has already started experimenting with drones as a new form of express delivery and advancements in sensor technology have made autonomous vehicles a reality for 2017 and beyond. These automated solutions have the potential to increase safety, reduce risk, and significantly increase efficiency.
- **Logistics-as-a-Service**
Overarching the broader industry is the movement towards cloud logistics that enables, “logistics-as-a-service” business models. Innovations in the cloud have improved control over supply chain processes with access to real-time information—allowing companies to be more agile in response to volatility or disruptive events. Meanwhile, this same technology facilitates flexible integrations with other key business processes to optimize all operations.

Whether moving product via land, air, sea or a combination thereof, transportation and logistics companies have a lot on their plate. Advancements in technology and changes in way goods are bought and sold are creating complexity, but also opportunity for the industry. In order to keep pace, companies operating in this sector will have to learn to be agile, forward thinking and open to collaboration as they navigate the constantly changing global economy. [77]



Figure 4.19: Amazon Prime Air service by drone
(Source: Amazon) [78]

4.4 Blockchain

Blockchain is a digital, decentralised (distributed) ledger that keeps a record of all transactions that take place across a peer-to-peer network. It is an interlinked and continuously expanding list of records stored securely across a number of interconnected systems. This makes blockchain technology resilient since the network has no single point of vulnerability. Additionally, each block is uniquely connected to the previous blocks via a digital signature which means that making a change to a record without disturbing the previous records in the chain is not possible, thus rendering the information tamper-proof. The key innovation in blockchain technology is that it allows its participant to transfer assets across the Internet without the need for a centralised third party. [77]



Figure 4.20: The blockchain allows anonymous and secure, peer-to-peer transactions
(Source: Tommy Parker) [80]

Blockchain technology has been rapidly growing in influence since 2015, when it became apparent that the technology underlying the relatively arcane concept of cryptocurrency could transform the financial system. By the end of 2016, major players like Bank of America and Goldman Sachs were laying claim to

promising blockchain technologies, filing patents at roughly twice the pace they had at the start of the year.

Trustworthy data and interactions are the cornerstone of the digital economy. As the physical world becomes ever more quantified, being able to guarantee the integrity and provenance of digital and physical assets and the transactions in which they're involved will become a core competitive advantage and blockchain is deliberately designed to embed that guarantee in every transaction. Distributed ledgers, smart contracts, and other blockchain technologies could form the foundation on which other exponential technologies combine and scale. The basic idea is simple: IoT sensors in drones, autonomous vehicles, 3D printers, and augmented/virtual reality gear would collect and record data in blockchain-based decentralized ledgers. This data would be immediately verified and could be made instantly available for use by any application. Smart contracts programmed into the blockchain would then execute business processes by drawing on these vast repositories of live data. Everything could be further automated by adding artificial intelligence into blockchain smart contracts to make decisions without human involvement.

4.4.1 Blockchain Across Different Fields

As blockchain makes considerable forays into financial services pioneers are beginning to recognize the equally big opportunities it offers in areas like energy, transportation, health care and even the arts. Here I choose the industries related to the city governance, new energy management and public administration.

1) Government:

Government departments that work in silos cause the exchange of information to be delayed, negatively influencing citizen services. Linking the data between the departments with blockchain ensures that data is released in real time, when both the departments and the citizen consent to sharing data. Blockchain technology could improve transparency and check corruption in governments worldwide. Estonia, where the identit.ee e-residency project provides a strong framework for building applied blockchain services. Delaware is also getting on board.

2) Energy

Microgeneration of electricity is becoming a huge trend in the power generation business. New energy initiatives such as home power generation and community solar power are filling in gaps of power supply across the world. As microgeneration adds to traditional power suppliers, it fosters creation of an energy market. Smart meters can register produced and consumed electricity in a blockchain, which allows for consumption of the surplus energy in a different location, providing credits or currency to the original producer. Energy Web Foundation is not so much a startup as an alliance body aimed at introducing an open-source blockchain designed for the electricity market, identifying use cases and helping build an ecosystem of participants. Also, Conjoule offers a blockchain platform designed to support peer-to-peer trading of

energy among rooftop PV owners and interested public-sector or corporate buyers.

3) Public sector:

The public sector will likely find compelling applications for blockchain, particularly where existing record-keeping methods are inadequate. For instance, Factom has reportedly collaborated with the Honduras government to pilot a blockchain-based program to record land ownership in the country. The intent is to reduce the corruption and fraud associated with a centralized registry under the control of government officials by substituting a distributed, transparent ledger instead. Other use cases include creating tamper-proof voting records, vehicle registries, fraud-proof government benefits disbursements, and digital identities for individuals, such as refugees, who lack government-issued identity documents. Stratum is a software security company that works with organizations to secure critical processes. The company's Proof of Process Technology allows for data traceability and transparency, and creates a common audit trail secured by blockchain and cryptography. [79]

4.4.2 Global blockchain initiatives

Countries such as Estonia, Georgia, the UAE, Sweden, the USA and the UK have already taken the lead in pioneering blockchain applications in the government and public sector. Dubai, which recently committed to transitioning all government transactions to blockchain by 2020 estimated that it could save nearly 100 million pages of documents generated in paperwork each year, 25.1 million hours of productive time and nearly 411 million km of travel time for its citizens.

Though slowly, India has also started treading down the path of blockchain adoption. Many states in India are now talking about using blockchain 5 technology. Andhra Pradesh, for example, announced a partnership with the Swedish firm ChromaWay to secure citizen data on a blockchain besides also exploring blockchain use in various other fields such as smart cities and transportation. The Institute for Development and Research in Banking Technology (IRDBT), RBI, published a white paper on the application of blockchain technology in the banking and financial sectors in India. Some prominent global blockchain initiatives in the government and public sector are highlighted below. [77]

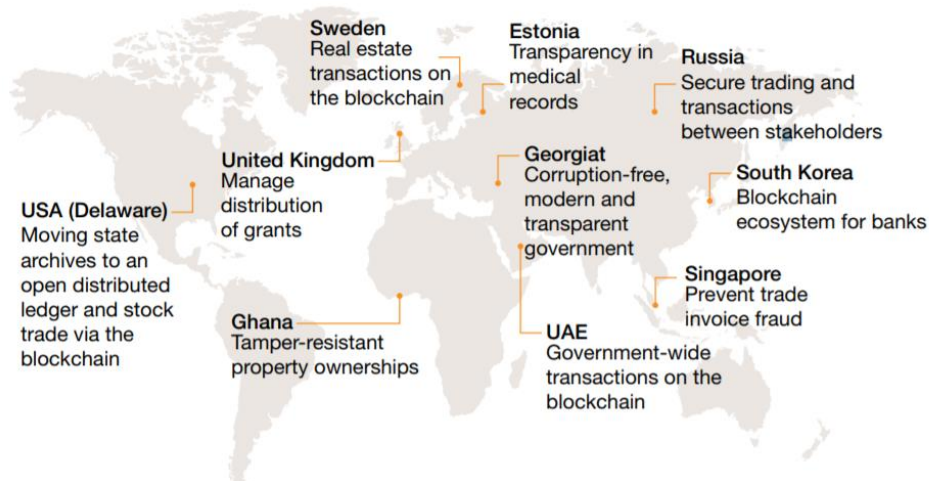


Figure 4.21 Global blockchain initiatives (Source: FICCI) [77]

4.4.3 Impact on Smart cities

Broadly speaking, the impact of blockchain in the realm of smart cities can be classified as under figure. Blockchain presents an opportunity to make the technology initiatives of a smart city more secure, transparent, efficient and resilient in consonance with the objectives for the Smart Cities Mission

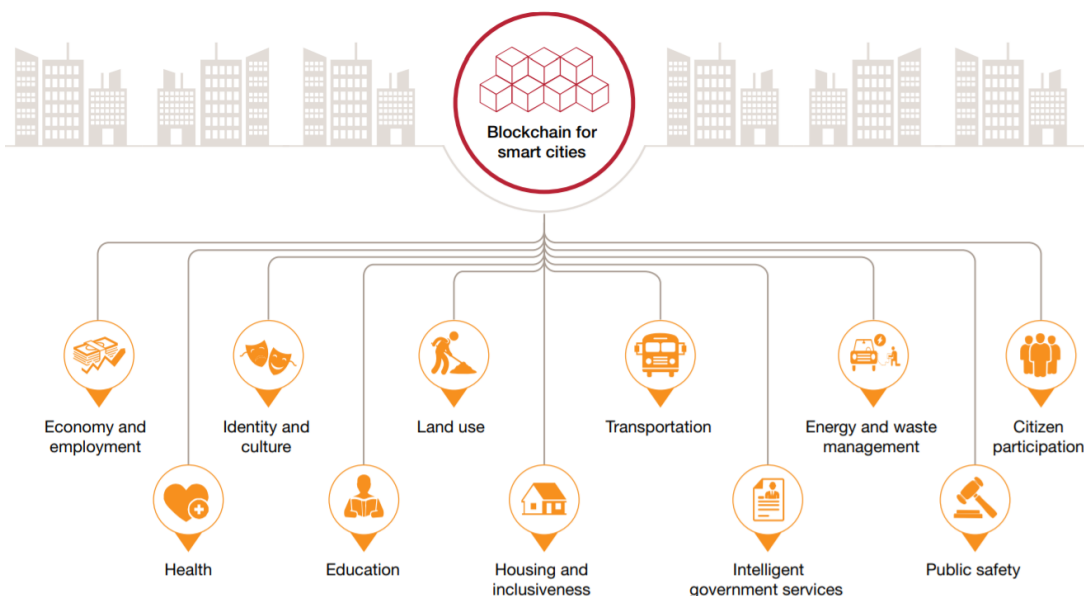


Figure 4.22: Smart city areas where the blockchain can have an impact (Source: FICCI) [77]

1) Land Use

A smart city has different kinds of land uses in the same places—for instance, clusters of offices, houses and shops.

The Blockchain is able to be used on Land and property registration and

life cycle management. Property registration on a blockchain can eliminate problems associated with tenuous land titles while creating a digitised process to automate property registration, thus eliminating cost and time taken. Such a system will increase the trust in the system, thereby improving the economy.

As a subset of land/property registry, all approvals, inspection reports and self-certification can be recorded against the land/property, thus providing an immutable 360-degree view of building design/construction and inspection/self-certification

2) Housing and inclusiveness

A blockchain-based auction/lottery system based on the identity of the respective citizens (validated through smart contracts) will ensure that houses are only allocated to the right citizens/user groups. Such a system will help improve the trust in the allocation process as a blockchain can make such a system transparent and openly auditable. Also, all transactions get captured immutably, resulting in increased accuracy in record keeping.

3) Transportation

P2P vehicle sharing on a blockchain network can help address first and last mile connectivity in a city and reduce private vehicles, thus promoting decentralised public transportation. A blockchain-based system can provide the reputation management capability which is essential for P2P vehicle sharing.

At the same time, Vehicle registry on a blockchain can provide life cycle provenance for a vehicle, thus ensuring only the right vehicles ply on the smart city roads. Such a registry combined with the right IoT systems (e.g. automated number plate recognition cameras) can ensure that warnings are provided to owners of outdated vehicles. [77]

4.4.4 Possibilities of future blockchain framework.

- 1) Democratized design and manufacture: A blockchain-enabled design and manufacturing platform would allow individuals and small businesses to play a larger role in the digital economy. Products designed from scratch in virtual reality, as well as copies of existing objects scanned with machine vision, could be easily bought, sold, shared, or even digitally remixed, at an affordable cost while protecting intellectual property rights. This would be true whether the work was complex multi-material physical products made with distributed 3D printers — or text, music, and images.
- 2) Autonomous logistics: Intelligent, self-driving delivery vehicles could shuttle products and materials to their destinations, or even use onboard 3D printers to create them in the location where they're needed, while using blockchain technology to execute and verify every transaction. Machine learning apps programmed into smart contracts, which are also

embedded in the blockchain, could optimize routing. This could make the current centralized model of warehousing and logistics obsolete.

- 3) Distributed commerce: Combining blockchain with virtual reality, 3D scanning and printing, artificial intelligence, and autonomous vehicles could create immersive, personalized shopping experiences anywhere consumers want to have them. Shoppers could grant permission for vendors to access their purchase history, preferences, and other data stored on a blockchain ledger. Vendor AIs could then generate more accurate recommendations and interact with ecommerce bots that complete purchases automatically. Customers would receive promotions for new styles, medication refills, or replacement parts without even having to think about it. Critically, blockchain would allow buyers to limit access to their personal or proprietary data to specific organizations over a defined period of time, for example, until the end of their shopping experience or the close of their fiscal year. [82]

The blockchain technology and smart contracts are still in the progress of exploration and experiment by different countries. It is obviously that the vision is positive and spectacular, but there are still various of challenges and arguments on it.

In conclusion, Internet and technology development set people free from the fixed working position and heavy electronical instruments. The e-commercial without doubt make a better life for the citizens by offering them more choices on shopping modes and more comfortable shopping experience. However, it also brought a shock on physical markets. It was not a negative phenomenon, the high competition stimulated the company owner to upgrading and transforming. The transportation and logistic were impacted both on the vehicle technology and the management system. We are looking forward the user-friendly and more efficient transportation modes in future. Blockchain is still a new field in the urban planning, various governments are exploring how the city can be benefited by the integration of blockchain with government management, energy saving and smart city approach.

CHAPTER 5. WILL INTERNET ELIMINATE THE CITIES?

Since the Internet is able to set human free from the fixed position, to realize the online communication, to satisfy citizen's living without making them to go out from their apartment, and even to substitute part of cities function (gather resource, transfer information, etc.).

In this chapter, the analyze is focus on following questions:

Whether the internet will eliminate the cities?

How is the development situation of the high-tech giants? If the internet can substitute so many social activities and satisfy communication requirements on working, will the high-tech company choose to cancel the office, or move the office to rural areas and separate with peer company?

5.1 Relationship Between ICT and Cities

The information and communication technologies changed the world not only on the virtual dimension, but also on the physical dimension. The scholars hold diverse attitudes on whether the ICT would eliminate or strengthen the cities, here we collected various of researches and papers in different years.

1) Nearly, six thousand years ago the first markets, temples, and palaces arose amid the irrigated fields of the Middle East and served as physical hubs for social networks devoted to commerce, worship, and government. As wealth and culture flourished, writing was invented to keep tabs on all of the transactions, rituals, and rulings. It was the world's first information technology. [8]

2) The movable type printing press was the signal innovation in early modern information technology. The first printing press was established in Mainz, Germany between 1446 and 1450. Printing transforming the ways ideas were disseminated and the conditions of intellectual work. Historians suggest the printing press was one of the most revolutionary inventions in human history, which increased the speed of communication and the spread of knowledge.

Printing was an urban technology. The market for printed media was overwhelmingly urban and printing spread as skilled, entrepreneurial workers travelled from Mainz and established presses in other European cities. There were important, localized spillovers to the technology at the city level. Robert Lucas observes that the spillovers associated with human capital accumulation and economic growth are what secure the central role of cities in economic life." [84]

Contemporary work on urban economics indicates that cities are associated with increased sharing of information, superior matching between workers and employers, and significant technological spillovers.

Print media was widely traded, but cities with printing presses derived benefits from the technology that others did not. In part this was because print media was heavy, sensitive to damp, and as a result costly to transport. Print cities also enjoyed benefits due agglomeration economies. Elizabeth

Eisenstein observes that the printer's workshop brought scholars, merchants, craftsmen, and mechanics together for the first time in a commercial environment, eroding a pre-existing town and gown" divide. [85]

- 3) In more recent eras, each time human settlements have grown larger, advances in information technology have kept pace to manage their ever-expanding complexity. During the nineteenth century, industrialization kicked this evolutionary process into high gear. Urban expansion multiplied our ability to process information and communicate quickly over great distances.

The telegraph revolutionized the management of big industrial enterprises. But it also transformed the administration of city government. (Police departments).

By enabling business to flourish and municipalities to govern more effectively, these technologies removed critical obstacles to the growth of cities.

By 1910, historian Herbert Casson could declare matter-of-factly. "No invention has been more timely than the telephone," he wrote. "It arrived at the exact period when it was needed for the organization of great cities and the unification of nations. [8]

- 4) Many have argued that new technologies undermine the need for cities and all of the productive yet expensive and sometimes unpleasant proximity they provide. In 1964 science-fiction legend Arthur C. Clarke articulated a vision of the future where, thanks to satellite communications, "It will be possible . . . perhaps only fifty years from now, for a man to conduct his business from Tahiti or Bali, just as well as he could from London. [8]

- 5) More recently, as the Internet began its meteoric rise in the mid- 1990s, tech pundit George Gilder wrote off cities as "leftover baggage from the industrial era." But instead of disintegrating, London grew bigger, richer, more vital and connected than ever. Instead of undermining the city, new telecommunications technologies played a crucial role in London's success—it is the hub of a global tangle of fiber-optic networks that plug its financiers and media tycoons directly into the lives of billions of people all over the world.

The digital revolution didn't kill cities. In fact, cities everywhere are flourishing because new technologies make them even more valuable and effective as face-to-face gathering places. [8]

- 6) In 1997, the economist Frances Cairncross followed this trend to its logical conclusion with an overt hypothesis that she called the "death of distance." The Internet would usher in a "communications future...in which distance is irrelevant." However, the death-of-distance theorists forgot something crucial to human experience: the importance of physical interaction between people and with the environment. [4]

- 7) E-topia, written in 1999 by the architect and academic William Mitchell, head of the MIT Media Lab's Smart Cities group, illustrated his point with a humorous vignette about a man living at and running a business from the

top of a mountain. Researchers at the Senseable City Lab analyzed telecommunication data and meetings and found that people who communicate digitally also tend to meet in person. People fundamentally want to be with other people, they want to be in a beautiful place, they want to be at the center of it all: people want to live in cities. [4]

- 8) Academic research has established that the Internet does not isolate people, nor does it reduce their sociability; it actually increases sociability, as shown by Manuel Castells in his studies in Catalonia on 2007 [83], and the World Internet Survey for the world at large (Center for the Digital Future 2012 et al.).
- 9) On 2012, Rainie and Wellman conceptualized Networked individualism to express that individuation is the key process in constituting subjects (individual or collective), networking is the organizational form constructed by these subjects; this is the network society, and the form of sociability.

Our society is a network society; that is, a society constructed around personal and organizational networks powered by digital networks and communicated by the Internet. And because networks are global and know no boundaries, the network society is a global network society. This historically specific social structure resulted from the interaction between the emerging technological paradigm based on the digital revolution and some major sociocultural changes. A primary dimension of these changes is what has been labeled the rise of the Me-centered society, or, in sociological terms, the process of individuation, the decline of community understood in terms of space, work, family, and ascription in general. [88] But individuation does not mean isolation, or even less the end of community. Sociability is reconstructed as networked individualism and community through a quest for like-minded individuals in a process that combines online interaction with offline interaction, cyberspace and the local space. [85]

- 10) Scholars in London School of Economics indicates on 2013 that what is important for creativity and innovation is creative occupations, rather than creative industries. “We also find no evidence that creative industries are more innovative in cities, meaning that, at least in the case of the UK, the role of externalities in driving innovation amongst creative firms in cities may be overstated. The UK is a small and relatively densely populated country, and the types of knowledge links required for innovation in the creative industries may apply even in rural areas (see, for example, the success of creative places such as Falmouth in Cornwall). This finding may also reflect the increasing importance of digital business models in the creative industries.” In this context, the author implied that the digital business may be effective at creating networks of professionals that do not necessarily live in proximity to each other. This is therefore the type of process by which the internet could substitute for urban proximity. [86]
- 11) A research of the relationship between virtual space and urban space was took on 2017. Though the previous literature and the empirical test on

whether or not internet demand is higher in urban areas, the authors summarized that urban populations create higher rates of high speed internet connectivity. There are several elements of the literature that support such a finding including research that reports how cities are more likely to have stronger information technology infrastructures than rural areas. It seems unlikely, however, that such results are simply a supply phenomenon. Instead, they believe that at least to date, urban dwellers are much more likely than others to acquire high speed internet connections, or firms in urban areas have many more connections. Larger cities are generally found to provide higher benefits to their populations than smaller cities and have higher costs because of congestion. The finding that increases in both the urbanization rate and the percentage of the urban population in the largest city are associated with an increase in internet connections demonstrates that the internet is a complement to urban agglomerations. [87]

Since the ICT developments dramatically after the typing writer stage, the scholars had been through the confusing and discovering periods. In recent years, the ICT have arrived in a new era: Ubiquitous Computing.

“Rather than the network subsuming and replacing space, the two are becoming increasingly enmeshed. In short, the digital revolution did not kill urban spaces- far from it- but neither did it leave them unaffected. The introduction of the Internet, the space of flows, the connective tissue that theorists from Carincross to Negroponte expected to kill physical proximity, has indeed had a profound impact on cities. Instead of flows replacing spaces and bits replacing atoms, cities are now a hybrid space at the intersection of the two. Physical and virtual are fused through a productive collision, where both propinquity and connectivity play an important role.”, concluded by Carlo Ratti and Matthew Claudel. [4]

At the same time, ICT in the Smart City is used to enhance quality, performance and interactivity of urban services, to reduce costs and resource consumption, and to improve contact between citizens and city stakeholders. Smart City applications run on top of the ICT infrastructure and are developed to manage urban flows and allow for real-time responses that improve the quality of life. [92] In this case, the ICT will play a vital role on future cities.

5.2 Internet Enterprises Booming

The Fortune published the list of 100 Fastest - Growing Companies on September,2016. This list traditionally examines three-year performance based on increases in revenues, profits per share, and stock return. This group- the most smoking among the hot- is a diverse group and benefitted from the rise of mobile, the ever increasing shift to online, the need for high-speed connectivity and the rebound of the financial sector, among other factors.

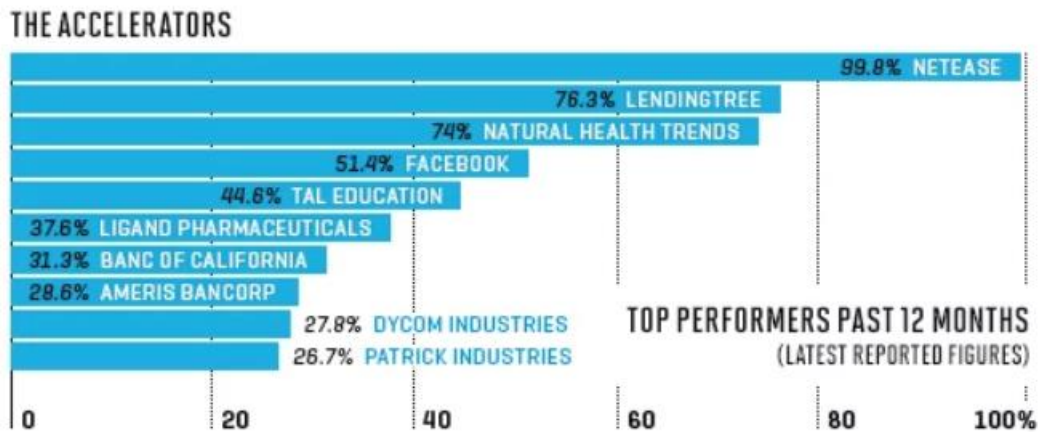


Figure 5.1: The 10 Accelerators fast-growing companies list on 2014 (Source: Fortune) [89]

The Internet companies occupied four places in the 10 fast-growing companies. The most successful company is NetEase, has more than doubled revenues since 2014. NetEase has produced plenty of popular online PC and mobile games, and was rapidly developing a stream of new games and transitioning its PC games to mobile to play into the country’s rapidly growing mobile gaming industry.

Online loan marketplace Lending Tree made its first appearance on Fortune’s annual list and jumped right to the top as the company celebrates its 20th anniversary.

The well-known Facebook is ranking top 4. Nearly a quarter of humanity—1.7 billion users—are on Facebook, and it’s projected to receive 12% of the world’s digital ad revenues this year. As with NetEase, mobile is driving growth, with 90% of Facebook users accessing the social network on mobile devices. Nearly a quarter of humanity—1.7 billion users—are on Facebook, and it’s projected to receive 12% of the world’s digital ad revenues this year. As with NetEase, mobile is driving growth, with 90% of Facebook users accessing the social network on mobile devices.

Internet, phone and cable companies rely on speedy connections, and some of the biggest companies turn to Dycom to make that happen. This telecommunications contractor lays fiber-optic cable for high-powered customers like AT&T, Verizon, Comcast and Alphabet, and it has benefitted as provider rush to satisfy (and compete for) the increasing demand for even-faster network bandwidth and mobile broadband. Revenues from its top five customers typically account for about 60% of the company’s total revenues, which reached \$2.6 billion in the past 12 months, with about 20% coming from AT&T. [89]

5.3 High Technology Company Headquarter Location

The high tech giants headquarter tended to move out from Silicon Valley to other Cities. I choose London and Milan for analyzing why it move to this cities

On the other hand, the reason that they move out for Silicon Valley also collected in the article.

5.3.1 London, England

While the UK has been responsible for the jet engine, code-breaking colossus computer and, lest we forget, the World Wide Web, the giants which shape the industry now either hail from the US – Apple, Google, Microsoft, IBM, Facebook, Amazon, Twitter, Uber - or from Asia - Samsung, Alibaba, LG, Huawei and Sony. [90]



Figure 5.2: Facebook's new London office
(Source: Facebook) [90]

- 1) The reason that the tech companies moving to London:
 - The attractive of Uncertainty;
The very uncertainty generated by the UK's bizarre current position also makes it an attractive tech prospect, says Paresh Davdra, chief executive and co-founder of currency transfer firms RationalFX and Xendpay. "Despite losing the close links with the EU that made London a business gateway into Europe, Brexit and the government's response provides businesses with potential benefits and incentives," he says. "The UK's hub status means more than just economic success for tech giants like Google and Facebook, it means there is an ever growing pool of lucrative talent, and gives them the chance to build new relationships with the industry in the UK, independent of the EU."

London's tech sector has been built on "a critical mass of entrepreneurs, investors and support services", which has not weakened in the face of both the EU referendum and US Presidential election, he added. "Despite this, we cannot become complacent, and the tech industry will need further assurances to maintain our record of success. One clear example is access to talent, where the

Prime Minister needs to spell out how she proposes to allow UK firms access to the best international talent while reducing overall immigration.” [90]

- Less expense than Silicon Valley.
Another factor which may work in London’s favour is the astronomical property prices in and around San Francisco, the most prominent of the world’s technology hotbeds.

Rent prices in San Francisco are, on average, 71 per cent higher than London, and the average consumer would need \$7,977 (£6,365) to maintain the same standard of life £4,500 could buy you in London, according to data from comparison site Numbeo.

Though there are many other cities across the world considerably less expensive than London, the weaker pound may help to attract companies that may have been previously put off by high relocation costs, [90]

Item	San Francisco (\$)	London (\$)
12 Eggs	4.06	2.75
Regular-sized Cappuccino	4.12	3.27
1 Litre of Gasoline	1.39	0.81
One Bedroom Flat Rent in City Centre	3,358.66	2,099.03
Three Bedroom Flat Rent Outside of City Centre	4665.85	2,421.00

Table 5.1: The expense in San Francisco and London in 2017
(Source: Inews) [90]

- Attraction of high educated talents.
British universities continue to rank among the best in the world, training the next generation of bright young workers.
- High-tech industry cluster Fitzrovia is closed to the London financial center, which offer the technology company with rich informative and financing channels.
- British government’s supports.
British government promised an additional 2 billion pound will be spent on scientific research every year.
The government has also announced a number of measures which will help to reassure businesses. Earlier this month, Chancellor Philip Hammond announced £1.9bn will be spent bolstering the UK’s cyber security to make it a safer place to trade and conduct deals, alongside protecting residents. Last month’s Autumn Statement, in which the chancellor pledged to invest £1bn in super-fast broadband and 5G technology, has also been welcomed as much-needed improvement to the poor internet performance which plagues much of the country’s rural areas. [90]

2) The Position of headquarters



Figure 5.3: The Tech-Giants' headquarters in London

Facebook, Snapchat, Apple and Twitter are located around SOHO London, Amazon and Bloomberg choice to stay in the Historical Financial district, and Expedia closed to the King's Cross area and Clerkenwell. All the companies are surrounded with universities, galleries, theaters, nice restaurants, trendy shops and metro stations. Staffs in the companies can go to Heathrow airport or other airports by subway or express from closed train stations and subway stations.

5.3.2 Milan, Italy

Financial Times declared Milan Italy's biggest startup hub on 2016. The geography of Italy's startup scene differs from most countries. While startups have bunched around big cities from San Francisco to London, in Italy it is more spread out. In a reflection of the country's postwar manufacturing clusters, startups gathered in all the main cities. Turin, Bologna, Naples and Rome all are startup hubs: however, Milan is the largest. The city has become a destination for startups partly because of the impetus and increase in vitality that followed the city's hosting of the World's Fair, Expo 2015. The largest of the Italian industrial hubs, Milan is Italy's finance and fashion capital and its talent pool is driven by a strong cluster of universities and colleges including

Bocconi University, IULM, Politecnico and Cattolica. [95]

Starting with Google Italy, which in 2014, set up its headquarters in Milan, headquarter of Sumsung and Microsoft Italy opened not only the offices but also the technology hubs at here. Besides the headquarters, the office of other technical giants: Amazon Italy, Facebook, Banzai and Alibaba have opened their offices in the center of Milan city, while Amazon Italy relocated its offices in Via Monte Grappe. Apple retail shops and Apple Piazza Liberty just started business on July 2018, just neighbor to the Duomo Milano and the Corso Vittorio Emanuele.



Figure 5.4: Apple Piazza Liberty in Milan



Figure 5.5: Microsoft House in Milan
(Source: Metropolis) [96]

1) The reason that the tech companies moving to Milan:

- Policy support
In September 2016, the Italian Ministry of Economic Development launched its Industrial National Plan 4.0— “Industry 4.0,” for short— which Scannavini describes as supporting “the digitization of the Italian economy.” The long-term strategic plan is designed to generate billions of dollars for technology research and innovation through tax breaks, venture-capital support for startups, and other public and private sources.
- Pool of talents
Talent pool in Milan is driven by a strong cluster of universities and

colleges including Bocconi University, IULM, Politecnico and Cattolica.

The Italian government plans to create four or five centers of competence at top Italian universities in Milan, Pisa, and other locations. Collectively, those centers will shoot for some ambitious 10-year targets: training 200,000 students and 3,000 managers, and awarding 1,400 PhDs “on topics related to innovation, high technology, and the industry of the future,” Scannavini says. Milan Talent pool is driven by a strong cluster of universities and colleges including Bocconi University, IULM, Politecnico and Cattolica.

- Financial Issue

Goldman is set to move into its new Milan office in the first quarter of 2019. Its new office, which is only a short walk from its existing base in Piazzetta Bossi, will accommodate several investment bankers who are currently based in London.

The Wall Street bank is finalizing the details of a new office for more than 100 people in the bustling heart of Milan, near the Duomo cathedral, increasing its Italy headcount almost six-fold, said the sources who declined to be named as the plans are confidential. [97] Over the past two decades, thousands of graduates have left Italy due to a lack of work and career prospects, with London a favourite destination. In a bid to reverse this brain drain the government has introduced the 50 percent, five-year income tax break for high-skilled Italian workers returning from abroad, as well as a flat tax rate of 100,000 euros on foreign income aimed at luring the wealthy of all nationalities.

Fabrizio Pagani, chief of staff for Italy's finance minister, has been organising international events to promote Milan as a financial centre. "We have seen a lot of interest around these new fiscal policies, especially the one offering a 50 percent tax holiday," he said. [94]

The financial movement is going to boom the city's economic and activate the market.

2) The Position of headquarters

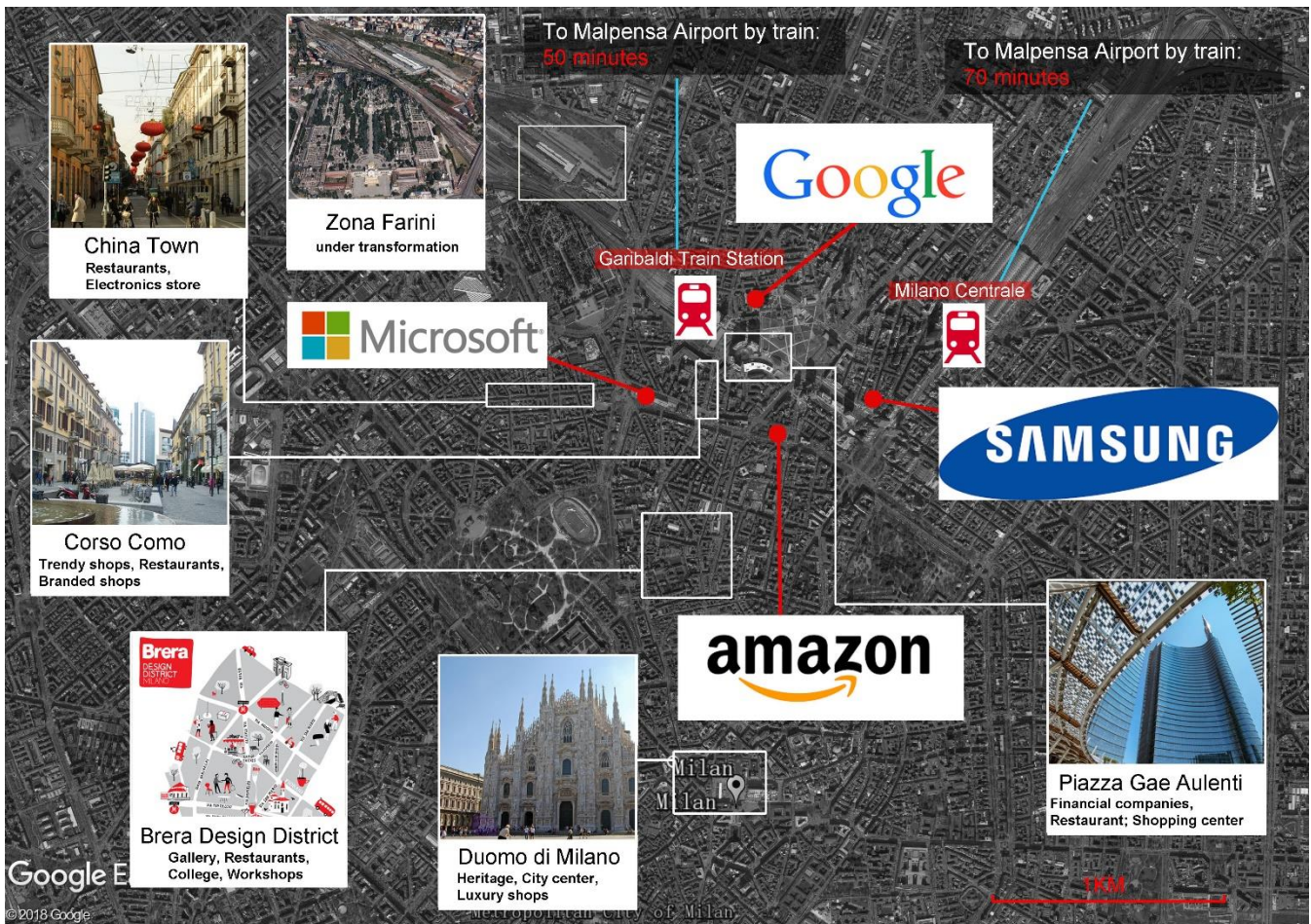


Figure 5.6: The Tech-Giants' headquarters in Milan

Unlike London, the tech-giants' headquarter in Milan are adjacent. The center area of these four companies is Piazza Gae Aulenti, a mix-functioned business zone, just above the metro station and train station Garibaldi. Besides residential area, there are several different dynamic shopping and design districts closed by, staff in this companies have rich options on the living taste and entertainment & social choices. Both train stations have direct train directed to the Malpensa International Airport.

5.3.3 Silicon Valley

An article in The New York Times declared, "Silicon Valley is over." There used to be a time when if you were a tech company or a hot new startup, you had to have a head office in Silicon Valley. But those days are on the wane (if they're not over already), it's certainly true that no single place can hold a monopoly forever. It's just a case of waiting for the political and economic conditions to be right for startups to thrive, and they're already starting to see that happen all over the world in cities as diverse as London, Toronto, Berlin, Tel Aviv and Singapore.

There are several reasons for people and technology companies to leave Silicon Valley.

1) The cost of living

This is arguably the single biggest barrier to launching a new startup in the Valley area. The property price, renting fee of apartment and living cost are all higher than other cities in USA, not mention the cities in other countries.

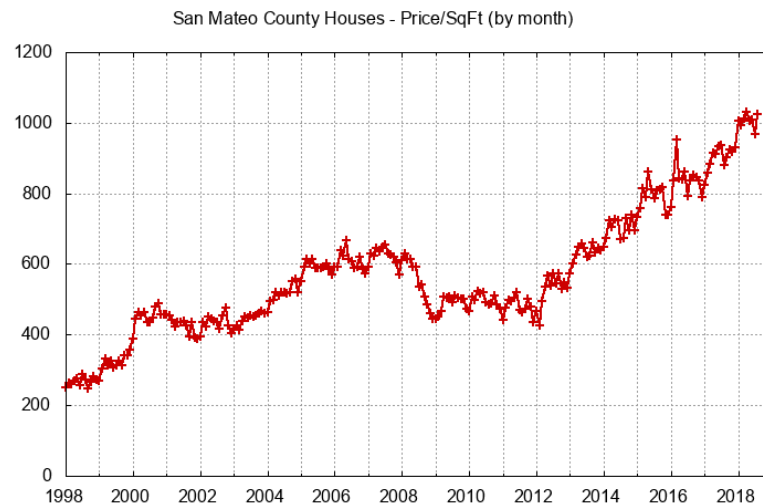


Table 5.2 The rising of San Mateo County real estate price
(Source: San Mateo County) [99]

2) Congestion problem

The length of the average commute has increased in recent years, since the rise of the Silicon Valley startup has brought with it a corresponding rise in congestion.

3) The brain drain

Silicon Valley residents are now leaving the area faster than they're arriving, which is hugely significant for the tech industry because a quarter of local jobs are in tech-related industries. The problem for startups is that if these engineers leave the area, they also leave the potential talent pool – and considering how in-demand top programmers already are in Silicon Valley, that means it will become harder and harder for startups to fill job vacancies.

4) Attraction of other cities

London, Toronto, Berlin, Tel Aviv and Singapore are all building solid reputations as alternatives to Silicon Valley. Different cities offer different incentives, varying from grants and reduced taxation to incubation programmes and government-sponsored facilities, and when it all comes together and starts to gather momentum, technological hubs pop up and offer a practical alternative to Silicon Valley for young entrepreneurs who want to start a company.

5) The gig economy and rise of internet

Gig economy and the rise of the internet enable that people are no longer limited to a single geographic location. They'll be able to do all of that online,

and the market will decide which products and services are the best. People won't care where the company is based. They'll just care how good their offering is. Thanks to the gig economy, founders no longer need to hire full-time workers that commute to a local office. They can hire people to work remotely as and when they need them, cutting overall costs, increasing quality and keeping people out of Silicon Valley. [102]

After a long period of arguments, researches and experiments, we found that, instead of eliminated the cities, ICT should be treated as a tool to complement the city, to solve the cities' problems, to make the city more sustainable, more even, and more intelligent.

In the future, the big trend that we're likely to see is the rise of the digital nomad, that they live a life where they're constantly on the move, working as they go with just a laptop and an internet connection. Nevertheless, it just indicates people have more choices on the working modes, living styles in future. They will still stay in city, because the city always can provide with you high speed web, highly effective face to face communication, complete service system, and so on.

For the high-tech companies, they moved out from Silicon Valley, but they choose to move to other advanced cities, and choose to address in city center and still closed with the peer companies.

Of course, it's likely that Silicon Valley will still maintain its impressive reputation for many years to come. It's just that it will no longer maintain a monopoly. After all – the startups of the future may well be created from the comfort of a shared working space in London, Singapore, and even Milan.

CHAPTER 6. THE CITY OF TOMORROW

6.1 Unpredictable

In 1900, the Boston Globe imagined the city in the year 2000.

On December 24, 1900, author Thomas F. Anderson published the article "Boston at the End of the 20th Century." Anderson interviewed experts in a range of fields to get their predictions on the future of Boston. He got some things right: he predicted a version of cell phones, air conditioning, and nighttime baseball games. But on other matters, he was pretty optimistic, or just plain off-the-mark.

Anderson envisioned a city with moving sidewalks, pneumatic tube delivery of everything from food to newspapers, and airships soaring high above the city. Overall, Anderson's predictions are quite optimistic. He predicted that Boston at the turn of the 21st century would be so beautiful that the word "slum" wouldn't even be found in the local dictionary. [100]

With all the fantastically futuristic predictions made in the article, it's somewhat interesting that the quaintest idea in the entire piece is the idea that Boston of the future will have both a morning and evening edition of the local newspaper. This newspaper of the future was, of course, to be delivered by fancy pneumatic tubes, but you'd be hard pressed to find a young person in the year 2000 who even knew such a thing as an evening edition of the newspaper ever existed. From radio to television to Internet, it's fascinating to look at the rapid and revolutionary changes in the way Americans consumed news over the course of the 20th century. [101]

Such descriptions are almost comical, while other predictions and surmises are still continued in different fictions and films. However, nothing ever looks as dated as old science fictions.

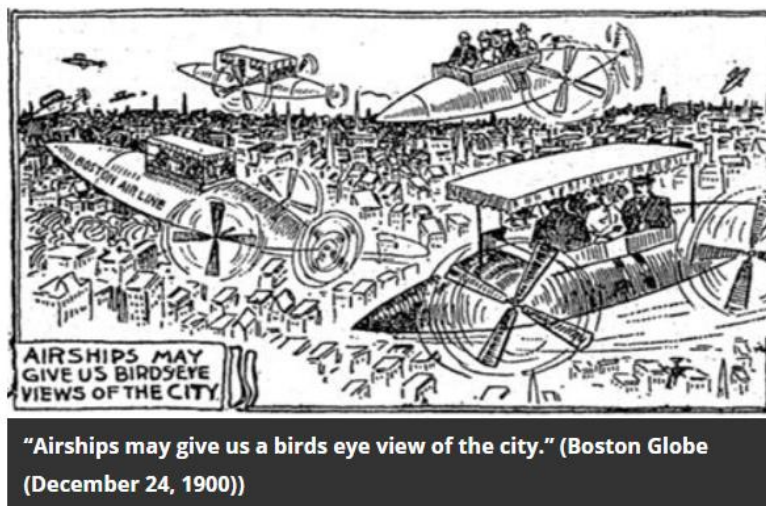
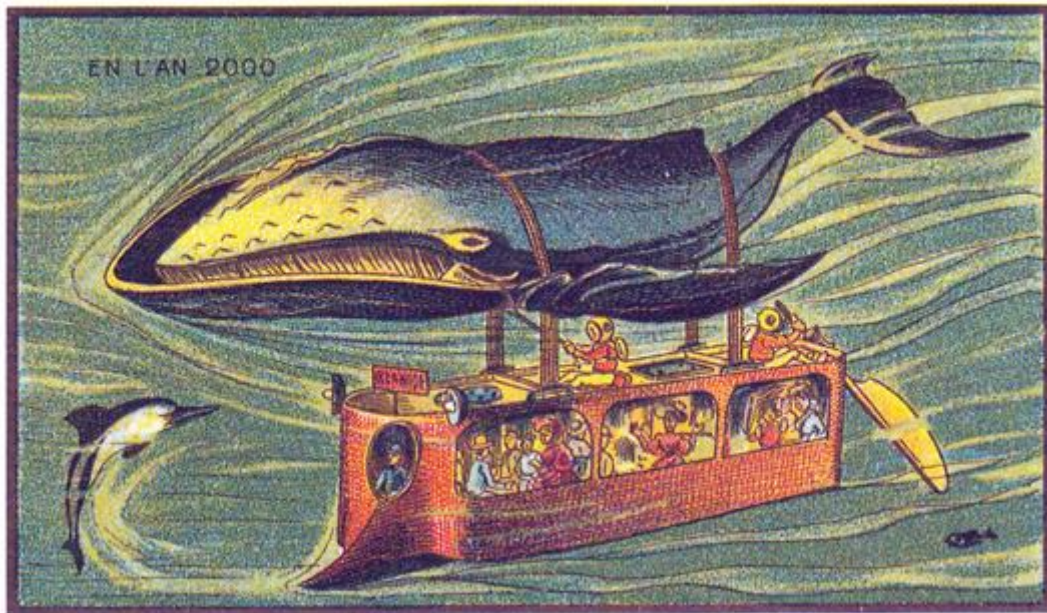


Figure 6.1: A utopian vision of Boston
(Source: SMITHSONIAN.COM) [101]

On 1823, Dr. Dionysius Lardner, a professor of Natural Philosophy and Astronomy, did not deem feasible a high-speed train to carry its passengers safely: "Rail travel at high speed is not possible, because passengers, unable

to breathe, would die of asphyxia.”

On 1900, Around the same time as the German ad campaign was running, several French artists created a series of futuristic pictures that were initially enclosed in cigarette boxes and were later sold as postcards. Flying taxis – so-called aero cabs – with their corresponding docking stations were one of the predictions. And when you live in a world with aero cabs, there is definitely a need for the aviation police to ensure traffic safety in the air. An even more bizarre prediction was the whale bus, a submarine pulled by a whale. Well, it seems like these artists were pretty optimistic about our future (whale) taming skills.



A Whale-Bus

Figure 6.2: A series of postcards depicted the world in 2000.

By JVillemand, via Wikimedia Commons [102]

Since year 1939 on, the prediction of the self-driving car has been on the table for almost 80 years. And while cars are undoubtedly getting smarter and better, the day that we will buy a self-driving car is a lot further away than we probably think. An exhibitor's prediction at the 1939 World's Fair in New York is not wildly wrong, but our expressways are yet to be filled with cars controlled by radio from a central tower, as they had envisaged it. At least not for now. [102]

Traditionally, most future visions have been attempts to accurately depict the world of tomorrow- and that may be their undoing. Prediction often involves a Nuria McCrea-Grifollssaying weak signals at the cutting edge of the contemporary world and flinging them far forward, for decades or centuries, to arrive at a protraitl of the future city. [4]

After all the above discussion on the ICT's influence on city and citizens, it is obvious that the technology itself and the way how people get use of it has been though dramatically development in the human histories. For the future, there are thousands of possibilities.

6.2 As an Urban Planner

In any case, predicting the future is a mug's game. None of us can see ten years down the road let alone forty. Then as an urban planner, how we could deal with this situation?

1) Not to portray what is to come, but posit what if?

Rather than the dramatic portray of future craft, as an urban planner, we could posit future scenarios (typically phrased as What if? questions), entertain their consequences and exigencies, and share the resulting ideas widely, to enable public conversation and debate. We proposed to extrapolate from the present condition and to place ourselves, as designers, in a fictive but possible future context with the intent of realizing or precluding that future through public discourse.

Most importantly, futurecraft is not about fixing the present or predicting the future but influencing it positively. Designers should not force their ideas into the world- in fact, whether or not an idea is realized is largely irrelevant. The debate can make positive impact. Effacing a dystopian vision for the sake of decency is a disservice, precluding the possibility of avoiding that future. [4]

2) Multiple skills

When it comes to the digital ages, the urban planner need to learn to cooperate with the different background professional scholars or staffs, such as engineers and hackers.

Meanwhile, it is necessary for us to explore the new skills to adapt to social and technology development.

3) Always link with the world

The pace of the world is quite fast, we always need to care about the changing of the cutting-edge technology, city development trend and policy in different countries. Never refuse to get an understanding on how the world trying different methods to make human a better life, and always hold the suspect attitude to verification.

4) City for citizens

Don't fall into the technical trap, the smart cities or any technologies using is for the people. Jane Jacobs mentioned in her book, "Cities have the capability of providing something for everyone, only because, and only when, they are created by everybody."

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