SmartHK

Urban Planning Strategies for Developing Hong Kong as a Smart City

Final Report

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<td>BCN</td>
<td>Barcelona City Council</td>
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<td>BEAMS</td>
<td>Building Energy Advanced Management Systems</td>
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<td>BTMICE</td>
<td>Business Travellers and Meetings, Incentives, Conventions and Exhibition</td>
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<td>Housing Development Board</td>
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<td>Home energy management system</td>
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<td>Hong Kong Special Administrative Region</td>
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<td>Hong Kong Science and Technology Park</td>
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<td>Information and Communication Technologies</td>
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<td>Infocomm Development Authority</td>
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<td>IOT</td>
<td>Internet of Things</td>
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<td>IRIS</td>
<td>Intelligent Route Information System</td>
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<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>ITB</td>
<td>Innovation and Technology Bureau</td>
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<td>ITF</td>
<td>Innovation and technology Fund</td>
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<td>ITS</td>
<td>Intelligent Transportation System</td>
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<td>KMB</td>
<td>Kowloon Motor Bus Ltd.</td>
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<td>LED</td>
<td>Light Emitting Diodes</td>
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<td>LEGCO</td>
<td>Legislative Council of Hong Kong</td>
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<td>LTA</td>
<td>Land Transport Authority</td>
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<td>M2M</td>
<td>Machine to Machine</td>
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<td>MTR</td>
<td>Mass Transit Railway</td>
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<td>NCB</td>
<td>National Computer Board</td>
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<td>NFC</td>
<td>Near Field Communication</td>
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<td>NGO</td>
<td>Non-governmental Organization</td>
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<td>NIST</td>
<td>National Institute of Standards and Technology</td>
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<td>NUS</td>
<td>National University of Singapore</td>
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<td>O2O</td>
<td>Online 2 Offline</td>
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<td>OZP</td>
<td>Outline Zoning Plan</td>
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<td>PDPO</td>
<td>Personal Data (Privacy) Ordinance</td>
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<td>PGS</td>
<td>Parking Guidance System</td>
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<td>PMO</td>
<td>Prime Minister Office</td>
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<td>Pearl River Delta</td>
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<td>Photo Voltaic</td>
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<td>PWCS</td>
<td>Pneumatic Waste Conveyance System</td>
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<td>R&amp;D</td>
<td>Research and Development</td>
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<td>RWHS</td>
<td>Rainwater Harvesting System</td>
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<td>SBS</td>
<td>Singapore Bus Services</td>
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<td>SEMAS</td>
<td>Smart Elderly Monitoring and Alert System</td>
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<td>SMART</td>
<td>Singapore Medical Alert &amp; Responsive</td>
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<td>Abbreviation</td>
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<td>SME</td>
<td>Small and Medium Enterprises</td>
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<td>SNPO</td>
<td>Smart Nation Programme Office</td>
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<td>SSL</td>
<td>Secure Sockets Layer</td>
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<td>STAR</td>
<td>Singapore Urban Transport Solution</td>
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<td>SWOT</td>
<td>Strength, Weakness, Opportunity and Threats</td>
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<tr>
<td>URA</td>
<td>Urban Redevelopment Authority</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<td>WEF</td>
<td>World Economic Forum</td>
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<td>WLAN</td>
<td>Wireless Local Area Network</td>
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Executive Summary

Technology is now everywhere - in every sector, in every organization and in every household. While this issue might once be concerned only by a few computer geeks, technology is now pertinent to policy makers across the world for its potential benefits to city management. Smart City, a concept first emerging in the early 2000s, is said to be a response to address the wicked urban problems brought about by rapid urbanization. By 2017, it is estimated that at least 20 of the world’s largest countries will have developed national-level Smart City policies (URENIO, 2015). While cities around the globe are enthusiastically experimenting with smart technologies and their application in city management, from electronic bill payment and remote working to citywide smart traffic management and waste collection, a close scrutiny of the concept reveals its inherent complexity.

Indeed, at present there is still no general consensus on what is meant by a Smart City. Also, it is doubtful if the concept of Smart City is as promising as it seems to be. Smart City is often criticized for neglecting actual needs of people and orienting urban development goal largely towards the application and development of Information and Communication Technology (ICT). Based on our in-depth literature review, our team believes “people”, instead of “technology” should be the essence of Smart City and that Smart City should be a means to achieve the ends instead of being an end itself. The end of Smart City should be to realize sustainability by improving quality of life, reducing environmental footprint and supporting a talent-based economy. It is also important for policy makers to acknowledge and address the pitfalls of the concept as several obstacles may arise in the midst of smart policy implementation, such as privacy breach and social polarization.

Many pioneering countries such as Singapore and Spain are using smart technology to create more opportunities as well as greater economic and social values to the society, and others are actively exploring how they can do the same if they aspire to compete for the accolade of world-class Smart City. To maintain Hong Kong’s position as Asia’s World City in the light of mounting global competition and to capitalize on the potential benefits of ICT in enhancing city management and quality of life, Hong Kong shall not be
passively responding to global trends and urban challenges but should actively and boldly shape a smart future by planning ahead.

To transform Hong Kong into a world-class Smart City, there is a need to be forward-looking - to foresee the future trends and issues that will affect Hong Kong and see how Smart technologies can be a useful tool to tackle those issues. The five most pressing issues for Hong Kong were identified and they include 1) Economic transformation towards an innovative and sharing economy, 2) Rising expectation on quality of life, 3) Greater emphasis on environmental stewardship, 4) Higher efficiency and transparency in governance and 5) Increasing collaboration with mainland China. Based on these five future trends and key issues of Hong Kong, the study goal of this project is to develop a Smart City planning vision and offer development strategies which revolve around these five issues for input into HK2030+ for Hong Kong to plan ahead for the vision of Smart City.

To chart a road for Hong Kong to develop into a Smart city, it is crucial to have an overview of its current Smart City development in terms of policy matters and technological development. Based on our comprehensive baseline study on current ICT infrastructure and government strategies and policies, it is concluded that Hong Kong has a strong ICT hardware in terms of quality and affordable ICT services and a sound business environment. All these have laid a strong foundation for Hong Kong to transform into a Smart City. As for software, strategies, policies and measures have been formulated for the sake of developing and applying technology citywide. For instance, in the 2015 Policy Address, Kowloon East was announced as a pilot testing area for exploring opportunities brought about by Smart technologies in urban management. Nevertheless, a thorough analysis on the software aspect shows that there are several roadblocks Hong Kong shall overcome in order to take a great leap forward to become a world-class Smart City. Examples of barriers include an absence of comprehensive long-term vision for Smart City development, insufficient data transparency and availability as well as inflexibility in regulatory regime.

After understanding the existing capacity and the gap for Hong Kong to become a world-class Smart City, we go beyond the local context by examining well-
known international practices of two pioneers - Singapore and Barcelona, as well as our major socio-economic partner, The Pearl River Delta, with a view to incorporating applicable elements into the final strategic plan and to identify future collaboration opportunities with the mainland. Particularly, overseas experiences regarding the strategic planning, governance structure for Smart City development, supporting system to create a favorable development context as well as key policy applications to the five key issues Hong Kong is facing have been discussed.

To supplement our assessment regarding the relevance of overseas experiences, opinions were collected from major stakeholders in the public sector, private sector and the academia through interviews. A review on international experience and interviews with major stakeholders have shed light on strategy formulation in terms of Smart City development foundation and application of Smart City strategies to address the five key issues. For example, international experience showcases that achieving the vision of Smart City requires a pro-business and pro-consumer environment and these are reached through provision of comprehensive supporting services such as a flexible regulatory framework and formulation of policies which address cyber privacy and security as well as digital divide.

Based on the aforementioned research and analysis, a long-term vision for planning and developing Hong Kong as a Smart City has been established - to envision Hong Kong to be People first, Technology-based Smart City to boost innovation, city liveability and competitiveness. To realize this bold vision, strategies have been formulated with detailed initiatives and policies devised for each of strategy. Strategies have been categorized under the word “CYBER”: 1) Commit to efficient urban management via data consolidation and dissemination, 2) Yield a digital inclusive and liveable society, 3) Bridge stakeholders for regional collaboration and cooperation, 4) Establish an innovative economy to sustain economic vitality and 5) Recognize environmental issues and endeavour towards a green city.

To facilitate the implementation process, various aspects of operating mechanism including governance, regulation and legislation as well as financing, should be taken into consideration by policy makers. For
example, for financing, policy makers shall acknowledge the importance to expand the ways for funding Smart City projects through Public-Private Partnership (PPP) to leverage resources from the private sector. Also, it should be recognized that Smart City is a city-wide transformation and thus it is difficult for the government to do everything on its own without interests and engagement from major stakeholders in various social and economic sectors. After all, the development of Smart City should be people-oriented and brings benefits across sectors of a society.

Our group, SPARK planning + design, hopes that the proposed vision and policy recommendation will be constitute valuable input into the current review of strategic planning under HK2030+ and facilitate HKSAR government in mapping out the way ahead for Smart City development in the hope of bettering the life of our citizens.
Section 1 Plan for future

Chapter 1: Time for Review
Chapter 2: Study Goal and Approach
Section I Introduction
1. Time for Review
1.1. Overview of Smart City Concept and Development
1.1.1. The Notion and Evolution of Smart City

The term of Smart City was first used in the 1990s. Originally, “Smart City” had been defined in a techno-centric approach that focused on the diffusion of Information and Communication Technologies (ICTs) and the utilization of networked infrastructures. The focus was on the significance of new ICT with regard to modern infrastructures within cities. The California Institute for Smart Communities was among the first to focus on how communities could become smart and how a city could be designed to implement information technologies (Alawadhi et al., 2012). There are two main reasons for introducing Smart City suggested by Kitchin (2014: 1) stimulate economic development and 2) make use of the new technologies to improve urban management. International Business Machines Corporation (IBM) has also shared a similar point of view with Kitchin. “IBM of the United States put forward the concept of “Smart City” to study how the functions of a city can be optimized to promote the development of a talent-based economy and improve the quality of life” (CPU, 2015).

Under these understandings of Smart City, social elements (i.e. sustainability, human factors and environmental issues) were neglected. Some scholars started criticizing the idea of smart cities as being too technically oriented. For examples, the Center of Governance at the University of Ottawa has suggested that Smart City development should emphasizes the role of social capital and relations in urban development.” (Albino et al., 2015) On top of economic development and improvement in quality of life, Boyd Cohen (2010), an internationally renowned expert in Smart City, proposed a more comprehensive explanation on the rationales of promoting the notion. He suggested that “Smart Cities share one thing in common: the use of innovative ideas and methods or the application of ICT in various aspects of the city to connect and integrate the systems and services of the city for better synergy as well as more efficient use
of resources with a view to improving city management and service delivery as well as quality of life of citizens, and at the same time reducing environmental footprint, in support of the development of innovation and a low-carbon economy” (CPU, 2015).

In this definition, “the use of innovative ideas and the application of ICT” have been positioned as means to achieve the ends. The ends of Smart City, according to this definition, is to realize sustainability by improving quality of life of citizens, reducing ecological footprint and supporting innovation and a talent-based economy. “Sustainability” and “People” are always the main goals of it and this is the distinctive element which distinguishes Smart City from other similar concepts.

With regard to the “People” element of the notion, Arup’s definition in Smart City helps provide a better and comprehensive understanding in this aspect: “Citizens are not only engaged and informed in the relationship between their activities, their neighborhoods, and the wider urban ecosystems, but are actively encouraged to see the city itself as something they can collectively tune, such that it is efficient, interactive, engaging, adaptive and flexible” (Arup, 2011). This definition has clearly stated that citizens are “actively” and “collectively” involved in Smart City and at the same time, the city itself should be intelligent enough in response to human needs and to provide sustainable solutions to assist people in fixing their economic, environmental and social problems. “Technology could be used in cities to empower citizens by adapting those technologies to their needs rather than adapting their lives to technological exigencies” (Cugurullo, 2013, Kitchin, 2014, Vanolo, 2014 in Albino et al., 2015).

1.1.2. **Working Definition**

There is still no general agreement on the term of Smart City with a lack of consensus on its definitions (Poting, 2013; Dameri and Rosenthal-Sabroux, 2014; Albino et al., 2015). Moreover, each city has its own contextual conditions
and it is not rational to use a “one-size fits all” definition to interpret the notion of Smart City. Hence, a tailor-made working definition of Smart City has been provided for this project. Albino et al (2015) has included 23 definitions of Smart City in his work and key elements in these definitions, which are “the Use of ICTs”, “Sustainable development”, “Economic development”, “Quality of life” and “Natural resources”, can be found. By making references to the definitions in different literature, the purposes of Smart City as well as the Smart City Wheel suggested by Cohen (2012), the following is the working definition of Smart City in this project:

“Smart City encourages knowledge exchange and innovations through advanced Information and Communication Technologies (ICTs), contributing to a society in terms of developing a talented-based economy, reducing ecological footprint and improving the quality of life of citizens.”

1.1.3. Merits and Opportunities

Merits of Smart City development are extremely diverse since Smart City covers almost every aspect of society and people’s livelihood, with examples being monitoring of public space in respect of municipal facilities; energy management in respect of buildings; public transport service such as signal management, road traffic and parking monitoring; home automation and remote management; high-speed network and cloud storage; and electronic public and business services. Generally speaking, Smart City can help improve city management, enhancing quality of life of citizens, reducing ecological footprint and promoting sustainable economic growth (CPU, 2015).

Merits can also be discussed through the lens of Smart City Wheel which is proposed by Boyd Cohen, is a more comprehensive explanation on the rationales of promoting the notion of Smart City. Under the Smart City Wheel, implications and merits can be further divided into six components, namely “Smart People”, “Smart Economy”, “Smart Environment”, “Smart Government”, “Smart Society”, and “Smart Living”. These components provide a framework for understanding the various aspects of a Smart City and how they contribute to the overall goals of sustainable development and enhanced quality of life.
“Smart Living” and “Smart Mobility”. Smart people can promote citizens’ flexibility, open-mindedness and creativity through lifelong education. Smart Economy can advocate innovation and entrepreneurship, focusing on developing new and high technologies in order to sustain long-term economic growth and maintain city competitiveness. Smart environment can enhance environmental sustainability through different monitoring technologies and better energy management. For instance, application of green vehicles and electronic devices can effectively minimize the use of fuels and electricity which help reducing carbon emission. Smart Government can strengthen the connections within and between the government, people as well as enterprises through an integration of networks and provision of public information and services. Smart Living can improve the quality of life through the use of online social platforms for people to connect with each other and interact closely with their surrounding environment. Smart mobility can enhance the efficiency and service quality of urban transport through the use of video surveillance and real-time traffic information. People are also encouraged to actively participate in public affairs through different online platforms.
1.1.4. Pitfalls and Challenges

According to the working definition, Smart City can benefit the society through enhancing sustainability and quality of life. However, several obstacles may arise in the midst of smart policy implementation. Firstly, privacy is one of the major concerns from citizens. Even in a Smart City, the network of sensors might be misused to spy on citizens instead of fighting against crimes. This constant monitoring can be considered as an intrusion into privacy. Moreover, a majority of these smart technologies are developed and monitored by corporate giants like IBM and Cisco. They may easily measure and control all these data without any accountability (Zaman, 2015).
Secondly, vulnerability forms another challenge that cities may encounter in a Smart City. The question left unanswered is that what will happen if the operating system of Smart City goes wrong. The fact that cities are bound to become increasingly connected can also imply that a failure in one sector could lead to problems in others. Accidents will surely happen: driverless cars will crash; virus will take down whole transport subsystems or the electricity grid. There should be safety precautions put in place to avoid such scenario (Pooles, 2014).

Thirdly, social polarization may emerge in a Smart City due to a contrast between professionals, creative class and IT illiterate sections of the local poorer population (Peck, 2005). Scholars have noted that some smart city strategies may exclude urban residents who are supposed to be benefited from the design and deployment process (Saunders and Barck, 2015). Smart City initiatives should promote social inclusion instead of tipping towards appealing to knowledge and creative class (Solnit and Schwartzenburg, 2000).

Lastly, unskilled workers may lose their jobs due to the increasing automation of daily activities in Smart Cities. This may give rise to the issues of unemployment in the society, especially lesser employment of menial staff. With daily activities getting automated, naturally, there will be fewer requirements of human resources, primarily, workers and less educated staff (Sannapureddy, 2015).

1.2 **Hong Kong's Future Trends and Key Issues**
In order to establish long-term goals and objectives for developing Hong Kong into a Smart City, future trends and needs should first be examined and analyzed. Below states major trends and needs classified into the six domains of Smart City development.
1.2.1 Economic Transformation Towards an Innovative and Sharing Economy

Hong Kong is renowned as one of the most vibrant international financial centers in the world. It is characterized by an integrated network of financial institutions and markets. Hong Kong is now the world’s thirteen largest banking center in terms of external assets and the sixth largest center foreign exchange trading (HK2030, 2006). The business service sector also plays an important role in supporting the continuous expansion of the economy. Financial and business services, contributing to one-fifth of Gross Domestic Product (GDP), will continuously grow and diversify in the future (HK2030, 2006).

Hong Kong is now under the third economic transformation towards a knowledge-based economic development. Developing innovation- and technology-based high value-added industries in Hong Kong is seen as a direction for Hong Kong's economic transformation due to its geographical location, international financial and logistics hubs. This requires the application of science and technology including the application of more advanced technologies, professional knowledge, special techniques and innovative ideas. For instance, new business concepts such as “sharing city” and “sharing economy” are emerging to provide new platforms for the exchange of information, goods and services among members in the community.

1.2.2 Rising Expectation on Quality of Life

With the economic prosperity of Hong Kong, people are in pursuit of a better standard of living. People’s lifestyles have now diversified from living environment, transportation modes to forms of recreation and leisure. At the same time, there is a burgeoning tendency in which people, particularly those in developed countries and cities, prefer to work for a shorter period of time for more leisure time and disposable income due to a wider use of technology in work. Citizens will expect a wider selection of choices in living and leisure. There will be an increase in the demand for leisure and recreational space such as community facilities and open space.
Due to low birth rates and longer life expectancy, the median age of Hong Kong’s population will gradually rise while the elderly population will reach 26% of the total population in 2036 (HK2030, 2006). Expanding ageing population is being faced by many developed cities and countries in the world. Much pressure will be on government’s tax and spending systems whereas more welfare will be targeted at the elderly. Thus, society should become more inclusive and caring in the future. New urban infrastructure including housing, recreation and health services should be equally enjoyed by all members of the community, irrespective of age, income or abilities.

1.2.3 Greater Emphasis on Environmental Stewardship

Concerns over environmental protection has been on the rise in recent decades. Rapid population growth and urban development in the past have given rise to pressure on the environment in Hong Kong. Behind economic prosperity and affluence is tremendous growth in water and energy consumption. Key areas of environmental concern in Hong Kong are identified, namely energy efficiency, waste and water management.

Waste management is a troublesome and urgent issue in Hong Kong. Due to the continuous growth of population and economic development, the city generates more than 6 million tons of solid waste each year and the existing landfills are expected to be full in the near future (HKSAR, 2015). Food waste, for instance, is one of the major constituents of the municipal solid waste in Hong Kong. It comprises waste produced during food production, processing, wholesale, retail and preparation, as well as after meal leftovers and expired foods. It is highly degradable which can easily cause odour and hygiene problems. Apart from building more landfills, waste management can be achieved through waste reduction and recycling to facilitate a green living environment and minimize the need to build more infrastructure.

Besides waste management, Hong Kong is also facing challenges posed by water management. Major issues include ageing drainage system, ineffective
sewage system in rural areas and flooding during wet season. Firstly, Hong Kong’s water mains are ageing. Under disturbance from heavy traffic loads, road works of congested underground utilities, the leakage rate reached as high a 25% in 2000 (WSD, 2015). Secondly, some rural area in New Territories are still using septic tanks and soak-away system which are ineffective in removing nutrients, organics and micro-organisms in sewage. Without proper sewage treatment while majority of urban area is connected to extensive public sewerage system. Lastly, mountainous terrain in Hong Kong Island and Kowloon are prone to flooding due to increase in surface runoff on mountains during wet season. Low-lying and flat terrain favors flooding in floodplains in New Territories.

1.2.4 Higher Efficiency and Transparency in Governance

There is a rising trend of increasing technological applications in the government to enhance the efficiency and effectiveness of work. A majority of governments in developed countries are rapidly developing smart infrastructure such as free Wi-Fi hotspots and intelligent underground pipelines monitoring system. On top of that, advanced communication technologies are also used to achieve more cross-departmental cooperation for higher efficiency. For example, better utilization of spatial data in spatial planning can be realized through the cooperation between different departments.

Furthermore, civic engagement and public participation have become more and more popular in Hong Kong. This can be revealed by the growing number of public consultation exercises, with a total of 226 of these exercise covering a variety of issues from 1997 to 2009 (Cheung, 2011). People have realized the need to establish a partnership between citizens and the government so as to deliver effective governance. Citizens are more willing to participate in and voice out in the process of policy formation and major infrastructure development. On the other hand, general public and business corporations are expecting higher government transparency and easier access to government information. For example, government information can be further released in
digital format which can help enterprises to develop applications for the public to receive useful information.

1.2.5 Increasing Collaboration with mainland China

The world’s economy is heading towards a more regionalized and globalized one as a result of free trade and advances in information technology. For regional context, rapid economic growth and intensification of reforms in mainland China have provided great opportunities for Hong Kong. Regional cooperation with the Pearl River Delta (PRD) which has strong ability in attracting foreign investment is one of the greatest advantages in sustaining economic growth in the long run.

The intimate socio-economic ties between Hong Kong and the mainland China will also lead to a rise in number of cross-border commuters and vehicle movements. For the former, apart from leisure and business as the main purposes of travelling, there is also a growing trend for Hong Kong residents to purchase or rent residential properties in the mainland. The proportion of people living in the mainland and commuting to Hong Kong for work on daily basis among cross-border commuters is up-surring. As for vehicle movement, by virtue of more and more cross-border economic activities, rapid increase is seen in vehicle trips of goods between Hong Kong and the Mainland especially in the eastern and central parts of the Pearl River Delta. As a result, demand on cross-border transport infrastructure including both rail and road networks is anticipated.
2. Study Goal and Approach

2.1. Study Goal

To ride on the trend of Smart City development, it is important to explore opportunities for further development of Hong Kong as a leading Smart City in the world. Since the unique context of a city affects its Smart City development in terms of policy matters and technological development, it is crucial to conduct a comprehensive baseline study on current ICT infrastructure and government strategies and policies of Hong Kong, followed by a critical review on international practices and its applicability to the city. The study goal of this project, in short, is to develop a robust Smart City planning vision and offer comprehensive development strategies for input into HK2030+ for Hong Kong to capitalize on its ICT resources so as to provide a sustainable living environment to citizens.

2.2. Study Objectives

To achieve the study goal, the following objectives have been identified:

- Critically review the concept and key issues in Smart City planning and development
- Examine the positioning of Hong Kong in the global context in terms of technological infrastructures in order to assess its potential in Smart City development
- Evaluate current government strategies and policies in developing Hong Kong into a Smart City
- Review on overseas experiences regarding their application and challenges in Smart City planning and development
- Review Smart City development in mainland China with a view to identifying possible collaboration opportunities
- Develop a robust Smart City vision for Hong Kong and recommend policies and strategies to achieve this development vision
2.3. Study Process

The study is divided into three phases which consist of an inception report, working paper and a final report respectively. Outcome of each phase will be produced, constituting a baseline study, international review and consolidation, strategy formulation and recommendation. At the end of each phase, research results will be presented to clients in the form of oral presentation and a written report as introduced in detail below.

<table>
<thead>
<tr>
<th>Study Phrase</th>
<th>Key Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inception Report</td>
<td>▪ Critical cognition of Smart City planning and development&lt;br&gt;▪ Study goals and objectives&lt;br&gt;▪ Key Issues/debates, opportunities/advantages and problems/challenges/pitfalls in connection with the planning and Smart City development&lt;br&gt;▪ Proposed methodology, study approach, tasks, program and staffing</td>
</tr>
<tr>
<td>Working Paper</td>
<td>▪ Government strategies, policies and measures related to Smart City in Hong Kong&lt;br&gt;▪ Evaluation of relevant stakeholders ‘views on developing Hong Kong as a Smart City&lt;br&gt;▪ International experience in Smart City planning and application in smart living&lt;br&gt;▪ Assessment of relevant overseas experience</td>
</tr>
<tr>
<td>Final Report</td>
<td>▪ A vision statement for Hong Kong being a Smart City&lt;br&gt;▪ Recommendation of spatial planning strategy and policy to achieve the vision&lt;br&gt;▪ Policy implications on the key stakeholders&lt;br&gt;▪ Strategic/district planning of Hong Kong based on the recommendations</td>
</tr>
</tbody>
</table>

Table 2.1: Study Process
2.4. **Study Methodology**

In order to achieve the goals and objectives discussed in Chapter 2.1 and 2.2, different methodologies have been applied in the three phases of this study. They include literature review, desktop research, interview, site visit and case studies. Detailed methodologies applied during the study are stated in the flowchart below.
Figure 2.1: Study Process Flow Chart
2.5. **Structure of Final Report**

This final report is set out in twelve chapters in five sections. It concentrates on what matters the most, i.e. the broad concepts and strategies, with details included in supporting inception report, working paper and annexes. The first section explains the concept of Smart City and the overview of this study, the second reviews Smart City development in Hong Kong, the third discusses international experiences, the fourth sets forth planning strategies and implications and the fifth summarizes key messages of the report.

**Section I  Introduction**

**Chapter 1 – Time for Review**

- Reviewing relevant literature of Smart City concepts and identifying the future trends and key issues in Hong Kong

**Chapter 2 – Study Goal and Approach**

- Identifying study goal, objectives and presenting the methodologies used and the structure of the report

**Section II  Smart City Development in Hong Kong**

**Chapter 3 – Policy Review**

- Examining relevant government strategies, policies and measures related to Smart City development in Hong Kong

**Chapter 4 – Strengths, Weaknesses, Opportunities and Challenges**

- Identifying the Smart City foundation, constraints and current gaps, development opportunities and challenges for Smart City of Hong Kong

**Section III  International Review**

**Chapter 5 – Review of International Experiences**

- Examining international case studies in Smart City planning and development and their application in five future trends and key issues of Hong Kong
Chapter 6 – Relevance of International Experiences

- Assessing the relevance of overseas experiences to Hong Kong with supplement from interviews with major stakeholders regarding developing Hong Kong as a Smart City

Section IV Planning Strategy and Next Steps

Chapter 7 – Vision and Strategies

- Developing the vision statement and planning strategies for planning and developing Hong Kong as a Smart City

Chapter 8 – Initiatives and Policies

- Recommending detail initiatives and policies to achieve the vision of Smart City

Chapter 9 – Operating Mechanism

- Presenting necessary considerations for implementation of Smart City in Hong Kong

Chapter 10 – Policy Implications

- Identifying policy implications on the key stakeholders and strategic/district planning of Hong Kong arising from the recommendations

Section V Conclusion
Section II  Smart City Development of Hong Kong

Chapter 3: Policy Review
Chapter 4: Strengths, Weaknesses, Opportunities and Challenges
Section II Smart City Development Foundation of Hong Kong

3. Policy Review

Positioning as Asia’s world city, Hong Kong goes in tune with the global trend and aspires to evolve itself into a Smart City. To further understand the current situation in Hong Kong, major strategies, policies and measures pertinent to Smart City development will be discussed in this section.

3.1. Smart City Strategies in Hong Kong

2014 Digital 21 Strategy - Smarter Hong Kong, Smarter Living
Digital 21, firstly issued in 1998, intends to map out the blueprint for ICT development in Hong Kong. The latest update of the strategy in 2012, has addressed the advent of new technologies such as cloud computing emerging in recent years and more importantly, laying emphasis on Smart Hong Kong. In short, 2014 Digital 21 Strategy “sets out the framework for Hong Kong to leverage on new technologies” to foster a thriving ICT industry and in the end, to propel Smart City development (Digital 21 Strategy, 2014).

Policy Address
The intention of developing Hong Kong into a Smart City was expressed by the Chief Executive in Policy Address 2015 for the first time. Since then, related policies and measures have been initiated formulated to explore the feasibility of Smart City development in Hong Kong. Smart City policies and measures have also been covered in Policy Address 2016.

Hong Kong 2030+ Towards a Planning Vision and Strategy Transcending 2030
Hong Kong 2030+ will be an updated version of HK 2030 which is meant to provide long-term planning directions for tackling possible challenges arising henceforth. Despite the fact that preparation of the document is still in progress, it is known that formulation of spatial development strategies to help enhance Smart Living in Hong Kong will be one of the main focuses of this updated long-term strategy for Hong Kong (HKIS, 2014).

Research Foundation for developing Smart City strategies - Central Policy Unit (CPU) research report on Smart City and the paper on Government initiatives on Smart City Development
To devise strategies in relation to Smart City, research has been carried out by The Commission on Strategic Development ("Commission") responsible for “exploring the way forward for Hong Kong’s long-term development strategies” under CPU (CPU, 2012). Both the report and the paper have “introduced features and indicators of Smart City, coupled with reports on the policies and measures related to Smart City development implemented or planned by the HKSAR Government” (CPU, 2015). With this research base, the Commission
can then make recommendations on the Government’s strategies and key initiatives in further developing Hong Kong as a Smart City.

To sum up, developing Hong Kong into a Smart City is a major trend and focus in present as well as future planning vision and strategies. Under strategies propelling Smart City development in Hong Kong, corresponding policies and measures have been put into effect.

3.2. Smart City Policies and Measures in Hong Kong

Smart City attempts can be identified in various policies and measures of Hong Kong Government. A brief illustration of policies and measures on Smart City development will be presented in this section with reference to the five major aspects, namely, Economic, Social, Environment, Government and Regional.

**Economic Initiatives**

Hong Kong has invested in high-end manufacturing, providing financial and infrastructural support and nurturing talents for innovation and technology.

<table>
<thead>
<tr>
<th>“Re-industrialization”</th>
<th>Promoting smart production, attracting high value-added technology industries and manufacturing processes</th>
</tr>
</thead>
</table>
| Establishment of Innovation and Technology Hubs | Initiatives on Hong Kong Science and Technology Parks Corporation (HKSTPC)  
  ▪ Performing as a hub to drive growth in Hong Kong’s innovation and technology sector, providing Research and Development (R&D) facilities, infrastructure, laboratories and technical centres which enable science and technology companies to nurture ideas, innovate and grow  
  ▪ Providing an additional floor area of 70,000 square meters for start-ups and other technology by 2020 (HKSAR, 2016)  
  ▪ Initiatives on Cyberport  
    ▪ Acting as a “creative digital community” with a cluster of technology and digital content tenants by providing a number of incubation scheme quotas, office spaces, digital facilities and technological infrastructures |
### 3 Policy Review

<table>
<thead>
<tr>
<th><strong>Assistance to Start-up and Small and Medium-sized Enterprises (SMEs)</strong></th>
<th>Potential of TKO industrial estate for ICT R&amp;D sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘iStartup@HK’, a one-stop platform startup portal from government for startups to showcase their products online</td>
<td></td>
</tr>
<tr>
<td>Extending the application period for the “special concessionary measures”, reducing the annual guarantee fee rate by 10 percent and removing the minimum guarantee fee for SMEs</td>
<td></td>
</tr>
<tr>
<td>Technology Start-up Support Scheme for Universities from ITC</td>
<td></td>
</tr>
<tr>
<td>SIE (Social Innovation and Entrepreneurship Development) Fund on University Entrepreneurship series</td>
<td></td>
</tr>
</tbody>
</table>

| **Innovation and Technology Support Programme (ITSP)** | Supporting midstream and downstream R&D projects conducted mainly by universities, industry support organisations, R&D centres and trade and industry associations, etc. (Innovation and Technology Fund (ITF), 2016a). |

<table>
<thead>
<tr>
<th><strong>Funding on R&amp;D</strong></th>
<th>Funding schemes on R&amp;D administered by ITC, which included $8.9 billion for more than 4,200 project and injecting $5 billion into the Innovation and Technology Fund (ITF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples of funding schemes:</td>
<td></td>
</tr>
<tr>
<td>▪ Applied research fund</td>
<td></td>
</tr>
<tr>
<td>▪ Patent application grant</td>
<td></td>
</tr>
<tr>
<td>▪ New technology training scheme</td>
<td></td>
</tr>
<tr>
<td>▪ Research and development cash rebate scheme</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Promote Commercialization of R&amp;D Technology Transfer</strong></th>
<th>Driving and coordinating applied R&amp;D in selected focus areas of R&amp;D innovations by ITC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2 billion Innovation &amp; Technology Venture Fund in matching local start-ups with private venture capital funds (angel investors)</td>
<td></td>
</tr>
<tr>
<td>University-Industry Collaboration Programme (UICP) promoting close collaborations between private companies and universities in R&amp;D</td>
<td></td>
</tr>
<tr>
<td>Promote smart manufacturing and attract high value-added technology industries as well as</td>
<td></td>
</tr>
<tr>
<td>Table 3.1: Economic Initiatives</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Nurturing ICT Talents and Promoting R&amp;D development</strong></td>
<td></td>
</tr>
<tr>
<td>high value-added production processes suitable for Hong Kong</td>
<td></td>
</tr>
<tr>
<td>- Promoting education in Science, Technology, Engineering and Mathematics (STEM) sectors</td>
<td></td>
</tr>
<tr>
<td>- The Academy of Sciences of Hong Kong established in 2015 to promote R&amp;D activities</td>
<td></td>
</tr>
<tr>
<td>- Overseas Research Facilities are set up in Hong Kong</td>
<td></td>
</tr>
<tr>
<td>- $2 billion will be injected to Universities for initiating Midstream Research Programme on key technology areas (HKSAR, 2016)</td>
<td></td>
</tr>
<tr>
<td>- R&amp;D Cash Rebate Scheme aiming to enrich the research culture among private companies and encourage partnership with local public research institutions (ITF, 2016)</td>
<td></td>
</tr>
<tr>
<td>- Funds to encourage university graduates to work in ICT sector via CyberPort scheme</td>
<td></td>
</tr>
<tr>
<td>- Public research funding for tertiary institutions</td>
<td></td>
</tr>
</tbody>
</table>

**Social Initiatives**

The Government has offered support and services to enhance the quality of life of citizens through promoting smart mobility and catering for elderly and healthcare needs.

<table>
<thead>
<tr>
<th>Innovation and Technology Fund for Better Living (ITFBL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- $500 million to finance projects which make use of innovation and technology to improve our daily life</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Healthcare and Elderly Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>- R&amp;D in biotechnology, healthcare and medicine as the key focuses of the HKSTPC to alleviate the burden of healthcare system and promote healthy ageing</td>
</tr>
<tr>
<td>- E-health services including a territorial wide electronic health record(eHR) sharing systems and a digital identity of all Hong Kong citizens</td>
</tr>
<tr>
<td>- “eElderly” (<a href="http://www.e123.hk">www.e123.hk</a>) in 2010, the portal is designed to enable easy use and navigation by the elderly, a friendly one-stop channel to information around their needs and interests</td>
</tr>
<tr>
<td>Walkable Kowloon East</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
</tbody>
</table>
| Intelligent Transport Systems (ITS) | Examples of ITS in Hong Kong:  
  - Area Traffic Control Systems  
  - Closed Circuit Television Images on the Internet  
  - Traffic Control and Surveillance Systems  
  - Automatic Toll Collection System  
  - Octopus  
  - Electronic Parking Meters  
  - Red Light Cameras and Speed Enforcement Cameras  
  - Journey Time Indication System  
  - Traffic Speed Map  
  - Traffic Control Centre  
  - Transport Information System  
  - Speed Map Panels  
  - Hong Kong eTransport  
  - Hong Kong eRouting |
| Road Cargo System (ROCARS) | Streamlining customs formalities and enhance border control efficiency by allowing shippers to register cargo information in advance via the online system before transporting the cargoes through boundary control points (CPU, 2015) |
| Promoting the Use of Electric Vehicles | Increasing the provision of charging facilities and more retired batteries which can be reused for energy storage |
| Universal Accessibility Programme | Retrofitting barrier-free access facilities to the existing public walkways which was introduced in 2014 (CPU, 2015) |
| Social Inclusion | One-off funding of HK$3.6 million in 2010-11 to support the development of ICT-based assistive tools and mobile applications for persons with disabilities |

Table 3.2: Social Initiatives
Environmental Initiatives
With respect to environmental aspect, Hong Kong has worked for sustainable urban planning, smart buildings and water management.

<table>
<thead>
<tr>
<th>Sustainable Urban Planning</th>
<th>Sustainable development is set as the overall objective in HK 2030 (CPU, 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greening Master Plan (GMP)</td>
<td>A guide for the planning, design and implementation of greening in all districts (CEDD, 2015)</td>
</tr>
<tr>
<td>Hong Kong Blueprint for Sustainable Use of Resources</td>
<td>Setting out clear goals and a 10-year timeline for the resource management strategy of Hong Kong which was issued in 2003 (CPU, 2015)</td>
</tr>
<tr>
<td>Building Information Modelling (BIM)</td>
<td>A pilot basis for generating a three-dimensional digital representation of building data throughout the life cycle of a building (HKHA, 2012)</td>
</tr>
<tr>
<td>Water Intelligent Network (WIN)</td>
<td>Installing sensors in water supply networks to reduce the risks of main bursts and leakages, thereby ensuring the efficient use of freshwater resources (HKSAR, 2016b)</td>
</tr>
<tr>
<td>New Water Treatment Plant Using Latest Technology</td>
<td>Desalination plant at Tseung Kwan O with Reverse Osmosis technology</td>
</tr>
</tbody>
</table>

Table 3.3: Environmental Initiatives

Government Initiatives
Major roles of government in Smart City Development include the provision of strategic plans, promoting online public services and open data to general public, and facilitating data usage.

<table>
<thead>
<tr>
<th>Innovation and Technology Bureau (ITB)</th>
<th>Established in November 2015 in order to formulate a digital framework and standards for the development of a Smart City</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Responsible for policy matters on the development of innovation and technology and information technology which are the key drivers in Smart City development</td>
</tr>
</tbody>
</table>
| Better Transparency and Utilisation of Public Sector Information | ➢ Gov-HK as the ‘one-stop government portal’
➢ Online/ mobile government service covers a wide range of daily needs with more than 100 mobile GovHK Apps as of end 2015, for instance:
  ▪ Sport and Recreational Facilities Booking
  ▪ Library e-notification
  ▪ eTax Services
  ▪ Interactive Employment Services
  ▪ Online Mail Tracking Services
  ▪ Online Job Application Platform
  ▪ Geo Info Map
  ▪ Smart ID Card
  ▪ EventHK |
| Integration of Government Information and Datasets and Encouraging Creative Data Usage | ➢ Geospatial Information Hub and GeoInfo Map
data.gov.hk
➢ GovCloud platform to join up public e-services |
| Data Centre Facilitation Unit (DCFU) | ➢ Providing one-stop help desk service to assist data centre operators interested in setting up data centres in Hong Kong |
| Pilot Study in Smart City Development | ➢ Kowloon East as the Smart City Pilot Area by capitalizing on smart data and harness technology to create a low carbon green community, enhancing walkability and mobility and providing high quality municipal management and public services (EKEO, 2015) |
| Deploy of Sensors in Urban Management | ➢ Maintenance issues of water pipes
➢ Landslip warning system
➢ Water intelligent network and smart water metering
➢ Traffic detectors with real-time traffic data collection in selected area |
### Provision of Network Infrastructure

<table>
<thead>
<tr>
<th></th>
<th>Increasing Wi-Fi hotspots for Public and Visitors, from 17,000 in 2014 to 34,000 within 3 years from 2016</th>
</tr>
</thead>
</table>

Table 3.4: Government Initiatives

**Regional Initiatives**

Riding on the current benefits brought by market liberalization measures of China and national strategic orientation on promoting regional innovation cooperation, Hong Kong draws lessons from Mainland China and fosters cooperation amongst local, Mainland and overseas ICT enterprises.

<table>
<thead>
<tr>
<th>Cross-Border Cooperation on ICT Services</th>
<th>CEPA: Joint venture enterprises on value-added telecommunication services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone was established aiming to serve as an experimental business zone for better interaction between the Mainland China and Hong Kong in the financial, logistics, and IT services sectors (China Briefing, 2014)</td>
</tr>
<tr>
<td></td>
<td>Guangdong-Hong Kong Technology Cooperation Funding Scheme (TCFS) aiming at strengthening collaborations between universities, research institutes, trade and industry associations, professional bodies, and local companies in technological research, provided by the ITC (ITC, 2013)</td>
</tr>
<tr>
<td></td>
<td>Shenzhen/Hong Kong Innovation Circle, a joint project between Shenzhen, HKSTPC, and DuPont to establish a Solar Energy R&amp;D Support Center announced in 2008 (Segal, 2014)</td>
</tr>
</tbody>
</table>

| Smart City Research Institute | The Hong Kong University of Science and Technology (HKUST) cooperates with IT service provider in China, Digital China Holdings Limited, to build the Smart City Research Institute and foster the development of smart city in Hong Kong and Mainland China (Hong Kong University of Science and Technology (HKUST, 2015) |

| Expansion of HKSTPC site area | Identifying sites near the Liantang/Heung Yuen Wai Boundary Control Point for the development of Science Park and industrial estates to cater |
Table 3.5: Regional Initiatives

| | the growing demand on HKSTPC site (HKSAR, 2016a) |
4. Smart City Development Foundation of Hong Kong

Smart City does not build on its own. The success of Smart City development requires necessary development environment and concerted endeavours to make things happen. After studying Smart City strategies, policies and measures of Hong Kong, this part will review the performance of Hong Kong in developing into a Smart City with a SWOT analysis.

4.1. Strengths

Generally, Hong Kong has advantages in infrastructure, affordable ICT services and having a sound business environment.

4.1.1. Quality ICT Infrastructure

With quality technology infrastructure, Hong Kong possesses the foundation for Smart City to be built on. According to ICT Development Index 2015, Hong Kong ranked ninth in the overall ranking, indicating that Hong Kong has relatively high ICT capabilities.

Robust ICT infrastructure has laid the basis for Hong Kong to further develop into a Smart City. With nine submarine cable systems, overland cable systems connected to three telecommunications operators in the Mainland, Hong Kong also operates ten satellites for external communications (HK Fact Sheet, 2016).

With reference to network coverage, broadband networks in Hong Kong “cover nearly all commercial and residential buildings in the territory” (HK Fact Sheet, 2016) while Hong Kong’s mobile network coverage comes first in the world according to the Global Information Technology Report 2015. Together with free public Wi-Fi service without prior registration available in most public places, including major parks, tourist attractions, leisure & culture facilities, Hong Kong can thus be called a well-connected city.

As for Internet connection speeds, Hong Kong’s average Internet connection speed is the fifth fastest in the world while the city’s average peak Internet connection speed is the second fastest in the world. The aforementioned infrastructure coupled with wide internet coverage and high connection speeds, have contributed to the bedrock for Smart City development in Hong Kong.

4.1.2. Affordable ICT Services

Smart City development should be reachable to all and hence affordability is a major issue. Being one of the economies with the most affordable fixed broadband services, Hong Kong provides internet access at an affordable price. For instance, the price of the fixed broadband basket represents less than one
per cent of GNI p.c. while mobile tariffs affordability of Hong Kong ranks third in the world in 2013 (Digital 21, 2014).

With a wide range of ICT services available at low prices, the growth of ICT industry can be sustained so that the city can take full advantage of ICT services and ensure that they contribute to the wider Smart City development by building capabilities for internet use and promoting ICT inclusiveness.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Economy</th>
<th>Fixed telephone sub-basket as a % of GNI p.c., 2014</th>
<th>Mobile cellular sub-basket as % of GNI p.c., 2014</th>
<th>Fixed broadband sub-basket as a % of GNI p.c., 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Macao, China</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>2</td>
<td>Kuwait</td>
<td>0.3</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>3</td>
<td>Singapore</td>
<td>0.4</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>4</td>
<td>Norway</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>5</td>
<td>Qatar</td>
<td>0.4</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>6</td>
<td>Hong Kong, China</td>
<td>0.4</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>7</td>
<td>Iran (I.R.)</td>
<td>0.5</td>
<td>0.1</td>
<td>0.4</td>
</tr>
<tr>
<td>8</td>
<td>Switzerland</td>
<td>0.5</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>9</td>
<td>Luxembourg</td>
<td>0.5</td>
<td>0.5</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Figure 4.1: ICT Price Basket and Sub-basket Ranking 2015

4.1.3. **Sound Business Environment**

An environment that fosters innovative business and technological invention is fundamental in developing a Smart City. The performance of Hong Kong in terms of its business environment is good. Overall speaking, Hong Kong ranks third in business and innovation environment, according to the Network Readiness Index 2015. To be more precise, Hong Kong ranked fourth for the time required to start a business and ranked fifth for venture capital availability. Such ranking illustrates that Hong Kong has a welcoming business environment, which is conducive to ICT businesses.
Strategic location of Hong Kong, last but not least, further ensures a low risk in investing in Hong Kong. Geographically located in the proximity of markets in China, opportunities can be found in regional IT projects or initiatives.

From the above, it is concluded that the strengths of Hong Kong lie in good infrastructure, affordable ICT services and a pro-ICT business environment.
4.2. **Weaknesses**

In spite of existing advantages in hardware of a city, Hong Kong is still lagging behind in terms of software which facilitate Smart City development. Eight weaknesses concerning Hong Kong Smart City development foundation are identified as below.

### 4.2.1. Absence of Comprehensive Long-term Vision

Having an agreed vision of Smart City development is a prerequisite for success, according to Smart City framework – *Guide to Establishing Strategies for Smart Cities and Communities* issued by the British Standards Institution. The guide suggests that successful Smart Cities should have a strategy and roadmap to set out how data and digital technologies could be used to deliver improved outcomes and align with city’s development framework.

Hong Kong, however, falls short of doing so as there is inadequate comprehensive policies supporting ICT development and long term vision on Smart City development in Hong Kong. Cyberport development is one example. As mentioned in section 2.1, Hong Kong Government announced its plan to develop Cyberport to promote digital development in 1999 and immediately carried out construction in 2000. Nevertheless, it seems that Cyberport development was not supported by a holistic long term planning. Cyberport was not mentioned in previous Policy Address or Digital 21 Strategy before 1999, while it “suddenly” became one of the major efforts of digital development in Hong Kong in 2001 Digital 21 Strategy. Cyberport development process is different from that of Science Park which has started planning few years before its implementation. For instance, in 1998 Digital 21 Strategy, it did not include any ideas on Cyberport development but only mentioned the preparation of Science Park development, which was established in 2001. The positioning of Cyberport was also uncertain at the beginning, whether the role of Cyberport is to attract world-leading firms to set up their offices in Hong Kong or to nurture local startups was not defined clearly.

Similarly, long-term vision of Smart City development in Hong Kong was missing in the past decades. Innovation and Technology Bureau (ITB), was only introduced in late 2015. However, the role of ITB is unclear, whether it is simply promoting innovation and technology in Hong Kong or engaging in Smart City development is still doubtful. “Promoting Smart City development in Hong Kong” is not even mentioned in “Our Role” on its official website (ITB, 2015). Government does not show enough strategic determination in promoting Smart City development, interviewee D also supported this viewpoint.
4.2.2. **Unsolid High-level Framework**

A solid High-level framework is indispensable in achieving success in Smart City development. In developing a Smart City, a bureau should be "tasked to take the lead in formulating overall strategies and plans, coordinating inter-bureaux or department responsibilities, and strengthening the Government’s facilitating role in support of the development of Smart City technologies and services driven by the community and the business sector", as pointed out in CPU report on Smart City (CPU, 2015). Unfortunately, such framework cannot be seen in Hong Kong Government at this stage, which hampers the effectiveness in implementing Smart City strategies.

One manifestation is a lack of dedicated agent in steering the formulation and implementation of Smart City strategies. As illustrated in the table below, matters concerning Smart City development are “under the purview of different bureaux and departments,” (CPU, 2015) while a steering committee or organization overseeing and directing overall Smart City development of higher position is absent. Such circumstance gives rise to two results, one being incoordination across bureaus or departments and another one being data fragmentation.

<table>
<thead>
<tr>
<th>Bureaux &amp; Departments</th>
<th>Duties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce and Economic Development Bureau</td>
<td>• Formulates the Digital 21 Strategy</td>
</tr>
<tr>
<td></td>
<td>• Responsible for internet governance in respect of the Electronic Transactions Ordinance and the Domain Name Administration Regime etc.</td>
</tr>
<tr>
<td>Development Bureau</td>
<td>• Co-ordinates city-wide urban planning and infrastructure, eg. pilot project of smart city in Kowloon East</td>
</tr>
<tr>
<td>Environment Bureau</td>
<td>• Responsible for the strategy for sustainable use of resources and initiatives for energy conservation and emission reduction</td>
</tr>
<tr>
<td>Office of the Government Chief Information Officer</td>
<td>• Officer co-ordinates ICT infrastructure within the government and integrates electronic public services.</td>
</tr>
<tr>
<td>Innovation and Technology Bureau</td>
<td>• Responsible for policy matters on the development of innovation and technology and information technology</td>
</tr>
</tbody>
</table>

Table 4.1: Bureaux and Departments Involving in Smart City Development
Source: CPU 2015
For the former, inter-bureaux or department cooperation is essential in putting forward Smart City development. At present, the absence of a high-level agent coordinating government organizations involved in Smart City development has led to difficulties in cooperation between various departments when formulating and promulgating Smart City initiatives. Different government agencies have their own concerns and standards, making compromising process tedious and as a result, consensus are difficult to achieve. Similar obstacles exist in Energizing Kowloon East Initiative, in which officers have spent much time and efforts in communicating with various department, as reflected by Ms Brenda Au, Deputy Head of Energising Kowloon East Office.

The newly established Innovation and Technology Bureau (ITB) is intended to “coordinate inter-bureau policy efforts and technology matters” (ITB, 2015). Nevertheless, since concrete outcome cannot be seen at this moment, it is hoped that the establishment of ITB can help overcome the hurdle of incoordination across bureaus and departments.

As for fragmentation in data, different government departments adopt different operation modes and data sets, resulting in incompatibility in the use of data. Government organizations such as Lands Department, Highways Department, Development Bureau, Planning Department, Civil Engineering and Development Department all have their own GIS application and modification system. This lack of centralized data collection system in Hong Kong Government constitutes one of the major obstacles of Smart City development in Hong Kong, as agreed by most interviewees.

4.2.3. Insufficient Data Transparency and Availability

Despite recent efforts invested in providing spatial data through online tools such as GeoInfo Map and statutory planning portal, these open data is still dispersed. Application Programming Interfaces (APIs), which provide consistent data and allow users to export data for their own uses, are not available at present. Such defect undermines the optimization of information analysis and usage in Hong Kong.

Given that much data is only for internal circulation in the Government, it is hard and expensive for the public to gain access to those data. For instance, land lease information from the Lands Department cannot be accessed without payment. Data transparency and availability will thus be low, which does not favour data analysis and technological innovation in Hong Kong. Similar view is shared by interviewee G, an urban planner working in private planning consultant firm.
4.2.4. **Inflexibility in Regulatory Regime**

With the proliferation of Internet and new technologies, innovations may lead to “disruptive business models that challenge existing interest groups and industry practices” (Our Hong Kong Foundation, 2016). In view of new trends, regulatory measures perform a major role in striking a balance between innovation and economic stability.

Uber operation in Hong Kong is an example. Uber online taxi-hailing service is forbidden in Hong Kong as drivers are driving without a permit or third-party insurance. Regulations discourages online car sharing services in Hong Kong. Besides, overly stringent regulatory regime is “commonly cited by FinTech start-ups and incumbents as a hindering factor to the development of innovative solutions such as crowdfunding” (Our Hong Kong Foundation, 2016). According to KPMG’s 2015 report, FinTech start-ups with limited compliance resources are finding it hard to understand the legal requirements applicable to them (KPMG, Thomas Reuters & DLA Piper, 2015).

That is to say, Hong Kong regulatory bodies is adopting a reactive instead of a proactive attitude towards new innovation which may constitute a menace to the current system.

4.2.5. **Lack of Mechanisms to Corporate with Private Companies**

Incentives and regulations to encourage private companies to open and share data or technological innovation are insufficient in Hong Kong. Similar to Government departments, data in private companies are mainly circulated and used internally. Technological innovations and improvements mainly rely on private companies’ own initiatives.

Development of KMB apps is one of the examples. It is derived from users’ demand and KMB’s initiative rather than driven by Government’s incentives or public private cooperation. Therefore, innovations are also piecemeal and fragmented. For instance, both MTR and KMB have developed their own application but there is no apps providing information of the whole public transport network nowadays.

4.2.6. **Insufficient Funding Support for Research and Development Activities**

Research and Development constitutes a key component of a country’s technology and innovation ecosystem. Businesses are often the major drivers of innovative concepts and prototypes through research commercialisation. Businesses also act as collaborators with universities and research institutes in R&D. In other words, business R&D matters in innovation and technological productivity. In this respect, however, Hong Kong is comparatively weak. As Figures 4.3 and 4.4 illustrate, the business sector in Hong Kong is spending
relatively less on R&D, when compared to wealthy counterparts around the world (Our Hong Kong Foundation, 2016).

Figure 4.3: Business R&D Spending on Percentage of Total R&D Spending

Government, aside from businesses, is also a crucial player in fostering innovation. Despite the substantial increase in government spending on R&D activities from HK$597.1 million in 2010 to HK$658.0 million in 2015, Hong Kong still lags far behind when compared with similarly “small open economies”, such as Singapore and Switzerland, or to the similarly liberal economic system of the US. This in turn affects the private sector’s incentive to invest in R&D (Levy and Terleckyj, 1983). This lack of government commitment underlines its “unwillingness to recognise that adequate investment in basic and applied research is important to facilitating a sustainable development of the economy.” (Our Hong Kong Foundation, 2016)
4.2.7. Insufficient Talents Cultivation

For Smart City development to be robust in a city, ICT talents are of great importance. Hong Kong is no exception. A pool of skilled ICT professionals, 83,000 coming from various business sectors in total, can be found in Hong Kong as at 2014 (HK fact sheet, 2015).

Talent is “the key to a thriving innovation and technology ecosystem” (Our HK Foundation, 2016). Despite education and internship programmes provided by the government as explained earlier, Hong Kong still has room for improvement when it comes to cultivating ICT talents. To commence with, there is a lack of demonstration of the urgent need to cultivate talent for the ICT profession. Although the government does invest in nurturing local innovation, it falls short on “addressing necessary support for the urgent need to cultivate talent for the ICT industry” (Hong Kong Computer Society, 2016).

With regard to the number of employees in technology and innovation industry, the situation in Hong Kong is not satisfactory. According to the World Economic Forum 2015-16 Global Competitiveness Report, Hong Kong ranks significantly lower in the metrics of innovative capacity, and availability of scientists and engineers. Moreover, as seen from the chart below, among the total number of IT employees in Hong Kong, only 0.8% is in relation to digital creative, implying that manpower in innovative industries is hoped to increase. One reason for
this may be a lack of attractiveness of science, technology, engineering, and mathematics (STEM). Graduates majoring in STEM are deemed to be “less attractive than professions such as business and finance, let alone medicine and law” (Our HK Foundation, 2016).

Figure 4.5: Distribution of Information Technology (IT) Employees by Industry Grouping 2014

Furthermore, in the near and medium term, the importance of training and education for IT human talent has not been given the level of support provided to, for example, the aviation industry, insurance sector, or agricultural sector as accorded in the Policy Address. (Hong Kong Computer Society, 2016) This creates a vicious cycle of weak demand for and supply of scientists and engineers, hampering Smart City development in Hong Kong.

ICT elites are human resources which are of great importance on the road to Smart City. Therefore, Hong Kong should not be complacent of what has been done by now but should further expand its scope in training ICT professionals.

4.2.8. Inadequate Citizens Readiness

Citizens’ awareness and acceptance to new technologies play a crucial role in promoting Smart City development as technological innovations and applications are often user-driven.

Even though the Government has put a lot of efforts in providing e-services in the past decades, citizens’ awareness to available e-services is not very satisfactory. According to Thematic Household Survey Report on Information Technology Usage and Penetration 2015, only around 60% of citizens are aware of GovHK. In addition, Hong Kong ranks thirtieth in “Government
success in ICT promotion” in the Global Information Technology Report 2015, which implies that the Government still has room for improvement in promoting the use of ICT and e-services.

Citizens’ acceptance to new technology is another concern. People in Hong Kong may be conservative in utilizing new mobile applications, specifically those related to community sharing. Take “Myflat.hk” and “Around” which target at promoting sharing economy and encouraging community cohesion as an instance. These apps are not widely used and the underlying reason is a lack of trust and readiness towards ICT in society, as underpinned by interviewee C, founder of the two apps.

4.3. Opportunities and Challenges

4.3.1. Rise of Digital Native

Entering Information Age, the population of digital native is expected to rise and Hong Kong is no exception. Digital native is a term used to “characterize (young) people born during the digital age and growing up using ICTs.” Currently, Hong Kong ranks twenty-first in percentage of digital native over total population in 2012, as shown in Figure 4.6.

With the growing level of digital nativism through time, enhancement in ICT infrastructure will be unavoidable, which helps foster Smart City development. Rise of digital native will be conducive to the development of Smart City, on the grounds that digital natives, with solid ICT experiences, know how to manipulate ICT as a powerful tool, shaping and driving Smart City.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Economy</th>
<th>DN (total)</th>
<th>DN as a % of total population</th>
<th>DN as a % of total youth*</th>
<th>Share of youth population**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Iceland</td>
<td>45,495</td>
<td>13.9</td>
<td>95.9</td>
<td>14.4</td>
</tr>
<tr>
<td>2</td>
<td>New Zealand</td>
<td>606,040</td>
<td>13.6</td>
<td>94.8</td>
<td>14.3</td>
</tr>
<tr>
<td>3</td>
<td>Korea (Rep.)</td>
<td>6,552,589</td>
<td>13.5</td>
<td>99.6</td>
<td>13.5</td>
</tr>
<tr>
<td>4</td>
<td>Malaysia</td>
<td>3,914,573</td>
<td>13.4</td>
<td>74.7</td>
<td>17.9</td>
</tr>
<tr>
<td>5</td>
<td>Lithuania</td>
<td>436,045</td>
<td>13.2</td>
<td>92.7</td>
<td>14.3</td>
</tr>
<tr>
<td>6</td>
<td>United States</td>
<td>4,132,288</td>
<td>13.1</td>
<td>95.6</td>
<td>13.7</td>
</tr>
<tr>
<td>7</td>
<td>Barbados</td>
<td>35,830</td>
<td>13.1</td>
<td>90.5</td>
<td>14.4</td>
</tr>
<tr>
<td>8</td>
<td>Slovakia</td>
<td>696,917</td>
<td>12.7</td>
<td>92.9</td>
<td>13.7</td>
</tr>
<tr>
<td>9</td>
<td>Latvia</td>
<td>275,036</td>
<td>12.3</td>
<td>97.0</td>
<td>12.7</td>
</tr>
<tr>
<td>10</td>
<td>Denmark</td>
<td>685,624</td>
<td>12.3</td>
<td>96.9</td>
<td>12.6</td>
</tr>
<tr>
<td>11</td>
<td>Norway</td>
<td>607,837</td>
<td>12.3</td>
<td>93.3</td>
<td>13.1</td>
</tr>
<tr>
<td>12</td>
<td>Singapore</td>
<td>643,589</td>
<td>12.2</td>
<td>88.4</td>
<td>13.8</td>
</tr>
<tr>
<td>13</td>
<td>Brunel Darussalam</td>
<td>50,049</td>
<td>12.1</td>
<td>73.7</td>
<td>16.5</td>
</tr>
<tr>
<td>14</td>
<td>Finland</td>
<td>645,961</td>
<td>12.0</td>
<td>98.3</td>
<td>12.2</td>
</tr>
<tr>
<td>15</td>
<td>Netherlands</td>
<td>1,993,587</td>
<td>11.9</td>
<td>98.4</td>
<td>12.1</td>
</tr>
<tr>
<td>16</td>
<td>Israel</td>
<td>915,636</td>
<td>11.9</td>
<td>80.0</td>
<td>14.9</td>
</tr>
<tr>
<td>17</td>
<td>Canada</td>
<td>4,124,622</td>
<td>11.9</td>
<td>90.1</td>
<td>13.2</td>
</tr>
<tr>
<td>18</td>
<td>Poland</td>
<td>4,538,102</td>
<td>11.8</td>
<td>89.4</td>
<td>13.3</td>
</tr>
<tr>
<td>19</td>
<td>Estonia</td>
<td>1,58,260</td>
<td>11.8</td>
<td>96.0</td>
<td>12.3</td>
</tr>
<tr>
<td>20</td>
<td>Sweden</td>
<td>1,110,582</td>
<td>11.7</td>
<td>89.4</td>
<td>13.1</td>
</tr>
<tr>
<td>21</td>
<td>Hong Kong, China</td>
<td>833,148</td>
<td>11.6</td>
<td>90.5</td>
<td>12.8</td>
</tr>
<tr>
<td>22</td>
<td>Australia</td>
<td>2,621,640</td>
<td>11.4</td>
<td>83.1</td>
<td>13.8</td>
</tr>
<tr>
<td>23</td>
<td>Chile</td>
<td>1,961,464</td>
<td>11.3</td>
<td>67.0</td>
<td>16.8</td>
</tr>
</tbody>
</table>

Figure 4.6: Digital Natives, 2012
Source: Measuring the Information Society 2013
4.3.2. Possible Regional Collaboration Opportunities
Synergy between Hong Kong and Mainland is an indispensable prerequisite for Smart City development in Hong Kong given its role of being a gateway to China. On top of CEPA mentioned earlier, one objective in the 13th Five-Year Plan established by the Central People’s Government is concerned with innovation – “building up bases of modern information-intensive infrastructure” (Globeone, 2016).

ICT industry in Hong Kong should therefore harness the opportunity to “facilitate technological upgrading in the Mainland, leveraging Hong Kong’s position as a two-way platform assisting Mainland enterprises to bring in foreign investment and expand their business in the global economy” (Digital 21, 2014).

One possible opportunity is to strengthen ties with the Pearl River Delta, especially Shenzhen, to drive Hong Kong’s applied research. Cooperation between universities in Hong Kong and technology companies in Shenzhen in research and development activities is one example. The emergence of Shenzhen as a high-tech cluster in China provides opportunities for technology collaboration that are currently under explored. At present, Shenzhen houses a number of globally competitive companies such as Huawei. Nevertheless, Shenzhen historically lacks strong university compatible to its economic status (Li, cited in Yeung, 2011). Although Shenzhen is making great effort to strengthen this area, Hong Kong still excels in terms of innovation capabilities, particularly in its cost-effectiveness in adapting foreign technologies to the Mainland environment (HKTDC, 2012). Collaboration with Shenzhen industry provides Hong Kong researchers with applied or translational research opportunity, as well as allows them to tap into the huge R&D funding pool (Our Hong Kong Foundation, 2016).

Through collaboration and knowledge exchange with the mainland, Hong Kong will be benefited on its road towards Smart City. Aside from optimizing the opportunities of Smart City Development in Hong Kong, Government should also be mindful of the potential threats which may be brought from social aspects, such as citizens’ concern on privacy and security issues, ageing population, digital divide and employment restructuring.

4.3.3. Privacy and Security Issue
Uncertainty of privacy and security issue is a major threat in Smart City development. According to the Global Information Technology Report 2015, Hong Kong only ranks twenty-second in secure Internet servers, which are servers using encryption technology in Internet transactions, indicating there is potential risks in online transactions.
Moreover, Digital 21 Strategy in 2014 stated that the adoption of standards and best practices on cloud computing, particularly on cloud security and data privacy, have not yet been developed.

Companies and organizations in Hong Kong are ill-prepared to deal with cybersecurity risks (SCMP, 2015). The uncertainty of whether citizens’ privacy and security are being breached during the use of ICTs may hinder the promotion of Smart City development.

Apart from users’ perspective, ICT talents who are engaged in technology innovation are also worried about their intellectual property protection and software licensing. Hong Kong ranks tenth in intellectual property protection, which is fair, but it ranks thirtieth in software piracy rate in the Global Information Technology Report 2015. This may discourage technology innovation in Hong Kong.

4.3.4. Ageing Population
Demographic transition may lead to a shrinking workforce, hindering the pace of Smart City development. In Hong Kong, it is expected that with low birth rates and longer life expectancy, the median age of Hong Kong’s population will rise and elderly population will reach 26% of the total population in 2036. Moreover, household size in Hong Kong has been shrinking. Slow population growth makes aging population problem more serious. The need to cater for the increasing demand of elderly care and facilities through smart solutions presents a special challenge to Smart City.

4.3.5. Digital Divide
Education level, skills, knowledge and readiness towards technologies may lead to digital divide and social polarization. Disadvantaged groups, elders, less educated and the economically inactive people generally have lesser chances to the services provided through information technology.

In Hong Kong, the monthly household income shows a close relationship with the rate of households having personal computers at home. Households with higher monthly household income generally has a higher rate. The rate of households having PC at home ranged from 42.1% for households with monthly household income of less than $10,000 to 98.7% for those with monthly household income of $50,000 and more (Census and Statistics Department, 2015). The problem of digital divide in Hong Kong is also mentioned by interviewee A, who suggested that NGOs can help to mitigate digital divide of elderly, disabilities and low income group by offering ICT courses and assistance.
4.3.6. **Employment Restructuring**

It is worried that wider technological application may replace certain low skilled jobs due to increasing automation of daily activities in Smart Cities. This may lead to change in jobs or even unemployment, due to Smart City development. Social impacts brought by employment restructuring should be under consideration.

4.4. **Conclusion**

Hong Kong is well-equipped with quality infrastructure, environment and ICT services essential for the success of Smart City but the city lacks strong soft components to complement and to drive Smart City development in Hong Kong. Difficulties are also ahead to be overcome. Potentials and challenges of Smart City development in Hong Kong are summarized below:

![Figure 4.7: SWOT Analysis](image-url)

Figure 4.7: SWOT Analysis
Section III International Review

Chapter 5: Review of International Experiences
Chapter 6: Relevance of International Experiences
5. Review of International Experiences

In order to gain insights for strategy recommendation for Smart City development in Hong Kong, overseas experience in Smart City planning and development will be reviewed, together with key applications to the five key issues Hong Kong is facing. The three cases to be scrutinized are Singapore, Barcelona and PRD. Singapore and Barcelona are chosen because of their similar socio-economic situation with Hong Kong and their international reputation in innovation and technology development. As for mainland China, the focus will be more on regional collaboration. Strategic planning, governance structure for Smart City development, supporting system to create a favorable environment and key policy applications from the cases will be discussed.

5.1. Construction of Smart City Development Foundation

5.1.1. Strategic planning for Smart City Development

**Singapore**

Singapore’s Smart Nation Initiative was officially announced by the Prime Minister in 2014. The most recent long-term strategic blueprint for Smart City development in Singapore will be the Intelligent Nation (iN2015) masterplan formulated in 2016 outlining the strategic infocomm development direction. Smart City development of Singapore focuses on better quality of life, as its vision speaks, “a Smart Nation where people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all” (PMO Singapore, 2014).

Initiatives and policies to achieve this vision are organized along three concepts (Figure 5.1) namely, innovation, integration and internationalization with four strategic thrusts (Figure 5.2) (iN2015, 2006). Singapore’s Smart City development emphasizes building a well-connected global nation powered by the use of infocomm in all social and economic spheres. As a result, accompanying the masterplan are 11 individual detailed reports in key economic and social sectors such as financial services and tourism, hospitality, government services and social development to further elaborate on the integration of ICT into key economic sectors (iN2015, 2006).
Barcelona
For Barcelona, Smart City Barcelona was initiated in 2011 by its mayor and three concepts have been established to define Smart Barcelona (Figure 5.3). The long-term vision of Smart City Barcelona is to transform the city into “a self-sufficient city, made of productive neighborhoods at human speed, inside hyper connected metropolis, of high speed and zero emissions inside a high-speed interconnected Metropolitan Area” (BCN Smart City, 2014). The pivot of Smart City development in Barcelona is to promote quality of life through city-wide application of technology, especially low-carbon technology application to create a zero-emission metropolis (Barcelona City Council, 2012). Smart City Barcelona development strictly follows five phases, which are starting phase, communication phase, planning phase, development of project phase as well as monitoring and evaluation phase (Mora, 2015). In terms of implementation, the focus is on international collaboration as initiatives are developed along three axis (Figure 5.4), which are international promotion, international collaboration and local projects (Mora, 2015).
As for PRD, the current direction for Smart City development lays emphasis on the socio-economic needs of the region, with efforts “to push forward regional integration in terms of broadband information and communication network, digitization of public services and infocomm infrastructure to make the region a world-class smart city cluster” (Government of Guangdong, 2014). The Smart City development process of PRD can be divided into two stages, starting with pilot projects followed by geographical expansion. The first stage is Pilot Cities (2010-2014).

In 2010, Internet of Things and cloud computing technology were developed and used in the industries of transportation, logistics, commerce and finance (Government of Guangdong, 2014). To accelerate the transformation of economic structure, Government of Guangdong put forward “Smart Guangdong” plan. Subsequently, the provincial government issued "Opinions on accelerating the development of Internet of things and development of Smart Guangdong" and "Promoting Internet of Things: Action plan to develop..."
smart Guangdong”, suggesting that smart application in key areas should be researched for a breakthrough (Government of Guangdong, 2014). Cities including Guangzhou, Foshan and Dongguan were designated as pilots to test Smart City applications (Government of Guangdong, 2014). The second stage is Smart Metropolitan Area (2014-2020). The long-term development vision of the Government of Guangdong is to develop PRD as a leading smart metropolitan region in the world. Development goals are, “to achieve regional integration in smart application in economic and social area by 2017” and “to transform PRD into a leading smart metropolitan area by 2020” (Government of Guangdong, 2014).

5.1.2. Governance Structure for Smart City Development

Singapore

The major characteristic of Singapore’s approach to Smart City development is a relatively top-down approach with political leaders at the Cabinet level formulating long term strategic plans, accompanied by a multi-agency approach in implementation (Wong and Singh, 2009). Such arrangement ensures Smart City development being an integral part of a larger economic development strategy and a concerted effort of different parties. The core government agents responsible for Smart City development in Singapore are Smart Nation Programme Office (SNPO) in the Prime Minister’s Office (PMO) and Infocomm Development Authority (iDA) under the Ministry of Information, Communications and The Arts (MICA). SNPO is responsible for consolidating the overall development of infrastructure, policies, ecosystem and technological capabilities necessary for Smart City development (PMO Singapore, 2014). On the other hand, iDA is responsible for implementation and supervision of the Smart City masterplan (iDA, 2016). Multiple stakeholders are involved in the management and implementation process from the fact that iN2015 Steering Committee comprises government departments, representatives from key economic sectors and infocomm industry leaders and this committee is formed under iDA to manage and implement projects in their respective scopes (iDA, 2016).

Barcelona

As for Barcelona, the approach is also top-down but with more citizen participation. The overall strategy is mapped out by City Council with dedicated teams formed for project planning and implementation led by Urban Habitat, a new organization formed directly under the city mayor. Government manpower from different departments of city development issues such as energy, urban services and infrastructures are drawn for Smart City project planning, management and implementation (Smart City Summit, 2012). This new organization is responsible for finding synergies among projects and ensure projects are aligned with long-term vision of Smart City development (EU-China Policy Dialogues Support Facility II, 2015). Barcelona encourages citizen participation for Smart City development of the city. More than 70,000
contributions have been made to the City Council regarding the formulation of the 4-year Municipal Action Plan for Smart City (EU-China Policy Dialogues Support Facility II, 2015).

**Pearl River Delta Region**

Smart City development in the PRD is a government-led process to a great extent. The provincial Economy and Information Technology Committee is responsible for overall organizational work. Its main responsibilities include: 1) to formulate the development plan for communication and information technology; 2) to promote the application of information technology; and 3) to promote cross industry and cross sector utilization, interchange and sharing of information resources (Government of Guangdong, 2014). Other major departments involved include the provincial Development and Reform Commission, provincial Department of Housing and Urban-Rural Development, provincial Information Centre and the municipal governments of the nine cities of PRD. Particular agent from the public or private sector will be involved in a specific field. For example, improving broadband network infrastructure involves the participation of telecommunications companies while the Department of Transportation plays a leading role in developing an integrated transportation (EU-China Policy Dialogues Support Facility II, 2015).

It is noted that the core essence of Smart City concept is that it is a city-wide transformation into a city with higher efficiency, better quality of life and more competitive economy. It is thus difficult for governments to do everything on their own. Both cases have demonstrated the importance of cross-sector collaboration in Smart City development. Singapore has demonstrated partnership with the private sector, researchers and industry experts. Public-Private Partnership (PPP) is commonly adopted by Singapore in the delivery of Smart City projects as private companies can contribute in terms of expertise and capital. As an example of Singapore, in partnership with government agencies, Panasonic is using Punggol Eco-Town to test and commercialize its Total Energy Solution. Partnership also happens in research and innovation field, the Land Transport Authority (LTA) of Singapore and Steria Asia Pte Ltd have signed a contract of collaboration to support Singapore Urban Transport Solution (STARS) initiative which aims to promote Singapore as a research center for urban transport solution (EDB, 2016). For Barcelona, it stresses highly on blending industry, academia and research sectors together to work on Smart City projects. For example, the Industry Ring projects allow government agents, industry, academia and research sectors to communicate with one another, unify their platforms and share resources in a safe environment and with the help of supercomputer and ultra-high-speed network (CPU, 2015). As for PRD, an example of PPP would be Qianhai in Shenzhen. It adopts a non-traditional PPP model where the government set up a joint venture with the telecom companies to collaboratively build and operate ICT
infrastructure of the city and co-share risks and rewards (EU-China Policy Dialogues Support Facility II, 2015).

5.1.3. Supporting Services for Smart City Development
A good Smart City development is one which provides enough supporting services to create a pro-business and pro-consumer environment for innovation. In other words, provision of a flexible regulatory framework and formulation of policies with an aim to address cyber privacy, security and digital divide, are important to allow innovation to flourish to make ICT accessible for all. Singapore, Barcelona and PRD have showcased some success in creating an environment conducive to development of Smart City.

In terms of a flexible regulatory framework, the current wave of start-ups presents a challenge to existing legal framework as to questions like whether companies other than regulated taxi companies should be operating taxis and whether non-banks should be running like banks to collect deposits (ISOC, 2014). In the case of PRD, the Minister of Transport announced in a recent meeting of the National People's Congress that innovative car-sharing service providers like Didi is supported by the government and relevant government departments while service providers should jointly draft safety regulations for car-sharing services. As for the Singapore government, the government begins to see their role as a promoter of new businesses other than a regulator (iDA, 2016). The Third-Party Taxi Booking Service Provider Act has been implemented in May 2015 to acknowledge third-party booking apps as a legitimate service and to support more customer services to be provided (LTA, 2015).

In terms of supporting services regarding cyber privacy and security and digital divide, in Singapore for example, Singapore Computer Emergency Response Team (SingCERT) has been established to respond to cyber security incidents and data privacy, iDA has been working to be compliant with Singapore’s data-protection legislation (iDA, 2016). With regard to programs to bridge digital divide, measures to bridge digital divide are organized in three categories, namely engaging the elderly, equipping the needy students and empowering the disabilities (iN2015, 2006). For instance, Silver Infocomm Initiatives have been launched to narrow the digital divide of the elderly by offering them training programmes in digital skills such as teaching them how to use mobile devices (iN2015, 2006). An example catering for the disabilities is the development of relevant assistive technologies, such as Internet-to-Braille conversion hardware and voice recognition software for the visually-impaired, to improve their lives and employability (iN2015, 2006).
5.3. Key Applications in Five Key Issues of Hong Kong

In this section, a summary of overseas policies and initiatives with reference to the five key issues in Hong Kong will be presented as follows.

5.3.1. Economic Transformation towards an Innovative & Sharing Economy

*Cultivate ICT Manpower*

To prepare for the change in economic landscape into a technology-based economy, ICT manpower development is crucial in talent cultivation and professional development. In Singapore, programs and initiatives have been launched to prepare students for the future infocomm workforce. For example, Infocomm Clubs Programme is a co-curricular activity targets at primary, secondary and junior college students in Singapore with the purpose of cultivating entrepreneurship capabilities and helping them to equip with the latest infocomm skills (iN2015, 2006). National Infocomm Scholarship (NIS) provides talented students with scholarship and internship opportunities in private sector so that student can chart their career paths according to their passion (iN2015, 2006). As for professional development, Tech Immersion and Placement (TIP) Programme provides professional training to convert non-ICT professionals into industry ready ICT professionals (iN2015, 2006).

*Facilitate Use of Integrated and Secure E-payment Platform to Promote E-commerce*

E-commerce has gained its popularity worldwide and to promote its adaptation for households and companies, sufficient data privacy protection and a high level of convenience are necessary. In Singapore, online transaction security has been boosted with the setup of the Public Key Infrastructure (PKI) Forum Singapore (iN2015, 2006). Despite the fact that PKI is recognized worldwide as the most secure platform for online transactions, the low adaptation rate prompts iDA to form a forum for industry and government to raise awareness of the benefits of PKI and to promote the interoperability and extensibility of applications using PKI for seamless application. To increase convenience in using e-payment platform, Alipay from the mainland develops itself into an integrated platform for both public services and retails. For example, students of any colleges in mainland can use Alipay to recharge their student cards in addition to booking travel package and movie tickets.

*Promote Innovative Sharing Mode of Transport*

To ride on the trend of sharing economy, Singapore government has taken the role as a promoter and supporter of sharing cars. Land Transport Authority of Singapore is working with The Singapore Economic Development Board and car-sharing operators to work towards a “car-lite” society which encourages a smart lifestyle that does not require one to own a car and the majority of the commute can be done by public transport (LTA, 2015). Various mobile
applications and websites are provided allowing travelers to be benefited from car-sharing. For example, Sharetransport.sg is a transport pooling website aims to gather people who live in the same building and work in the same location into shared transportation by car-pooling, taxi-pooling or bus-pooling. Users can easily find drivers and passengers at the website according to their preferences (LTA, 2015).

**Promote New Mode of Working**

Singaporean government has partnered with Regus to provide Smart Work Centers (SWC) (Figure 5.5) as another support to new working mode and increasing work mobility. These SWC are for all-intents-and-purposes co-working spaces, which come along with individual desks, thinkpods, meeting spaces, high-speed Wi-Fi, video-conferencing services as well as printing and copying facilities (iDA, 2016). SWC are strategically located in regional libraries within major residential hubs. The locational benefits of SWC include easy-access to library resources, and close-proximity to residential homes.

![Figure 5.5: Smart Work Centre at Jurong Regional Library, Singapore](Photo:ST)

**Drive Innovation and Entrepreneurship**

As for boosting research and development (R&D), three cases have demonstrated efforts. A national R&D framework is outlined in one of the supporting documents of iN2015 in Singapore with an aim to transform Singapore economy into a research-driven knowledge-based economy (iDA, 2016). Different R&D agenda have been set with regard to different key economic sectors. For example, an agenda is set on new technologies and models for using infocomm in Education and Learning (iDA, 2006). Furthermore, in Singapore, most co-working spaces are largely subsidized by the government and they are located close to downtown area to provide convenience (oddup, 2016). Barcelona, winning iCapital 2014 Award for its
innovation capacity, creates a friendly ecosystem for innovators. Initiatives can be categorized into four aspects, including events and meetups for start-ups to network, diverse co-working space, incubator and accelerator programs for financing and free advices, such as Barcelona Activa, providing free resources to help entrepreneurs turn their business ideas into reality (sturtus, 2016). The promotion of innovation in Barcelona focuses on synergy effect between private sector, research institutions, the academia and public sector through the establishment of Smart City Campus, Spark Lab and Industry Ring. For example, the Industry Ring provides a trusted internet connection for government agents, industry experts, the academia and the research sectors to collaborate and communicate with each other. This project also links up their systems and allows sharing of resources in a safe environment with the help of shared facilities such as supercomputer and high-speed network (CPU, 2015).

5.3.2. Rising Expectation on Quality of Life

Distance Healthcare Support

With the advance in technology and the widespread use of the Internet of Things (IoT), traditional healthcare services can be carried out outside hospitals. An example would be the Radars Project in Barcelona enabling the elderly aged over 75 years old to live at home while enjoying regular health consultation (BCN Smart City, 2014). Volunteers of the project make periodic companionship call to participated elders to collect updated information about their health condition so that Social Service Center can follow up and give timely response to people with abnormal conditions. Another example would be Tele-rehabilitation (Figure 5.6), showcased in The Information & Communications Technology Experience Centre (IExperience) which allows patients to do rehab exercise at home comfortably with “live” guidance from physiotherapists at the hospital (iDA, 2016). Patients can also do videoconference with physiotherapists and receive feedback to facilitate recovery.
E-platforms for Entertainment Experience Enrichment

The application of technology in leisure stimulates tourism and entertainment through enhancing entertainment experience. In Barcelona, BCN Contactless is a mobile application which offers people information and position of their surrounding facilities, services and current activities at a precise location and time. This encourages positive usage of entertainment facilities (BCN Smart City, 2014). In Singapore, the government has developed a Digital Concierge (DC) for visitors which is a mobile e-platform run by both tourism and retail businesses that provide personalized concierge services for visitor to analyze and anticipate visitors’ needs and preferences in sightseeing, shopping, dining, etc (iDA, 2016).

Intelligent Transport System

Singapore has implemented a range of Intelligent Transport Systems (ITS) infrastructure to provide innovative and efficient solutions and services for travellers. The heart of ITS is the ITS Centre which collects data from ITS infrastructures and allows transmission of real-time traffic information through LTA data portal and electronic message signs. Examples of ITS infrastructures include Expressway Monitoring Advisory System (EMAS), Electronic Road Pricing (ERP) and Green Man + (LTA, 2015). Green Man +, in particular, is a measure designed for the elderly and Persons With Disabilities (PWD) by giving them more green time to cross the road safely. Similar intelligent traffic signal control system can also be found in Barcelona.

High Quality Transport Information Delivery and Dynamic Processing of Big Data

As for traffic and transportation information management, in terms of parking information management, LTA in Singapore has set up Parking Guidance System (PGS) in 2008 to provide real-time parking lots availability information
for drivers, so that they can make informed choices regarding parking locations (LTA, 2015). This minimizes the amount of circulating traffic looking for available parking spaces in a particular area. For public transport information delivery, Smartquesina is a device installed in each bus station in Barcelona for enhancement in the availability and clarity of real-time bus information such as bus frequency and operation situation (LTA, 2015). Orthogonal Bus Network (Figure 5.7) in Barcelona is a bus route network which forms a pattern of vertical, horizontal and diagonal lines according to traffic demands predicted from big data (BCN Smart City, 2014). This system improves connectivity between different means of transportation and increases accessibility to metro station and bus stops. Beeline is Singapore’s first crowd-sourced bus service platform, developed by the iDA and the Land Transport Authority (LTA), collaborating with private bus operators, such as Bus-Plus, to allow users to pre-book bus services which routes are generated by analyzing historical travel patterns and crowd-sourced suggestions on the Beeline website (LTA, 2015).

5.3.3. Greater Emphasis on Environmental Stewardship

*Experimental Blocks to Promote Sustainable Living Environment*

Both Singapore and Barcelona have experimental blocks dedicated as a pilot for researches and further implementation of smart city technologies in a bid to create a sustainable living environment. The Housing and Development Board in Singapore has initiated a pilot scheme of smart buildings called HDB Greenprint (figure 5.7) in Jurong as the testing point (HDB, 2016). Blocks in the estates will be transformed into green buildings using smart technologies such as solar panels, sensor-controlled LED lightings, Elevated Energy Regeneration System (EERS), Rainwater Harvesting System (RWHS) and the
Pneumatic Waste Conveyance System (PWCS). The EERS regenerates potential energy generated during lift descending and ascending, and then converts it into electricity for powering up different functions within the lift such as lightings while PWCS makes use of underground pipe network to collect household waste. Super block project and 22@Barcelona in Barcelona have designated blocks in the city for integrated planning for a more livable environment (BCN Smart City, 2014). Smart technologies such as charging facilities for electric vehicles, smart rubbish collection points, provision of more greeneries and community facilities, smart car parks and water conservation schemes are implemented (BCN Smart City, 2014).

Figure 5.8: HDB Greenprint Project in Singapore

Interconnected Sensor System for Energy and Water Management
Barcelona has adopted Smart Grid, making use of digital and remote sensing technology to connect power plant, renewable energy facilities, power grid and users, so that users' electricity consumption can be monitored, maintained and adjusted automatically (BCN Smart City, 2014). Besides, Hot and Cold Network, as a central air-conditioning network, has been implemented in various areas of Barcelona, for cooling or warming buildings in the region (CPU, 2015). This allows a building's internal temperature to be adjusted according to environmental temperature. Telemanaging irrigation is an automated and remote-controlling irrigation system for irrigating Barcelona’s green space with sensors put in the ground for detection of soil moisture (BCN Smart City, 2014). Singapore has established the WaterWiSe (Water Wireless Sentinel at Singapore) project in 2008 to manage water leakage from old pipes by installation of sensor-network-based infrastructure for continuous and accurate monitoring purpose (iN2015, 2006).

Promote Green Mobility
Travel Smart Program is a measure by the LTA to partner with organizations to reduce the demand for peak hour travel and encourage the use of
sustainable transportation alternatives such as cycling and walking. For example, Travel Smart Grant co-fund Travel Smart measures carried out by organizations such as flex-travel policies and installation of bicycle parking facilities (LTA, 2016). A Smart Pathway System has been launched in Barcelona to encourage school children walk to and from school in a safe environment by organizing dedicated routes and setting safety-keeping facilities such as monitors and guardrails (BCN Smart City, 2014). Measures has been taken by Barcelona to promote use of electric vehicles. For example, a Public Car Sharing System in which cars are all in electric mode is promoted. In terms of ancillary facilities, 300 free charging points and 180 additional parking locations have been provided to address the issue of insufficient charging and parking facilities for electric cars (BCN Smart City, 2014).

5.3.4. Demand on Higher Efficiency & Transparency of Governance

Citizen Participation E-platform
All cases have capitalized on the use of technology to encourage citizen participation in municipal issues so as to co-create greater social and economic values. For example, In Barcelona, BUITS Plan (Urban Spaces with Territorial and Social Involvement) encourages suggestions for making temporary use of idled urban sites (BCN Smart City, 2014). Citizens are encouraged to propose an unused site which has no provision for short-term development, and suggest its potential use on the platform. eCitizen Ideas! (Figure 5.9) in Singapore is a crowdsourcing portal which allows the public to contribute creative ideas and solutions for a better nation by gathering different crowdsourcing activities organized by different public agencies (iDA, 2016). The Singaporean government has also created e-engagement platform to facilitate active public consultation and open governance. REACH portal is used to gather public concerns, reaching out to Singaporeans through both traditional and online channels such as SMS, forum and Facebook to engage Singaporeans on issues and concerns and finally encourage active involvement in public policies formulation (iDA, 2016).
Data Standardization and Open Data
For Smart City development, openness and standardization in data is important as it can promote information sharing among government departments to enhance government capacity and synergy, as well as opening up government information to public for greater value creation. The Singapore government has also developed a government platform (data.gov.sg) to provide easy data mining and access to government datasets (IDA, 2016). This allows interested parties to use the data for research and analysis, or product development. An example in planning will be Conservation Portal which allows the public to get access to information on built heritage and share personal stories and images (URA, 2016). For PRD, data operating system has been constructed as well. For example, the open data platform constructed by the government of Nansha, Guangzhou allows citizens to upload and download data to use (EU-China Policy Dialogues Support Facility II, 2015). Also, it allows them to easily purchase dataset regarding hydrology, public facilities, to mention but a few.

Establishment of Centralized Spatial Data Infrastructure (SDI) for Urban Planning
A comprehensive and centralized Spatial Data Infrastructure (SDI) builds up government’s capability to coordinate spatial and temporal conflicts of various types of planning and facilitates scientific decision making in planning. In
addition, it also empowers planning as a public activity by sharing data. In Barcelona, SDI is built upon three technological layers, namely the city’s sensor platform called Sentilo, which unites sensor data; second, the technology architecture layer, called City OS, which aggregates and analyzes data collected from different locations; and third, the urban platform, which shares the data provided by the City OS within city government and with the public and private sectors (BCN Smart City, 2014). In Singapore, a Smart Integrated Planning Approach has been adopted to incorporate different spatial analytical tools to process and analyze data across five steps, namely, Data, Visualization, Collaboration, Make Sense to Test Options (SLA, 2011). Specifically, GeoSpace is the cloud-based spatial data infrastructure used by different government agencies for both data supply and usage (SLA, 2011). Aligned data enables Urban Renewal Authority to be cost-effective in data collection in any preliminary planning investigation stage for both Concept Plan and Master Plan. In the mainland, geographic information has been replaced by time-spatial information. Cities in the PRD which are pilot cities are instructed to follow “Technical Guidance for Establishing the Time-Spatial Information Cloud Platform for Smart City Development” to establish a “China Spatial Information Network” for further data processing on a cloud station so that data can be used in urban planning (EU-China Policy Dialogues Support Facility II, 2015).

5.3.5. Increasing Collaboration with Mainland China
Collaboration and networking with other cities or countries are important for Smart City development as this allows pooling of resources and expertise, as well as exchanging knowledge. Barcelona government works closely with international cities, especially European ones by joining city networks and participating in European projects (BCN Smart City, 2014). For example, by taking part in Evolutive User-centric Networks for Intraurban Accessibility (EUNOIA), Barcelona jointly conducts research on Smart mobility policies with other European cities (BCN Smart City, 2014). In PRD, Qianhai Administration has entrusted Jiansu Posts & Telecommunications Planning and Designing Institute and China Academy of Telecommunication Research of MIIT to cooperate in formulating the feasibility report and implementation proposal for the joint construction and sharing of infrastructure for smart Qianhai (EU-China Policy Dialogues Support Facility II, 2015). Another example will be CitySDK, which is an open source infrastructure promoting development of new services and applications by standardizing application programming interfaces (APIs) across cities (SDK, 2016). By taking part in the project, Barcelona exchanges know-how and information easily on shared specs with other cities. In mainland China, partnership has been established between mainland China and overseas cities and companies. For instance, since 2001 Guangzhou has signed a twinning agreement with Bristol in the field of Smart City development (Government of Guangdong, 2016). Cross-border service platform has been created to provide services for people in different cities as well as people traveling across cities. WeChat City Services is a good example. Take
Guangzhou as an example, this service allows citizens in Guangzhou to buy cross-city bus tickets, recharging their transport cards online and obtaining traffic flow information.
6. Relevance of International Experiences

6.1. Construction of Smart City Development Foundation

6.1.1. Strategic Planning and Coordination

Portraying a clear long-term vision of a city and ensuring a good coordination among different departments set the backdrop of Smart City development. City Government, being the representative of the public, should take up this role to steer Smart City development. For instance, Singapore Government has developed Smart Nation vision at the cabinet level, setting up Smart Nation Programme Office (SNPO) to oversee policy formulation process of Smart City. Following the stage of policy formulation stage will be to delegate Infocomm Development Authority of Singapore (IDA) to coordinate and manage the implementation process. By concentrating all relevant resources to a central organization and empowering the organization to allocate resources and manage the development effectively, can boost the efficiency in implementation of Smart City development.

In Hong Kong, the development of Smart City is at its primary stage, at which the intention of developing Smart City had not been mentioned until the 2015 Policy Address. Hence, more efforts and time are required for the government to develop a clear long-term Smart City vision for the city. Interviewee I also commented that the Government is lacking political will and focus to transform Hong Kong into a Smart City. Furthermore, a cross-department task force and a better planning system should be adopted in order to strengthen the coordination among government departments, for the sake of better coordination and management of resources, implementation of the development, similar views are shared by interviewee C and interviewee D.

6.1.2. Supporting Services for Smart City Development

Supporting services in the three aforementioned regions have been cultivated through various means which can be summarised as flexible regulatory framework, digital inclusiveness and a trustworthy security system.

Late Peter Hall named Hong Kong as an Enterprise City, in which ICT sector may experience differently from the financial and service sectors. Inflexibility in the current regulatory system may prevent Hong Kong from accommodating new and innovative ideas. Uber is a good example to illustrate that the existing regulatory framework is not responsive enough to new trends. Interviewee F and interviewee I both agreed that the Government has to review the existing regulations. In order to support the development of Smart City, the Government has to take the initiative to strike a balance between new trends and archaic regulations.

Digital inclusiveness also matters in Smart City in a way that the problem of digital divide can be eliminated to a large extent. When it comes to digital divide,
issue of affordability and citizens’ readiness are of great importance. For the former, ICT services are offered at affordable prices in Hong Kong, with the Government and Non Governmental Organizations (NGOs) providing subsidies and in-kind supports to the needy. As suggested by interviewee A, affordable ICT devices and services in Hong Kong enable citizens to be granted access to ICT services in an affordable manner. Hence, the challenge to realize a digital inclusive city lies not in the issue of affordability but in citizens’ readiness.

As for citizens’ readiness, despite a safe system, citizens should be ready and capable of utilizing ICT services. Barcelona and Singapore educate citizens particularly the elderly in basic technology knowledge through organizing community courses and providing volunteers for visiting services so as to enhance their ability and willingness in using smart facilities. With a view to widely introducing the development of Smart City, Hong Kong Government has to educate and equip the citizens, especially the elderly and children, with the necessary skill-sets and mind-sets to utilize the smart services and technologies.

Constructing a trustworthy security system by the Government and private companies to ensure the safety of personal data, will be another workable suggestion to bolster digital indecisiveness. Hong Kong Government can learn from Singapore in terms of its National Authentication Framework which enhances the security of online transaction via a nationwide platform. For private e-services providers, Alipay is a vivid example of developing an Advanced Secure Sockets Layer (SSL) technology to protect their users and to protect every transaction on their platform. With such government monitor system and advanced technology, citizens’ trusts in using online services can be enhanced and this can facilitate the future development of Smart City.

6.1.3. Multi-stakeholder Approach for Smart City Development

Overseas experiences illustrate that partnership with private sectors can effectively accelerate the exchange of ideas, constructive communication of Smart City experience and technologies, and expansion of local smart industry. The Public-Private Partnership model has been widely adopted in the development of Smart City in order to concentrate all the expertise and resources to strengthen the development. For instance, Municipal government of Shenzhen signed a strategic cooperation agreement with Tencent Inc in June 2015 on developing Smart City. Meanwhile, the Singapore LTA has cooperated with the Sopra Steria Singapore to develop Singapore Urban Transport Solution (STARS).

Currently, Smart City Consortium has been founded in Hong Kong, but more concrete collaboration and plans are needed for future development. The consortium not only can work as a platform for different stakeholders to share
their experiences and exchange new ideas, but also owns the potential to assist the government in the coordination of the Smart City Development in Hong Kong. Apart from the consortium, the Government can also develop Smart City Infrastructure Projects based on the existing Public-Private Partnership model so as to fully utilize different resources and expertise in public and private sectors in support of the development.

6.2. Application of Smart City Strategies

6.2.1. Economy

Research and development (R&D), talent cultivation and infocomm industry development are main pillars to support the development of Smart Economy. For example, Barcelona and PRD have developed R&D platforms as a solid foundation for innovation and technology progress. Furthermore, Shenzhen has almost 90% R&D funds coming from the private sectors which can create an encouraging environment for innovation. Nurturing infocomm manpower helps propel the development of the infocomm industry, as demonstrated in Singapore and PRD. The Government has to provide more resources and support to R&D, talent cultivation and infocomm industry development. Currently, Hong Kong has insufficient R&D funds and a lack of opportunity in infocomm industry. Interviewee C, with his experience in supervising start-ups, has commented that there is a lack of well-defined funding in Hong Kong and some of the existing funding restrictions are too demanding for new startups. For instance, there is a limitation on the marketing budget of the startups which is in fact a critical factor in the brand building work in the early stage. Such limitation will hinder innovation development. Hence, the government has to take more initiatives and review the existing funding framework to enhance the innovative environment. Hence, the government should take the initiative to enhance the innovative environment.

The development of new consumption modes has brought convenience to customers while new payment methods make shopping much easier than before, which can facilitate online shopping development as well as the commercial land use pattern. Regarding the development of e-commerce in Hong Kong, it is not as rapid as China. A lack of trust in financial technology is one of the reasons. Furthermore, existing regulations and privacy matter should be taken into consideration. As interviewee C commented, FinTech (Financial Technology) is very popular in mainland, like TaoBao, Alipay and WeChat Payment, but Hong Kong people do not fully trust financial technology. In addition, interviewee B commented that, with his previous experience in Octopus Card Limited, financial regulations can ensure the quality of the development of e-commerce in Hong Kong, but they also account for the slow development. This will be a hurdle for the Government to bring convenience to citizens’ urban experience and, meanwhile, guarantee security and confidentiality.
With regard to shared mode of transport, Singapore has developed car-sharing platforms, striving to use shared vehicles to connect public transport nodes. Car sharing and taxi-pooling can also improve the traffic condition by diminishing the number of cars on street. Nonetheless, the two initiatives may increase illegal on-street parking at the same time. As illustrated in the case of Uber in Hong Kong, a viewpoint raised by interviewee B, Uber is one of the major sources of illegal parking. Bus operators, as Mr. Jain elaborated, have been suffering from on-street illegal parking so one possible suggestion will be the Government adopting smart enforcement strategy by installing camera devices in prevention of illegal parking at bus stops and to smoothen existing traffic flow.

6.2.2. Social

Social is one of the important elements of Smart City. Smart initiatives can help citizens maintain physical and mental well-being. Using ICT technology and location-information can be a powerful tool to facilitate citizens for better utilization in transportation, sport facilities and open space for exercises and social interactions.

Public transport is a major source of transport resources and a unified data platform can help both the service operators and users make better decisions on services allocation and the use of transport modes. Singapore’s public transport system provides accurate real-time transport information in arrival time, available seat numbers and platform information to passengers. Besides, Singapore Bus Service (SBS), a national company, is going to introduce interactive bus stops that not only provide basic bus travel information, but also allow passengers to enquire about their journeys with the Intelligent Route Information System (iris).

However, smart mobility initiatives such as unified data platform and interactive bus stops, are difficult to be implemented in Hong Kong at present. Interviewee B once commented that there is no industrial standard of data nor incentives for KMB, as a private company, to share its data with its market competitors. He further elaborated that most of the bus stops are shared by multiple bus services providers and KMB only has limited control on 1/4 of its bus stops, which is the greatest obstacle for KMB to take the initiative to introduce interactive bus stops in Hong Kong. Transport service providers in Hong Kong, including KMB, City Bus, Tram and MTR, have been proactively making use of their own data to optimize utilization rate of their own services. Nevertheless, there is a lack of incentives and concerted efforts to expand this better utilization strategy to the whole transport system. As suggested by interviewee D, Government can change the franchise conditions in the future and require the service providers to disclose their data for public usages.
In addition to better utilization of transportation, mobile applications in Barcelona presenting people's interests and showing public activities, facilities and surrounding persons that they might be interested in, can stimulate positive social interactions. In Hong Kong, most of the people living in gated communities do not trust others and the bond between neighbors in those communities are weak, a remark made by interviewee C. Interviewee G also added that Hong Kong people have insufficient awareness towards public space due to the fact that they seldom utilize public space for social interaction. Recently, location-information sharing feature applications have gained increasing popularity. Social media, such as Facebook, Whatsapp and Instagram, have taken advantage of this feature to attract users to interact with their friends by sharing locations of public and private events. People are encouraged to use nearby sports and recreation facilities for exercises and social events, which can facilitate physical and mental development of citizens. Similarly, interviewee A also holds the same perspective. Through this type of interaction, locals and even tourists can capitalize on this feature to explore city life and different events happening in Hong Kong.

6.2.3. Environment
Environmental sustainability can be achieved in the forms of energy efficiency, waste management as well as green mobility. For energy efficiency, it is not only pertinent to hardware but also open data, which can lead to behavioral changes of residents. In Hong Kong, people can get access to their bills, but they have low awareness to and insufficient information on their resource consumption patterns. In this respect, smart devices can help users understand their consumption patterns better, making informed and rational decisions. Interviewee H goes along with this viewpoint, stating that Hong Kong can learn from the overseas in sharing information and data. In regard to reduction in daily resource consumption, both smart devices and strategies on open data have to be upgraded in order to facilitate changes in resource consumption patterns. Smart City Strategies can help citizens make informed decisions, but hardware should also be upgraded to support positive changes.

Moreover, green transport can be promoted by introducing a unified platform to share the location of electric-car-charging points and other related information to make the use of electric car more convenient and user-friendly. Smart technology can also facilitate pedestrian flow and encourage walking by creating a safe and interesting pedestrian environment. Surveillance system can be installed to ensure safety of the pedestrian. Meanwhile, the use of mobile application can make walking interesting. As interviewee C shared that there is a mobile applications showing the location of alleys decorated with
beautiful graffiti. This smart initiative can encourage people to walk and better utilize these underused alleys.

6.2.4. **Governance**

Governance capability can be enhanced through Smart City Strategies in terms of centralized spatial data infrastructure, citizen e-platform and open data. These strategies not only can improve government decision-making process by organizing the government’s data in a better manner, but also strengthen the communication between government and citizen via new types of communication platforms and social media.

In the matter of existing planning and decision-making process, interviewee D mentioned that there is a lack of common standard of government data and it has hindered the cooperation among different departments in policy making process. Hence, standardized information can reduce the obstacle of departmental communication and encourage more cooperation. In addition, a shared information platform can also alleviate the information asymmetry between the government and citizen. For instance, the Town Planning Board (TPB) can share the non-confidential project information with the public via an online platform and this can help citizen express their views in a concrete and constructive manner by using accurate data provided by TPB to support their arguments.

6.2.5. **Cross-boundary Collaboration**

Cross-boundary collaboration of Smart City development can strengthen the connection between Hong Kong and different parts of the world as well as the competitiveness of Hong Kong. Based on the established ties and geographical constraints, collaboration with China is much more favorable for pilot schemes and the other possibilities of collaboration can be further explored in the future.

Regarding the collaboration with China, in the short term, Hong Kong can cooperate with different stakeholders in Smart City development by exchanging ideas and experiences with different sectors and cities. For instance, Hong Kong has been performing quite well in online security and electronic safety aspects. Meanwhile, the Government can learn from the PRD with its enhancement on innovative environment and improve the situation in Hong Kong. In the long run, Hong Kong and PRD can cooperate in the form of integration of ICT infrastructure development and application. For these collaborations, a set of common standards may also be needed in order to facilitate the integration, as interviewee A recommended that ISO standards of Smart City can be one of the possible common standards.
Section IV  Strategy Formulation and Recommendation for Hong Kong

Chapter 7: Vision and Strategies
Chapter 8: Initiatives and Policies
Chapter 9: Operating Mechanism
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Section IV Strategy Formulation and Recommendation for Hong Kong

7. Smart City Vision and Strategies

7.1. Envision the Future
A vision provides a roadmap to the future while planning helps aspirations transform into reality. Hailed as The Pearl of the Orient, Hong Kong has been excelling in various domains. To maintain its status as Asia’s World City, Hong Kong should not be complacent with its current position but should make continuous endeavours to pursue a better future.

7.2. Vision
Taking into account Hong Kong’s current development foundation together with future trends and needs of Hong Kong, a long-term vision for planning and developing Hong Kong as a Smart City is established as “To envision Hong Kong to be People first, Technology-based Smart City to boost innovation, city liveability and competitiveness.”

Associated spatial policies and strategies will be proposed for inputting into the current review of strategic planning under HK2030+.

7.3. Strategies
Recommendations function as stepping stones for Hong Kong to reach Smart City. It is hoped that Hong Kong can ride the waves of opportunities to develop itself into a Smart City. Five strategies, CYBER, which have been formulated for the sake of realising Smart City development in Hong Kong, are listed as follows.

1. *C*ommit to Efficient Urban Management via Data Consolidation and Dissemination
This strategy, concerning the Government, is to optimize the use of spatial planning data of the city together with enhancing data openness, so as to raise the quality of government services and facilitate decision-making process.

2. *Y*ield a Digital Inclusive and Liveable Society
This strategy, regarding the social aspect, mainly at the community level, is to respond to possible social needs arising in the midst of Smart City development, strengthening the accessibility of public services.

3. *B*ridge Stakeholders for Regional Collaboration and Cooperation
This strategy, relating to regional collaboration, is to ride the waves of opportunities brought about by the opening up of China and increasing cooperation with the mainland.

4. *E*-stablish an Innovative Economy to Sustain Economic Vitality

This strategy, considering the economic aspect, is to promote a pro-innovation ecosystem which in turns drive diversification in the economy.

5. *R*-ecognize Environmental Issues and Endeavour towards a Green City

This strategy, in regard to the environment, is to capitalize on advanced ICT for real-time monitoring of the environment so as to address resource allocation and environmental protection in a concise manner.
8. Smart City Initiatives and Policies
As the old saying goes, actions speak louder than words. A vision without concrete initiatives and policies can never be realised. In this chapter, recommendations corresponding to each strategy are suggested for Hong Kong Government to put forward in pursuing Smart City, details of which are explained as follows.

8.1. Strategy 1 Commit to Efficient Urban Management via Data Consolidation and Dissemination

8.1.1. Establish a One-stop Cross-departmental Data Sharing Platform for Government Management
To prevent information silo among government bureaux and departments, a data sharing platform should be established.

At present, Lands Department, Civil Engineering and Development Department and Development Bureau, for instance, have their own GIS systems but they are not connected. Hence, when assessing a site during land development process, for instance, private or public developers have to gather related information from various departments and do comparison to see which data can better be applied to the current situation.

A data sharing platform is therefore needed to achieve better management of data and eliminate duplication of data amongst departments so as to deliver services in a more efficient manner.

One example will be on planning. Having a communal data platform, expanding the decision-making body on city construction can be expanded through a better integration between various government departments in planning matters.

Given that data from different government departments are shared through the platform, Planning Department can easily get access to relevant data when preparing planning works. Such platform can also encourage interaction between departments so that departments other than Planning Department can also contribute to city planning.

Overall speaking, having a shared data platform can prevent redundant work on the same issue or on areas currently lacking administration. All these can strengthen the efficiency in urban management.

8.1.2. Promulgate a Collaborative Planning Platform for Citizen Participation
In hopes of further enhancing the responsiveness to urban issues in planning system, a collaborative planning platform can be implemented to encourage citizen-friendly public participation.

Currently, public participation in planning is manifested in the forms of public consultation, workshops, District Urban Renewal Forum, to name but a few.

Leveraging on Smart tools such as GeoPlanner and CityEngine, the Government can collect and analyse public opinions more effectively, particularly public views on Smart City development whereas citizens can make informed comments on planning proposals.

GeoPlanner is an example to illustrate that with sufficient and easy-to-be-accessed data provided, citizen co-creation can cultivate constructive solutions to urban challenges. By managing a complete planning process in a single web app and enable collaboration among citizens, participants can get access to visualisation of plans and compare planning alternatives from anywhere using mobile devices (Esri, 2015).

Such collaborative platform can free the public from temporal and spatial constraints imposed to public consultation or forum held in a particular place at a particular time while on the other hand, motivating active citizen participation in city planning.

8.1.3. Advocate an Agile Transport System through a Traffic Control Centre Platform

To ensure a timely and efficient traffic arrangement, a central traffic control centre platform should be constructed.

Process involved can be summarised as collect – analyse – disseminate. Whenever emergency occurs, respective traffic arrangement can be done through the platform.

Capitalising on traffic information collection devices or infrastructure such as sensors and traffic monitoring system, real-time traffic information can be obtained. Subsequent to centralising and processing data, the data can then be utilized to identify patterns, define problems, and make decisions.

For example, traffic can be better regulated due to large data concerning real time congestion level by street and preferred or alternative GPS routes. In case of traffic accidents, it also used to map the damage in transportation networks and to access information about alternative routes and zones (Smart 2020 Tokyo).
Once abnormal activities appear, the government can respond to in a spontaneous manner. For instance, sensors can detect where defects in roads are by measuring the vibrations made by vehicles with sensors. The information can therefore contribute to an efficient traffic management within the city.

As for dissemination of traffic information, smart facilities can be installed at applicable location for showcasing real-time traffic information, with LED variable message signs being one of the examples.

LED variable message signs, also known as electronic display, are flexible in publishing information. Information such as traffic conditions of bridges can be released to the drivers in time, so that the drivers can choose the best route so as to avoid the congestion stress whenever traffic accidents happen.

Real-time parking information and road traffic information can also be released. A unified platform sharing real-time parking information and road traffic information can help Hong Kong to improve traffic situation by minimizing circulating traffic and traffic congestion.

8.2. **Strategy 2 Yield a Digital Inclusive and Liveable Society**

8.2.1. **Provide Education to Bridge Digital Divide**

Smart City development should be reachable to all. One major obstacle in achieving a digital inclusive society is digital divide. Hence, promoting ICT education for all is of paramount importance.

Senior citizens may be interested in keeping up-to-date with ICT, since some of them are still part of the workforce.

In addition to the specific learning needs of citizens, it is crucial to notify citizens, the old in particular, of other learning needs they may not know about but which are perceived as significant from the perspective of society. Capitalizing on information on resources and services which contributes to their independence and quality of life should be acquired.

To facilitate education programmes catered for citizens who are interested in keeping abreast of technology advancement, learning space for formal and informal learning is necessary.

Learning space for formal and informal learning, including e-learning and technology support) is an instance. Such learning space, community centre for example, can provide support for ICT learning, especially to those who are not confident about their ICT skills or about to learn new things.
8.2.2. **Enhance Community Vitality and Inclusion**

Striking a balance between work and leisure is conducive to people’s everyday life. As a result, it is crucial to promote an active lifestyle at community level.

One suggestion is locating point of interests (POI) related to leisure and recreation within the community, which can be done through crowdsourced mapping.

Locations of sports facilities, cultural events and community facilities can be mapped so that people can be aware of the nearest parks, football fields, or cultural nodes. This encourages positive usage of urban facilities for recreation. This service is the result of stationing hundreds of access points distributed throughout the city. People can connect the points through their mobile devices and meet their entertainment needs immediately.

POI can be classified into 18 districts in Hong Kong so that people who are not familiar with certain districts can also be informed leisure and recreation facilities, which in turns helps to minimize under-utilization of public facilities and boost vitality in districts.

An initiative on All-in-one Community Services can be launched to foster convenience in living environment.

To strive for a better living environment for the citizens, community management can be more user-friendly through the adoption of smart technology.

To this end, a centralized data platform for property management, integrating car-parking, CCTV monitoring, escalator management, security patrol services, automatic sprinkling system etc can be established.

On one hand, information on community events or updates on community services can be disseminated via mobile application so that residents can be reminded of what is happening in the community. For instance, community events such as item exchange can be promoted through the app. A sense of belongings can therefore be strengthened within the community.

On the other hand, if residents have spotted any public facilities that are in need of repair, or any places where trash are yet to be collected, residents can simply take a picture of the situation, adding a few lines for explanation and send them to the corresponding department or mobile community management client. Two days at most the problem will be tackled. In this way, residents can have a say in improving their living environment.
8.2.3. **Promote Shared Modes of Transport to Provide More Options to the Citizens**

Government can take the initiative to negotiate with sharing transport companies and to revise the existing safety regulation in the hope of lifting up quality of life by facilitating innovative ideas.

Uber is one example. To promote such sharing mode of transport, existing regulation can be revised. In order to minimize the side effect brought by Uber, illegal parking for instance, smart technology can be applied to step up the enforcement to combat illegal road occupation/to mitigate possible adverse effects.

Illegal parking detection system, which relies mainly on its image analysis function, is used to detect and tackle illegally parked vehicles which affect the normal flow of traffic. The police can issue Fixed Penalty Tickets according to the information provided by the system and the actual traffic situation. Tickets will be sent to car owners via mail.

8.2.4. **Achieve Active and Healthy Ageing**

The proportion of elderly population aged 65 or above will increase from 15%, or 1.07 million, in 2014 to 36%, or 2.58 million, in 2064 (2016 Policy Address). With an attempt to build an age-friendly city, it is of vital importance to pay heed to the needs of the elderly.

In line with healthy ageing advocated by the Government, mandatory remote health sensing system installation in newly-built public housing can be implemented to encourage telehealth caring or rehabilitation.

To better locate ageing population and facilitate planning for ageing-related land use, GIS can show commuting patterns and the locations where the old people live, help the Government to decide on where to allocate services such as pharmacies and healthcare centres.

With the expanding ageing population, healthcare centres catering for the seniors will be in greater demand than before. Thus, in the long run, land use specifically designated in relation to ageing phenomenon may be needed since the area of land used will be large.

For elderly to stay active, the Government can continue to promote wider adoption of barrier-free website design to facilitate browsing and use of online information and services by members of the public, enabling the elderly to lead a fulfilling life.

8.3. **Strategy 3 Bridge Stakeholders for Regional Collaboration and Cooperation**
8.3.1. **Capitalize on Market Opportunities in mainland China**

Taking advantage of Guangdong-Hong Kong-Macau Big Bay Area revealed under one-belt-one-road Initiative in 13th 5-Year Plan, Hong Kong can foster the development of innovation industry.

Science Park and Industrial Estates to be developed near the Liantang / Heung Yuen Wai Boundary Control Point will further open a window of opportunity in terms of forging closer ties and cooperation with the mainland.

Mutual benefits can be gained: On one hand, meet the needs in demand for sites or scientific research and new industrial use. On the other hand, attract business opportunities or capital injection for innovators in Hong Kong.

By introducing high-end services into mainland market, more room can be provided for ICT talents and a bigger market for innovative products allows the fruit of innovation to continue to grow. Thus, Hong Kong enterprises have strong complementarity with China.

8.3.2. **Optimize Cross-border Travel Experience**

To strengthen travel experience for cross-border travellers between Mainland and Hong Kong, smart technology can be deployed to optimize convenience and efficiency for cross-border travel.

A travel app containing traffic information such as arrival, departure time and forward journey time for cross-border buses and subways can be launched so that travellers can make better time arrangement when crossing the border.

Another recommendation will be to provide a dual-currency Octopus card in order to bring about a more convenient shopping experience for cross-border consumers. Further studies should be conducted with Octopus Cards Limited to investigate into the possibility.

8.3.3. **Emphasize Exchange of Know-how with mainland China**

Knowledge exchange performs as a catalyst in technological advancement and breakthroughs. Therefore, the Government should ride on already available cooperation opportunities such as 16 Partner State Key Laboratories and Chinese National Engineering Research Centres (CNERCs), to continue seeking knowledge exchange with the Mainland in a proactive manner.

Exchange of knowledge in ICT can be realised in various forms, ranging from tech expo, innovation summit to academic forums or seminars. More efforts should be inputted into infrastructure construction such as convention centres required for aforementioned events, galleries for showcasing technology or innovation-related exhibitions. These all can be beneficial to an exchange in
technology not only within China, but also with other countries around the globe. Citizens can also understand more with the achievement their country has obtained.

8.4. **Strategy 4 Establish an Innovative Economy to Sustain Economic Vitality**

8.4.1. **Drive Innovation and Entrepreneurship**
Expanding tech talent pool and raising R&D capabilities is indispensable in developing innovative industry.

Talents cultivation can be achieved through endeavouring to promote STEM (Science, Technology, Engineering and Mathematics) education, provide ICT general education, and to implement enrichment programmes such as offering internship placements in enterprises.

As far as R&D development is concerned, the Government should finance R&D projects in the hope of encouraging R&D to go beyond market-oriented tool development.

For instance, R&D projects that study the needs of the elderly or technical possibilities conducive to the old, should be largely encouraged so as to socially-oriented so that final products are of real benefits for citizens.

Technology and innovation start-ups requires financial support from the beginning of the development till the end. Funding is thus a key enabler in driving innovation industry forward in Hong Kong. In addition to funding schemes set aside by the Government, the Government can consider encouraging private sector to contribute financial resources to facilitate Smart City development.

8.4.2. **Expedite Growth in E-commerce**
The rise of e-commerce is seen as creating new momentum in today’s economy. It is thus imperative to seize the opportunities to expedite the diversification of Hong Kong’s finance industry.

For financial services industry, security and privacy issues in e-payment have long been in the limelight. To provide an environment conducive to the development of e-commerce, the Government should lay more emphasis on information protection.

Resources can be allocated to Financial Services Development Council (FSDC), for instance, to motivate research on how to enhance the development of financial services industry with different sectors of the industry.
Furthermore, the scope of incubation scheme should also be widened to cater for new clusters for financial technology and e-commerce to meet the latest development of the industry and the market (Policy address 2016).

Accompanied by the expansion of e-commerce are changes in logistics industry. Demand for logistic land uses such as storage or docking facilities are anticipated to meet the demand for import and disassembling goods.

When taking forward the proposal of Lantau Logistics Park at Siu Ho Wan, technology can come into place to ensure effectiveness and efficiency in operation. A control centre which monitors all operations, shipment management and system control within the park, can be established.

Cargo handling system which connects with the Customs Examination Hall can be introduced to speed up customs inspection.

8.4.3. Foster Location-free Work Culture
To encourage a new “work-live” relationship, advanced technology can be used to facilitate such change in work culture.

Through the advancement of information technology, new ways of doing business arise. The rise of residential cum work environment is one example. Through e-commerce and telecommuting, workplace is no longer confined to a particular physical space. Research and measures fostering location-free work culture should be carried out to support new trend of Smart working.

8.5. Strategy 5 Recognize Environmental Issues and Endeavour towards a Green City

8.5.1. Popularise Green Mobility in forms of Electric Cars, Cycling, and Walking
A clean environment is vital in Smart City development. Given that green modes of transport are gaining popularity, the use of green mobility should be widely promoted.

Electric vehicles have zero emission, and their wider use will reduce roadside air pollution. To allow electric cars run smoothly in Hong Kong, drivers in particular, a unified platform should be constructed to collect and share the locations of electric-car-charging points and other related information to make the use of electric car more convenient.

Integration with public transport is also important in promoting green modes of transport. More supporting facilities such as park-and-ride facilities should be stepped up at public transport interchange in order to facilitate drivers to change electric cars to public transport after parking.
Cycling is also becoming popular. To support this trend, cycling tracks and cycling-related facilities should be built in newly-built estates, especially in new towns. One example will be smart parking sites for bicycles. Mandatory parking sites for residents should be provided in public housing estates. With CCTV and smart bike locks, security can be guaranteed so more residents will consider opting such green mode of transport.

Walking, another green mode of transport, should be advocated at all time. To encourage walking, smart technology can cultivate a safe, comfortable and interesting walking environment to facilitate pedestrian flow. Surveillance system can also be installed to ensure safety of the pedestrian.

8.5.2. Promote Green lease for Efficient Building Energy Management
Conventional leasing may deprive tenants of control over energy use. Often are the tenants charged an overall bill that includes management fees and electricity charges, with little transparency to the tenants of how much electricity they used; and energy savings by tenants benefit the landlord.

One possible solution is to implement green lease in which smart meter performs a pivotal role. The smart meter, connected to the landlord, can be used to monitor tenants’ energy consumption while real-time energy performance is publicly displayed, so tenants can also be informed of their energy use and pattern.

For example, tenants can see their energy wastage during non-business hours, which enables them to consider how they may save energy. This kind of transparency should be conducive to encouraging an energy saving mindset. Such move can encourage green tenancy for buildings.

8.5.3. Facilitate Effective Water Management
Water is a precious asset to a city. Without sufficient supply of water, a city cannot be sustainable. Spatial planning for water management should be carefully conducted. When planning large-scale new development projects, lands should be reserved for greywater recycling for non-potable use. Examples are spaces reserved for grey water recycling and rainwater harvesting systems together with ancillary facilities in new public projects including schools and government facilities.

Buildings, be they government buildings or housing estates, should be encouraged to install water-saving devices such as water-efficient water taps in combination with smart technology such as real-time water quality and distribution monitoring system.
For example, all existing municipal buildings, wherever retrofitting works are carried out for the building’s interior service, together with new government buildings, should install water saving devices that allows automated meter reading. Data from meter reading can then form the basis for real-time water consumption monitoring system.

As for newly-built public housing estates, sensor-network-based infrastructure can be installed to identify water leakage.

With the help of smart devices, water usage can be managed in a more efficient way.

8.5.4. **Encourage Waste Recycling**

Waste is another environmental issue often in the spotlight. Managing waste in an efficient manner is therefore of prime concern.

Improvement in waste management through smart technology grants easy waste management. One example is leveraging smart bins which are all connected to the same underground channel through respective valves. Trash in the bins will go through the valves and will be transmitted to refuse collection points. Computers will then help classify items for further recycling process.

Newly built public housing estates in proposed new towns can be the pilot areas to test out the workability of such technology, expediting waste recycling in the city.

Food waste is also highly pertinent to Hong Kong. Everyone consumes food so every citizen has an active role to reduce food waste. Government should encourage food waste recycling to make best use of surplus edible food.

Food donation is one vivid example to promote food waste redistribution and donation to the needy. Places for food bank should be planned to facilitate food waste recycling.

For new buildings and estates, sufficient room should be reserved for the operation of on-site composting. Approximately 15 sq m will be needed for one composter with a capacity of 100 kg. Efforts should be made to encourage a more facilitating design for food waste recycling through reviewing BEAM Plus, for instance.

8.5.5. **Implement Ecosystem Management**

With a view to conserving natural resources, the Government should be continuously devoted to strive for a better environment.
Through the use of web-based and remote monitoring technologies, planners can fully understand and analyse the distribution of public spaces, grasslands and green belts with a view to promoting a green environment.

One example is to establish a monitoring system on environment which can boost the efficiency in city-wide environmental protection. Leveraging on Digital Photogrammetry and Unmanned Aircraft System (UAS), environmentally sensitive areas can be regularly monitored without compromising extra human resources. Data captured by UAS can be compared at different time phases to identify changes or abnormal activities in a particular land.
9. **Operating Mechanism**

In a bid to ensure a smooth progress in taking forward strategies and policies formulated for Smart City development, it is essential to establish operating mechanism to complement implementation of strategies and policies.

9.1. **Governance**

9.1.1. **Planning**

*Long Term Vision and Holistic Planning*

Vision is a "desired state of affairs which one hopes to come about some time in the future" (HK2030, 2006). It is created from a long-term perspective after taking into consideration the possible pathway a city will take. A long-term vision and a more comprehensive planning are indispensable in the development of Smart City, as illustrated in international cases.

In Hong Kong, a long-term vision and holistic planning are yet to be seen in spite of positive progress in the field of ICT development. A vision-based Smart City planning should be an integral part of Hong Kong’s long-term strategic planning so as to develop Hong Kong into a more competitive global city.

Having an appropriate vision for Smart City attracts commitment of the Government and motivates a wide spectrum of stakeholders. If the Government is devoted to the vision, strategies will be generated according to that particular vision. Meanwhile, various stakeholders will also be committed to working towards that vision (Hill and Lones, 2010).

On the other hand, a long-term vision contributes to comprehensiveness in planning process. Developing Smart City is a continuing process which requires a long-term vision to bridge the present and the future. On the whole, a long-term vision offers a positive direction and orients the city through the development. In other words, a vision provides a vision-based development framework and guiding principles for embedding approaches into practice. Therefore, the Government should to pursue a sustainable future for Hong Kong.

9.1.2. **Management**

*Governance Structure/ High-level Framework*

A solid high-level framework is essential in achieving success in Smart City development. A bureau should be “tasked to take the lead in formulating overall strategies and plans, coordinate inter-bureaux or department responsibilities, and strengthen the Government’s facilitating role in support of the development of Smart City technologies and services driven by the community and the business sector” (CPU, 2015). In Hong Kong, such framework cannot be seen at this stage, which hampers the effectiveness in putting forward Smart City strategies.
As a result, one suggestion is to task Innovation and Technology Bureau to be the dedicated agent in steering the formulation and implementation of Smart City strategies in Hong Kong, overseeing and directing overall Smart City development by fostering coordination across bureaus or departments to avoid data fragmentation.

9.1.3. Implementation

Multi-Stakeholder Participation
Considering that Smart City intends to be people-centric and reachable to all, the Government performing as the main guider and supporter in Smart City development, should encourage all stakeholders to fully participate in development process in a proactive manner.

Private companies, being one of the main builders of Smart City, should be largely motivated to partake in development process. Communication between the Government and private enterprises should be promoted so that both sides can reach consensus on the objectives and contents of developing Smart City. Through mutual interaction, challenges and difficulties in implementing Smart City can be clearly understood by each other. Eventually, solutions can be worked out more efficiently.

The public, as end users of Smart City, should also be taken into account. Interactive communication approaches should be advocated by the Government. Conducting surveys on people’s needs and satisfaction of Smart City development is one instance, enabling the Government to be informed of public opinions in order that public awareness and participation of Smart City development will be enhanced.

Another manifestation is to introduce Smart City applications in communities, which allows residents to enjoy the convenience brought by Smart City, so that the public can better understand, accept and adapt to living in a Smart City.

9.1.4. Assessment

Smart City is a long-term development process where ICT continues to grow and innovative applications and services constantly emerge. With a view to ensuring the development keeping pace with the evolution of ICT, an assessment mechanism should be established. Based on assessment standards, progress and impacts of Smart City development should be evaluated at different stages to examine challenges and deficiencies.

To monitor Smart City development process in Hong Kong, it is advised that a third party agent can act as a government watchdog. Take newly founded Hong Kong’s Smart City Consortium as an example. It can be assigned to conduct assessment of Smart City development for Hong Kong. The agent should regularly release information on assessment and white papers for the Government. In addition, the agent, as a think-tank, can also provide
brainpower support for formulating strategy in the process of Smart City development.

Furthermore, in order to strengthen the external comparability of Smart City development, development trends of overseas Smart Cities should also be paid heed to when setting up criteria for evaluation. Gaps identified will provide the basis for possible adjustment of Smart City strategies.

9.2. Legislation and Regulation
9.2.1. Legislation on Cyber Security
Rapid development of ICT benefits citizens but it also enables lawbreakers to take advantage of advanced technology to commit crime. Currently in Hong Kong, a certain number of laws are relevant to the use of computer, including Law of Copyright, Personal Data (Privacy) Ordinance and some other legislations on Computer Crimes.

Nevertheless, these laws are not set up specifically for regulating behaviors on the Internet and ICT in the first place, for the government believes that “most of the ordinances targeting crime prevention in the real world apply also in the cyber world of the Internet” (Hong Kong Police Force, 2016). It should be born in mind that the cyber world has become increasingly complicated under Smart City development. As open data and sharing modes are supported, copyright issues need to be revisited. The growing number of cyber threats also remind the Government that the threat of cyber-attacks should not be underestimated.

In the meantime, as Big Data technology adds commercial value to personal information, privacy breaches and hacks happen from time to time. These issues need to be further acknowledged and addressed through improving current legislation framework. Development of Smart City can gain popular recognition only if the rights and interests of various stakeholders are protected.

9.2.2. Regulation on Standardization
High-level principles-based standards is pivotal in Smart City development on the grounds that it provides a technical framework for Smart City development, helping remove technical barriers. In Hong Kong, a standardized organization responsible for the formulation and promulgation of local standards has yet to be set up. Hence, regulation on standardization is necessary to promote common standards.

To this end, one option for Hong Kong to develop its own data standards is to make reference to international standards while acknowledging the unique characteristics of Hong Kong. One reason accounting for this is that it is difficult to cover specific needs with a set of unified standards. Countries around the world, including China, Spain and Singapore, whose Smart City development has been gone through as international cases, actively participate in and
promote international standards, with adjustment in accordance with local context (Rakesh, 2016). Thus, Hong Kong should strike a balance between adopting global standards and adapting them to local practices.

Smart City standards should be established through effective collaboration of government departments, technical experts, and representative stakeholders.

At present, three global standards bodies, namely the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the International Telecommunication Union (ITU), have started standardization work on Smart Cities, with their respective focus areas (ITU, 2016).

In formulating data standards in Hong Kong, certain criteria should be pondered on. Smart City standards normally include ICT Standards, Service Standards, Management and Assessment Standards and Information Security Standards (ISO and IEC, 2014), details of which are tabulated as follows.

<table>
<thead>
<tr>
<th>Standards</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICT Standards</strong></td>
<td>Define key Smart City technologies, hardware and software, including technology and equipment for acquiring data, broadband and wireless network for transferring data, coding and format of different types of data and web services framework, such as Service-Oriented Architecture (SOA), which equips users with improved flexibility in cross-sectoral cooperation.</td>
</tr>
<tr>
<td><strong>Service Standards</strong></td>
<td>Provide technical models, application guide and other specifications for smart development of typical domains, such as government, mobility, energy, community, and so on.</td>
</tr>
<tr>
<td><strong>Management and Assessment Standards</strong></td>
<td>Include standards for strategic planning, operational methods, implementation approaches, administrative management and assessment methods in the process of Smart City development.</td>
</tr>
<tr>
<td><strong>Information Security Standards</strong></td>
<td>Established for security issue of data, technology, and management.</td>
</tr>
</tbody>
</table>

Table 9.1: Contents in Smart City Standards

9.2.3. Regulation on Eliminating Procedural Obstacles

Development of Smart City includes a series of processes spanning from infrastructure construction, technology application, service promotion to operations management. Certain regulations are necessary in eliminating
procedural obstacles as well as ensuring the application of standards, so as to promote sustainable operation of Smart City.

For example, regulations on cross-sectoral information collection and inter-enterprise information sharing can reduce the transaction cost caused by procedural obstacles.

Specialized technical working group, formed by the government departments, research institutions, experts and technicians, should be established to research and develop rules and regulations for cross-sectoral information sharing, information updating and project developing management.

9.2.4. Regular Review on Existing Regulation and Legislation
Legislation and regulation should be constantly reviewed to cater for changing circumstances, no matter they are in the virtual or the real world, in the process of Smart City development.

Legislation should be continuously perfected to adapt to new development trends. Just as in a real society, new cases continue to propel the improvement of the law, things are similar in the virtual world. It is inevitable that each time an emerging business model appears, laws and regulations are behind the development. Issues involved in the development of Smart City, such as privacy and security as mentioned above, have to experience a process of gradual improvement. To refrain from going further because of sensitive issues will be equivalent to overlook the needs of the market and the public. What can really benefit citizens is to strive for continuous refinement, not only technically but also institutionally.

9.3. Financing
Developing Smart City requires a considerable amount of investment. Financing is one of the biggest challenges facing Smart City development in Hong Kong. Since the development of Smart City covers myriads of domains and is often seen to be a relatively long development process, relying solely on government funding is difficult to meet the demand in financing. To ensure a sustainable Smart City development, seeking more sources of investment is vital.

In Hong Kong, leading enterprises with strong capital may not be willing to dedicate themselves to the market of Smart City, provided that the future prospect of Smart City development remains unknown. These enterprises may therefore hold a wait-and-see attitude towards financing Smart City while continue injecting capital into usual businesses or projects.

Hence, Government's investment is essential for Smart City development, especially at the initial stage. To strengthen the confidence for private
companies in investing in Smart City, financial support for Smart City should be further emphasized by the Government, through incorporating funding for Smart City in annual financial budget.

In the short run, in the hope of reducing the financial burden of the Government, sources of financing should be diversified. Certain investment and financing mechanism should be considered to leverage social capital to support Smart City development. For example, development funding for major projects can be set up to stimulate private investment.

In the long term, private companies will be the main investors in Smart City. As companies seek maximization in profits, they are keen to capture the needs of users, collecting and making full use of all possible information. That is to say, private enterprises are in control of data pertaining to market demand, promoting the market operation of Smart City. In a mature Smart City market, R&D activities, investment, innovative services and applications are inevitably associated with private companies. The Government should thus have reasonable mechanisms to cooperate with private companies when it comes to operation and management issues, to maintain a sustainable market of Smart City.

For projects involving public services such as e-government projects and public infrastructure projects, financing is mainly relying on the Government. In view of the fact that the Government may have insufficient capacity in operation and maintenance of projects, professional operation and maintenance service can be introduced. Projects for public services which are in need of large investments can be executed through cooperation between the Government and private companies. The Government can provide support for private companies through providing subsidies, franchising, or creating value-added services. Build-Operate-Transfer (BOT) mode can be considered as a solution. Projects that are not for public services can be completely operated by the market. The Government should create a good market environment through introducing policies to encourage business innovation and free competition.
Section IV Planning Vision and Next Steps

10. **Policy Implications**

The preceding section presents the anticipated stakeholder and strategic implications as a result of the implementation of the aforementioned strategies in Section 4. By presenting the implications, it opens up opportunities to facilitate future discussion, preparation and considerations, in order to ensure the success of the recommended Smart City strategies.

10.1. **Stakeholder Implications**

The challenges faced in carrying out a high-level strategic policy is that the Government may encounter unpresented implications and constraints. The preceding section will highlight key implications that may be encountered by the listed stakeholders based on the prescribed CYBER strategy.

10.1.1. **Commit to Efficient Urban Management via Data Consolidation**

*Implication to Government*

In order to establish an open government data sharing platform, the government will have to account for the substantial cost and time required to initiate and maintain the program. Furthermore, the government may need to deal with potential criticisms from the opposing government groups, interest groups and non-government body. The use of consultants and advisory boards to substantiate the Government’s strategies and commitments, such as impact assessment reports, may incur high costs and create unpresented delays of the action plan.

Internally, various government departments will need to conduct further studies and discussion to determine the course of action for the procedures of sharing departmental data. Furthermore, the move towards e-sharing platforms to replace existing government processes, for example, using e-form instead of in-office paper application for Lease Condition documents, may require staffs to take on additional education and training.
Privacy and security of data will be a critical element of data sharing that the Government will have to address. For instance, the government will need to review and determine legal implications of publishing sensitive data under existing laws and government acts. On the other hand, new administrative and security policies may need to be created to ensure that sensitive data remain secured and be out of the threat of potential cyber-attacks.

**Implication to Citizens**

With the delivery of the data services and hardware provided by the public and private sector, implication for citizens will be determined by the learning process, access to participation and adaptation to the services.

The learning process of using technology and e-services varies greatly amongst the general population. Without proper guidance or awareness of the available data sharing platforms available to citizens such as web based maps, GPS tracking services, it may create negative feedback from the end-users. Furthermore, without proper instructions, users could be accessing the wrong data or on the other hand, be providing the wrong data inputs, with mistakes in filling out e-forms being an example. As such, this may lead to the formation of interests groups and NGOs to provide assistances to citizens so as to optimize the usage of data sharing services as well as consolidate citizen feedback that could be used to enhance and modify the services provided by the public and private sector.

Physical and social barriers are another attributes of citizen implication to the data sharing platform. Ownership with outdated hardware may be limited to certain electronic based platforms as certain applications will require specific I/O configuration as well as performance specification. Similarly, some users may not have access to Wi-Fi hotspots or adequate internet speed to take the most benefit of e-platform as certain data file sizes may be too large to be transferred to citizens within a short-time span. Socially, citizens may not be
complacent in providing certain data such as income, marital status and age, to be shared.

That being said, citizens can expect a more streamlined process in dealing with government application and participation as it minimizes the need for in-person document pickup and drop off. Web-based GIS map and applications can provide citizens with a greater awareness of specific interest such as future development projects and locating attractions.

**Implication to SME/Developers**

Developers who wish to attain the data sharing platform may pose the question of whether the data accessed is fully transparent as the source of the information may be altered due to sensitive material. Due to the commercial nature of their usage, there may be monetary fees associated with data sharing for developers and SME’s. Without any price regulation, it may create a barrier for entry.

That is to say, the development of smart technology and applications by SME’s can enable new and improved services and awareness for citizens. The access to personal data and enhanced connection to end-users may improve economic activities and productivity for SMEs. Delivery-based transaction may see a rise with the use of e-platform sales and this may require SMEs to reconsider their physical locations and business model.

**10.1.2. Yield a Digital Inclusive and Liveable Society**

**Implication to Citizens**

Enhancing the liveability and quality of life for its citizen is the priority in the overall strategy. Having said that, the benefits from certain action plans may not satisfy certain groups of citizens, and in some cases, certain groups or individuals may see threat in the change of the quality of life associated with Smart City. For instance, advocating public transportation through smart
technology can improve public transport ridership. However, this could hamper existing public transit users’ experience due to more rider congestion.

To be part of the digital inclusive community may require ownership of certain hardware such as computers and cellular phones. Without any subsidies or support, certain citizens may not have the capacity to attain these necessary hardware for personal use. As such, there may be a need to incorporate greater access to public computers and devices to ensure all citizens can benefit from the liveable society action plan.

**Implication to Government**

Incorporating digital inclusive technology in public facilities may see substantial financial cost. For instance, the adoption of computers in the education system impedes substantial costs for schools, but in the long term, this can foster greater local ICT talents. Other public facilities such as school, community centres and public parks may require expensive facility upgrades to establish a better digital inclusive system. The promotion of services like car-sharing will require the Government to determine whether existing driving laws and regulations will need to be updated to protect the users and owners of car sharing services.

With the recognition of the increasing elderly population and also the goal of enhancing life expectancy, the Government will need to reevaluate the budget and available services for seniors in order to prepare for the potential surge in senior population in Hong Kong in the long term.

**10.1.3. Bridging Stakeholders for Regional Collaboration and Cooperation**

**Implication to SME/Industries**

The difference in business culture and operations between Hong Kong and mainland China may hamper cross-border ICT operations. On one hand, with data censorship policies in the mainland, this can be a barrier for effective cross-border ICT data-sharing and collaboration.
On the other hand, the collaboration can provide an increase in business and expansion opportunities, as well as workforce supply in the ICT and e-commerce sector.

**Implication for Government**

With the establishment of a more efficient cross-border network between Hong Kong and mainland China, a review of preexisting infrastructure should be reviewed to see whether any additional improvements may need to be taken forward to accommodate the increased cross-border movement.

The use of smart technology to improve travellers' experience will require the Government to review and develop changes to existing border crossing infrastructures. These new ways of cross-border movement will require the Government to develop new security monitoring measures to maintain the safety of citizens.

10.1.4. Establish an Innovative Economy to Sustain Economic Vitality

**Implication to Government**

With a view to fostering the development of innovative economy in Hong Kong, the Government will have to provide numerous financial and infrastructure initiatives and support. Therefore, consideration should be taken to determine how these initiatives can be put into effect and sustained for the long term. That being said, this shift in government spending towards the innovative economy in Hong Kong can face public pressure and opinions from interest groups, related stakeholders and the general public.

The Government will have to determine whether existing land and transport facilities will meet the needs for e-commerce and ICT businesses. Current land use zoning may not be adequate for the warehouse storage demand required in e-commerce businesses. With the increasing demand of road networks required to transport goods and services in e-commerce operations,
improvements or expansions of existing road network as well as expansion of shipping container ports may need to be considered for potential transportation improvement projects and upgrades.

**Implication to SME/Industries**

Hong Kong’s free-market economy and its establishment of transnational corporations (TNC) could pose a threat to local ICT-based SME and e-commerce businesses. These TNCs can create unfair competition towards local businesses as they can potentially drive out local e-commerce or SME businesses. Similarly, SMEs may not have the capital to take use of ICT that could potentially enhance productivity and effectively lower cost of production in the long run. This barrier of ICT adoption may create a bigger gap between SMEs and TNCs.

The rise of e-commerce businesses in Hong Kong can lead to the displacement of existing and unique local business as the convenience and possible lower cost of goods and services through e-commerce businesses may drive out local businesses.

**Implication to Citizens**

Individuals may feel a breach in privacy when making use of e-platforms as ICT innovations as it is common for the services to collect potentially sensitive information such as credit card numbers, personal identifications and addresses. On a similar note, citizens are more vulnerable to potential identity and information theft as their information may be stolen due to cyber-attacks or fraud transactions.

**10.1.5. Recognize Environmental Issues and Endeavour towards a Green City**

**Implication to Government**

Rectifying environmental issues in the city scale can pose substantial capital and infrastructure needs. The processes from start to finish can be lengthy, with extensive costs involved in the consultation, R&D and implementation
stages. Furthermore, government role of improving public systems and infrastructures for better environmental efficiency will require extensive comprehensive planning and project management efforts that can ultimately be faced with backlashes and resistance from the public and affected stakeholders.

New regulations, bylaws and permits should be considered to regulate and monitor the progress of the green city plan as well as to control potential environmental misconducts. On the other hand, the Government can encourage public and private involvement with incentive programmes such as rebates and grants to encourage the long-term development of energy management in infrastructure as well as day-to-day behaviours.

*Implication for Citizens*
To partake in the environmental stewardship, citizens will require a change in their day-to-day behaviours and implement upgrades to strive towards a more environmental conscious and greener way of living. That being said, without any support, the cost of such upgrades and behaviours may deter a long-term commitment from citizens. For instance, the cost of renovation may become substantial for homeowners.

That being said, the adoption of this strategy can provide long-term financial benefit and improve living environment for the general population. A strong citizen participation in this effort can minimize the effects of climate change and lead to a positive trend in improving the quality of life for Hong Kong.

*Implications for Businesses*
To meet new environmental goals and standards, new business would have to incur higher construction costs to adapt to the smart technologies and services available. This may create extra barrier for entry for SMEs who may not have the capital to abide to higher green standards in building design and regulations.
10.2. **Strategic Planning Implications**

The enhancement of data sharing and collection can be utilized to enhance the forecasting of future land-use planning. That being said, land-use requirements might require evaluation based on the needs and lifestyle changes that come about with the Smart City concept and the increasing demand for ICT-based infrastructures such as Data Centers.

New conditions and requirements may need to be addressed in future land lease applications to reflect on the implementation of smart initiatives and ICT-based technologies. Similarly, existing building and planning standards may require amendments to adapt to the shift in infrastructure and public services demand. For instance, parking standards in Planning Department guidelines may be reduced in residential developments as there may be less car ownership in the future due to increase green modes of transport such as cycling and walking.

In the direction of transportation strategies, the evolution and promotion using ICT to enhance alternative modes of transport such as cycling, walking and public transportation will mean a greater demand for public transport supply, as well as enhanced transport linkages to new town development. New regulations and controls may be required to establish certain smart transport initiatives such as driverless vehicles and electronic road pricing in urban road networks.

10.3. **District Planning Implications**

With regard to the proposed strategies and policies, there are certain implications towards district planning of old districts, new towns, Outlying Islands and rural areas.

10.3.1. **Old Districts**

When implementing Smart City Strategies, old districts such as Sham Shui Po, Tai Kok Tsui and To Kwa Wan, have to deal with the challenges in relation to
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a lack of supporting infrastructures, old buildings, demographic and socio-economic structure as well as land use zoning. For instance, the building structure of tenement buildings may not be able to support the installation of new devices such as smart meters to monitor the consumption of energy and water and new pipe systems. Meanwhile, a lot of senior citizens and underprivileged citizens are living in old districts and digital divide matters more in these districts due to insufficient ICT knowledge and skills as well as a lack of means. Hence, more digital inclusive measures have to be taken in these areas to bridge the digital gap.

Interviewee G also commented that a high density environment could pose obstacles in creating a green neighbourhood. For example, it might be hard to plan cycling paths. One of the concepts in Smart City is sharing the water and electricity delivery through common use of pipes. However, the current pipe network in Hong Kong is very messy and not shared. It is difficult to construct a huge pipe for shared usage because it would involve a relatively long period of street closure and street activities would be heavily intervened.

10.3.2. New Towns

With regard to the abovementioned problems in old districts, new towns will be possible alternatives to introduce Smart City Strategies and run pilot schemes. Currently, Energizing Kowloon East Office (EKEO) has been authorized to take forward a pilot scheme to test the feasibility of Smart City strategies, such as Smart Traffic Lights, in Kowloon East area which has been planned to be the second Commercial Business District (CBD 2) in Hong Kong. Ms. Brenda Au shared her views with us that they have taken some initiatives to bring in the notion of Smart City in the district, but some Smart City strategies require coordination among different departments and the coordination process is quite time-consuming. In addition, more incentives are needed to attract private companies to share their data and cooperate with the Government in putting forward the notion.
10.3.3. Outlying Islands and Rural Areas

In order to create an agile transport system, it not only requires a unified transport information sharing platform, but also relies on many different factors. Population density, availability of transport modes and road design also matter the implementation process of creating a smart and agile transport system. The population densities of Outlying Islands and rural areas are relatively low, which may not be able to support a smart transport system in terms of financial viability and utilization rate. Furthermore, availability of transport modes and road design are constrained by the population and geographic features of these areas and, as a result, there are limited choices of transport modes in these areas. The abovementioned limitations will affect the implementation of Smart transport strategies in these areas.

On top of that, energy efficiency, waste management and water management strategies also have to face similar difficulties in rural area. For instance, some rural areas are still using septic tanks and soakaway system which are ineffective in handling sewage. Despite the Village Sewerage Programme launched by the Drainage Services Department to resolve the problem, the programme is very time-consuming due to the extensive consultation and negotiation process. Without the upgraded hardware, it will be a challenge in implementing the Smart City strategies in rural areas.
Section V Conclusion
Section V Conclusion

Whether it's the concept of “Sustainable City” in the 1980s, “Low Carbon City” in the 1990s or the “Smart City” concept in the 2000s, they all share a common vision in urban development - enhance the living environment of citizens. Advancement in technology undoubtedly brings huge opportunities to Hong Kong and other world cities in boosting the efficiency and quality in urban management and services. However, as mentioned in this report, Smart City development has its challenges which policy makers have to consider if they are to unleash the potential of ICT in city management for the wellbeing of all walks of life.

The completion of this report with highlights on the recommended strategies is only the first milestone to transform Hong Kong into a Smart City, provided that the report only provides a broad direction and concepts for Smart City development of Hong Kong. Subsequent to recognizing the implications of these strategies and policies on urban planning and key stakeholders, further studies and researches are needed to translate these recommendations into concrete strategic and district plans as well as planning guidelines of Hong Kong.

Last but not least, the introduction of new strategies and policies will inevitably affect different stakeholders and hence it is crucial for the Government to maintain an open dialogue with key stakeholders. More importantly, a constant and open dialogue helps policy makers to understand community needs and aspirations so that Smart City planning and development is truly catering to people’s needs under ever-changing circumstances.


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Interview with interviewee A

1. How would you comment on the use of social media and mobile application?

People use social media like facebook and instagram to share locational information. There are more and more location-driven applications which people are willing to expose their privacy in social media and mobile application.

2. Is high population density an advantage to develop Smart City?

The use of technology is to solve problems. High density cities generate different social problems. In the past, we mainly used human minds to solve problems. Nowadays, we can rely on ICT and GIS technology to help us. Hong Kong is definitely a high dense city which creates spatially related problems. Technology could help in solving these problems, for instance, real time data can improve the arrangement, management, scheduling of construction work and reduce disturbance to neighborhoods. Development of smart city is a way out in alleviating problems in high population density cities.

3. Can smart strategies solve housing problem in Hong Kong?

We should view housing problem in Hong Kong from both quantity and quality perspective. For quantity, GIS can help to search for available lands for housing development. To improve the quality of housing, we can also use GIS for re-arranging the high density area where has too many public housing. It may also use GIS to create a model for green spaces and improve the quality of life of citizens.

4. What should the Government do to push the development of Smart City?

EKEO is a pilot scheme of Smart City development in Hong Kong, which has been running quite well. However, the largest obstacle which Hong Kong is facing now is to coordinate different departments in terms of data sharing. Smart city development is more about the quality of the data, in other words, the readiness of data usage and availability of data, instead of the quantity of data. Although there are more than 5000 data sets provided by the government currently, these data sets do not have the same data definition and base map, which is difficult to carry out further data analysis or application. SDI is needed to improve the data definition among different departments. Most importantly, an API is needed to develop in order to create a platform for different users to access those data and facilitate data application. ITB maybe an opportunity as it is trying to cope with the standards of various data sets.

5. Do we need to plan the land use for Data Centers?

Currently, there is data center policy and some industrial land uses are redesigned for data centers. The development of Cloud service needs data centers to support and planning has a role to play in this area.

6. From financial perspective, what are the challenges to Smart City development in Hong Kong?
Recurrent cost is the biggest challenges for the development. Financial Bureau is not willing to commit the recurrent cost every year to develop a system for data management and collaboration. This prudent financial management style hinders the development of smart city. Besides, outdated regulation and rigid regulatory framework is another challenge. Of course, filibuster in LegCo may also affect the financial situation and budget approval. Moreover, data from government is not always free. Lands Department sells Geo Information Data and add value to the projects. This increase the cost for data usage and application.

7. Why Hong Kong has not yet developed its API?

This is mainly about the institutional arrangement. There should be one government department responsible to develop the API and share it to other departments. This requires better institutional structuring.

8. What should be done to promote Smart Transportation in Hong Kong?

There are many aspects that Hong Kong can explore in Smart Transportation. For example, providing traffic time data, parking information and real time congestion information, improving EV chargers location and developing applications like the KMB apps.

9. We noticed that KMB has cooperated with ESRI and developed its applications. Could you share this experience with us?

KMB has initiated the project and approached us. We have cooperated for more than ten years and there are various stages of development. At the beginning, KMB seeks to improve the passengers’ enquiry system and use GIS to build a model and input data on webpage. The second stage we aimed at enhancing efficiency by data integration and streamlining the process. At stage three, we focused on fringe management which allowed us to know the buses and drivers locations. At later stage, our development became more customer oriented and started developing mobile application for customers. Nowadays we can even calculate the transition time and walking distance between two bus stops to facilitate passengers.

10. As one of the members of Smart City Consortium, can you tell us more about the role of Smart City Consortium in Hong Kong?

It is a platform for different stakeholders to share ideas. Integration with Mainland is one of our major focus. Frankly speaking, Mainland Smart Cities are much more mature than Hong Kong. We will use Mainland standards as reference and hope to create synergy through cooperation. There is possibility for both parties to join ISO jointly.

11. How could GIS facilitate public engagement and settling controversial issues?

Public engagement requires institutional arrangements, however, data can be one of the support factors and provide evidence.

12. How would you comment on Digital divide problem in Smart City development?
Digital divide has been alleviated in this generation since the devices become much more affordable to the public and NGOs provide help to the needy.

13. Talents are essential foundation in Smart City development. What should be done for talents cultivation?

Coding and GIS courses should be provided to the students. In fact, ESRI is providing GIS materials to primary and secondary schools nowadays.

**Interview with interviewee B**

1. Does KMB employ ICT into your daily operation?

Basically we look at data to see how they can be harnessed to improve our efficiency and we have invested money into changing the way buses operate and give information.

2. Does the government provide any help?

In Hong Kong, government doesn’t provide anything. If the government really hands out money to transport operator, one disadvantage of this is to hand out money to public services. If government provides money, there will be less innovation. And in the end, everyone will be doing everything the government wants to do.

3. How do you see the role of KMB in the development of Smart City in Hong Kong?

KMB has a very key role in Smart City since KMB’s public transport market share is the second largest, with 4000 buses and 4000 bus stops, 2000 drivers and 12000 staff plus drivers. If you map our network on a Hong Kong’s map, you will find a very wide coverage.

4. Can you tell us more about sharing data?

Data that can be shared include arrival info, how full the bus is, as well as forward journey time. The problem of sharing data is that under a market-led environment, nobody wants to share. The ideal situation will be putting data in an open platform for the sake of achieving better quality. Right now, there is no common standard so nothing can be integrated. You just can’t make sense of the data with a single platform. Therefore, the government should set clear industrial data so that everyone will comply and to share basic data available in public domain.

5. We have seen interactive bus stations during our field trip to Singapore, do you have any comments on such devices?

All bus stations in Singapore are by NDA. It is a difficult task to enhance a bus stop in Hong Kong. Say I want to upgrade the bus terminal, saying that KMB is willing to invest in such upgrading process, but since they are all maintained by Highway Department, we are not allowed to change a lightbulb.

For bus shelters, since they are structured on public land, getting a power connection to station is also difficult. We only have 1000 bus stations with power out of 4000 bus stops.
Even for the ones with power, there are high restrictions of what we can do. For example, at least LED screen for bus arrival info, end of 2017 all the bus stops with power.

Speaking of electric power, it is known that electric buses need charging facilities. We need extra power for charging electric buses and we have been telling CLP that we want to build a sub-station and we will pay for them. But the point is that CLP has no incentives on transport.

6. How do you comment on Intelligent Transport System in Hong Kong?

No. There is no such thing in Hong Kong. We are lagging 20 years behind, such thing doesn’t exist in Hong Kong. What the city can do is to establish a basic system - central traffic management centre like those in Singapore, Taipei and Seoul. They all are real time. The centre will be responsible for management interdependency on transport. For instance, if MTR breakdown and needs buses to help transfer its passengers, this single platform will decide how many buses will be needed. But now since there is no communal platform sharing data, KMB often over- or under-deploy buses.

We also need intelligent junctions. Those in Hong Kong are running like robots. They don’t have prediction - based timing advanced vehicle management system.

Private cars in Hong Kong increase tremendously. Illegal parking is another issue. In Hong Kong, if see illegal parking, no prosecution will be carried out by the police but in other countries corresponding authority will take actions. This issue also affects bus operators. Bus stations are sometimes occupied by loading and unloading while buses can’t go in. For example, Canton Road outside Apple store.

In Seoul, they have cameras, as soon as there is illegal parking, the camera will take more than 30 pictures, taking a picture of you license plate and no staffs have to come.

7. Could you comment on KMB application?

Right now our mobile app is popular but we will be bringing our app to the next level. At present we have app usage data but little personalization but new version will be more intelligent built.

Privacy and personalization are different issues since for personalization, your phone will do the work. Your phone just need to know your behavioral pattern. But for privacy, we have to identify the person or obtain personal data. We have to have many clear handling policies like customer hotline, setting customer services.

8. How do you see e-shopping trend in Hong Kong?

E-shopping is growing fast even in Hong Kong but the delivery of satisfaction is much poorer than other countries. In the US, delivery is very clear, perfectly packed but in Hong Kong, logistics supply chain discourages e-shopping. E-shopping in Hong Kong is not really cheap sometimes.

9. What do you think about implementing electronic road pricing (ERP) in Hong Kong?
ERP feasibility studies was done 10 years ago and Hong Kong did a pilot, spending HKD 100 million. The pilot was successful and this can show that we have available data and ERP can indeed happen in Hong Kong. But why we still don’t have it now? It’s because of the opposition of the drivers etc.

In Singapore they have a device in the car. Everyone has a card and put the card in the device. If the car passes by a toll area, the money will be deducted right away. They don’t have to stop their cars and start counting money to pay the fare, like in Hong Kong. We need a signal poster linking 10 to 20 junctions together. Hong Kong has developed this but Hong Kong needs to put more efforts at area control system.

10. What is your comment on Uber?

Speaking of Uber, from a regulatory perspective, Uber poses challenges since it is an unregulated market. Buses were like Uber back then. There was no regulation to for bus operators to apply for. As long as you bought a bus, you could drive. And since everyone did the same it soon became chaotic and incidents occur. Uber is exactly undergoing the same cycle. Uber costs problems like illegal parking. They stop at non-stop areas and they have poor driving behavior.

For electric signage in Hong Kong, there are very few. We don’t have IDS backbone. If we have this backbone running in highway, screens displaying info and that info has to come out from somewhere.

11. What are your suggestions in making Hong Kong smarter?

Smart City intends to build a network of networks. Bus system can do that very soon. We don’t even need to connect to a center, we can make buses talking to each other, just like machine to machine communication. We should build a web of information and distill real-time data.

Interview with interviewee C

1. What are the difficulties to introduce a Neighborhood Sharing Mobile Application?
Residents' readiness is one of the challenges and which is not enough now. Hong Kong people do not have mutual trust and they do not rely on their neighbors, especially in gated community. In the old days, people shared food and service, i.e. television, child caring services and this would help to tie everyone together and build a strong social link between the neighbors. Nowadays, in contrast, people living in gated community are not really ready to share their things with neighbors and not ready to build relations with their neighbors. For instance, there was a Tseung Kwan O bazaar in the gated community, but no one would like to come due to a lack of community spirit. However, there were some successful cases, i.e. the Tung Chung Dogs Club which occurs to fight for their own interests. People use ICT, i.e. whatsapp, to communicate and organize people to deal with the conflicts. ICT solve problem as a painkiller to tackle the pain points (problems) and it has to be down to the earth. Hence, the use of ICT makes Smart City much more effective and efficient by reducing the cost and time.
2. How to enhance spatial planning with the use of ICT?

EKEO has developed an application for the pedestrians to locate different alleys and graffiti. Hysan Place may also incorporate some smart technologies in their design. Ms Chan Pik Ki (陳碧琪) and HKIE will also be helpful for the research of Smart City.

3. What do you think the Hong Kong government can do to support the development of Smart City?

Hong Kong is lacking of a well-defined government funding which is not looking into quick return. Currently, for instance, the Cyberport Incubatee Fund cannot really help to facilitate the development since it has too many restrictions (need to rent Cyberport office, restricted marketing budget). For the Matching Fund System, it is not helpful because young start-ups are very hard to attract Venture Capitals. Every big thing must be driven by the government, for example, to establish ITB to coordinate the development of Smart City. ITB should do the 5-years plan with the VMV (Vission, Mission, Values) and every departments should do annual report about the use of big data.

4. How would you comment on the current development of Smart City?

The current development of smart city technology is mainly profit-driven. MTRC has adopted the prudent financial management principle since it is a listed company which means that it has to be responsible to its shareholders. In addition, it has to fulfill some requirements of Sustainability and Corporate Social Responsibility (CSR). Environmental auditing and energy efficiency have also taken into account since it can reduce cost and increase profits. With regard to a unified public transport app, since it is customer-driven, so if there is a demand, someone will do it.

5. How would you comment on the development of FinTech?

Taking the mobile application of DBS bank which has its branches address and e-banking services. It brings convenience to customers, but Hong Kong people do not have trust in technology. Fin Tech in mainland is quite common, like TaoBao, Wechat pay, Alipay. Chinese government use institutional arrangement to push the development. Clouding funding may be risky, but the regulation system can be adjusted and revised. The widespread of Octopus card mainly because of its flexibility to accommodate different functions, like residents card and staff cards. However, Octopus Card Company has been required to use bank license and it may be one of its constraints of its development.

6. How to strike a balance between privacy and the use of big data?

It is a kind of trade off and everyone can have their own judgment. There are two types of people. The first type of people will adopt the new trend of technology and less care about privacy, while the second type of people stress on privacy more.

Interview with interviewee D
1. How would you interpret the concept of Smart City?

I think smart city is a concept related to city development and urban governance. Hong Kong is facing population growth and this is a challenge for the government. Technology may provide a solution to the city to improve our quality of life.

2. How would you comment on the current development of Smart City in Hong Kong?

Hong Kong is lagging behind. Although it has good IT infrastructures and high mobile penetration rate, there is no agent to lead the development of smart city. Currently the development of smart city is only done by a small department of the EKEO. The new Innovation and Technology Bureau (ITB) does not have a clear positioning so it is doubtful whether it could be the agent. In addition, Hong Kong is currently lacking a set of standards for data.

3. What are the strengths and weaknesses for Hong Kong to develop as a Smart City?

I think the strength is that Hong Kong has good ICT foundation. For example, our wifi hotspot is everywhere and we have octopus card which you can use it in public transport, supermarket and convenience stores. Also, Hong Kong has existing legislation and government body to protect data privacy of our citizens. However, the weakness for Hong Kong is that it lacks a cross-departmental collaboration, ICT talents, a Smart government and data transparency. For example, there is no mobile app about parking vacancy because all data are owned by the private company.

4. What elements do you think the Hong Kong Government should take into consideration in developing Smart City strategies?

I think Hong Kong needs a cross-department task force in order to develop smart city. The task force should draw representatives from different government departments and to coordinate data from different department in terms of its format and standards. Also, the government also take into consideration society’s mindset. I think that currently our society still have think that IT talents are worse off than businessmen and thus parents don’t encourage their children to pursue a career in ICT industry. The government should consider making ICT compulsory in the school curriculum. I think the future development of Smart City in Hong Kong should be a Public-private partnership model. However, it is challenging to ask the public transport service providers to share their data due to a lack of incentives, hence, the government should make open data as a condition when renewing the franchise. Hong Kong should have a platform to collect all the parking information and share to the public.

5. In terms of regional collaboration, especially with PRD, what will be the future direction for Hong Kong to develop into a Smart City as part of a Smart region?

There is a need for Hong Kong to make reference with the international and mainland standards of Smart City. For example, there should be a common standard of cloud computing. Also, Hong Kong and China can have more cooperation. For example, China has a vibrant e-shopping platforms such as Taobao and Alipay. The platform could be expanded to Hong Kong.
Interview with interviewee E

1. As quoted in the The Hong Kong Institute of Surveyors Annual Conference 2014, “Smart city development strategy will transform Hong Kong into a quality city which enables it to attract people, capital and ideas”. Can you elaborate some of these strategies?

In Hong Kong, we have sufficient data but still it is not fully concentrated. In the spatial scale, Smart City innovation using ICT can help improve developments like public space. For example, the use of Google Map or similar web applications can help improve information for public to access public space. On a related note, the public spaces should also be reconsidered to find ways. The government’s Innovation and Technology Bureau (ITB) can take lead on initiating ICT based strategies and refining the ordinance to promote data integration in various government departments.

2. What affect does Smart City have to address the growing ageing population?

Smart City has potential to cater and address to the growing ageing population in Hong Kong. The traditional notion of the senior cares centers or underwhelming and does not provide any positive moral for those who are reaching the senior age bracket. ICT can provide better living conditions for elderly so that they can continue to live at home alone. For instance, alert systems or cameras could be placed in homes to make sure medical services are alerted in case of any irregular activities. ICT can also help improve ways of daily chores. Lastly, innovation in how we design homes can better prepare seniors in their existing homes.

3. Based on the current government environment, do you feel developments towards a smart city (e.g. enhancing homes with ICT) will be feasible within the next 2030 plan?

As mentioned earlier, there is sufficient data available for use for ICT. However, the data is not fully utilized when compared to neighboring regions such as Shanghai. Currently there is no transparency for the data, which reduces credibility and accuracy. With better transparency of these data, both government and the private sector can benefit from the use of the datum.

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**Interview with interviewee F**

1. What do you think is Smart City?

   Smart City is not only about IT technologies. People is the most important part behind this concept. It should focus on resource allocation & sharing, with respects without discriminations. For example, sharing the old clothes to someone who needs through mobile apps & internet through apps such as Around Hubs or Around Neighbors. Apps alone cannot connect people. They cannot be too commercial but for better resource allocation among people.

2. Is Hong Kong ready for Smart City development?

   Hong Kong is not ready for Smart City development. For instance, Uber in Shanghai is legal and there is over 1000 types of cars can be rented through apps in France but these apps are not in Hong Kong. We could also rent cars instead of really own and buy a car. There is another example of sharing and better resource allocation. Kai Fong apps which advocates sharing and renting services in Hong Kong. These new ideas and thoughts can make a real difference.

   Besides, people would not move in the same pace. Some people will move faster. There are new concepts emerged in Hong Kong like co-working and co-living, such as sharing your kitchen, co-housing, Nine Floors and Airbnb. You can rent a room for strangers and earn money. In daytime, your sitting room can be rented out as working place, you only need to provide free Wi-Fi which turns into co-working place. You could also chat around and share information among each other.

3. What are the problems of Hong Kong developing into Smart City?

   The regulations of Hong Kong are too outdated, for instance, strict regulations in open spaces. Assemble in UK was initiated by a group of young architects, they are turning spaces under flyover into an outdoor cinema. In Hong Kong, leadership is too sensitive. All the ideas are thought as related to politics, only some occasional street markets can be found in Hong Kong. Even in Guangzhou, all people can form a street market in open space.
The regulations are more relaxed. Only when there are too many people, the police would intervene. Sharing is about design and respect.

In Hong Kong, street markets are occasional instead of permanent. Bicycle trials are not continuous like Tin Shui Wai. Many deadends are found, which are poor urban design and planning. In Hong Kong, roads are dominated by cars though many people own a bicycle. Bicycle trials should be designed to be safer. In London, people take their bicycles on train. Then, they cycle to their working places instead of driving. People’s behaviors are changing but not the government.

4. Are the Smart City development affected by the problem of trust?

Yes, people are still not in trust with new technologies. In Seoul, there are apps for people to share their dinner to strangers. People can cook, eat and chat with strangers. In Germany, people could share their excessive meals to strangers through apps. In Hong Kong, there are mistrust for inter-generations, i.e. between youth and elderly. However, Smart City should aid for those elderly, 60-75 years old are those retired but still active. Apps could aid these elderly to work or be volunteers. Also, there could be travel and hiking apps. People can form hiking team and hike together in Hong Kong.

5. Should Hong Kong strengthen the education in ICT for promoting Smart City development?

We don’t need ICT experts. More importantly, we need those who have the ability of observation. For example, Dog Bnb for people to keep their dogs to strangers’ home when they are out for travel. Also, the government should be more willing to listen. There should be more public engagement instead of public consultation. There are lots of solutions instead of one. We need more face-to-face communications instead of more ICT experts alone.

Interview with interviewee G

1. How GIS or spatial data can be applied into urban planning? Compare to traditional planning, what are the advantages of this type of smart planning?

From the perspective of planning phases, spatial data can be majorly used in preparation phase, the baseline review of a city. GIS containing all aspects of information serves as a city portfolio. Secondly is the planning and designing phase, which also includes public consultation. GIS serves as a tool to interact with citizens which offers all alternatives to citizens and encourages them to propose their own design. Lastly is the evaluation phase, demonstration showcase for planning projects. GIS can present the planning projects before implementation to predict and avoid problems caused by inappropriate planning.

From the perspective of planning types, spatial data can be widely used in overall planning. While some controlling-detailed planning and community planning will also benefit from GIS. This kind of Smart Planning, compared with traditional planning, has more foresight and accuracy because it celebrates an integrated and comprehensive data bank.
2. Is this type of smart planning widely used in Hong Kong or worldwide? Are there any obstacles and opportunities applying GIS or spatial data into urban planning in Hong Kong?

For Hong Kong, the application of GIS and spatial data visualization is preliminary. We are still in the process of exploring and developing. Actually, we do have plenty of information controlled by different departments like Planning Department, Lands Department, Transport Department and Water Supply Department etc. These kinds of data should have been all contained by GIS system for planning and other positive uses. But since different departments have different ways to record and operate the data of their own field, there has been enormous difficulties to unify the fragmented data in GIS and plan as a whole and comprehensive system.

From my view, there are three major obstacles keeping spatial data being used in spatial planning. First, there was no dedicated department to manage and unify all kinds of spatial information before 2015. Also there is no integrated programme to record and present all data as a whole system. The opportunity is, for now, we have Innovation and Technology Bureau. If it succeed to solve those problems, it is just a matter of time to popularize GIS. Moreover, some spatial data is confidential such as military information. If the government can consider to open data and keep appropriate transparency, much more ideas and innovations can emerge. In addition, Government do not have enough trust towards citizens to share and open their information, concerning they use the data negatively.

3. What kind of technology can be used to facilitate citizens in using open space?

Open space in Hong Kong is enough. However, why are most people feel there is a shortage? Simply because the lack of awareness. Some pocket open spaces are concealed and barely idle. If there is a technology that can tell people what facilities and spaces are around them wherever they are, such problems will be solved. "People-oriented" technology will encourage citizens to use not only open space but also all kinds of services.

4. In terms of regional collaboration, especially with the PRD, what do you think will be the ways for Hong Kong to develop into a smart city as part of a smart region?

Spatially, we already have interconnected bridges and roads. If we can simplify customs clearance procedures through some approaches, the connectivity would be enhanced. We often talk about that we live in one hour transport circle. This could be true only if we improve the commuting efficiency. For cooperation, actually I think it is most likely for Hong Kong to cooperate with some areas including Hengqin, Qianhai and Nansha, which are some free trade areas that are still in their initial stage of the development. On the one hand Hong Kong can participate into the development of these areas. On the other hand, Hong Kong will seek opportunity for its own development through a larger platform.

5. Is it necessary to have local supporting industry to support the development of smart city?

It is true that compared with Singapore and Mainland China, Hong Kong has been behind in terms of information technology industry for too many years. Development of information technology industry is still at an initial stage in Hong Kong. Actually government of Hong Kong has concerned about this. However, we should acknowledge that cultivating the
system of industry, research and relevant talents is a long term process. It is not possible for us to see significant results within just a few years. I think it takes at least ten years or even twenty years that we can gradually catch up with other cities and regions. But this is definitely a direction of our development.

6. What would be the possible models of smart city development in Hong Kong? E.g. government-led, PPP, cross-regional collaboration. What would be the challenges in using the model?

As just mentioned before, on the one hand, there is still not a department that can coordinate the whole things of smart city development. On the other hand, each department may have some confidential information that is inconvenient to open to the public. These two aspects are the obstacles to the development of partnerships. The key point of opening data is how to balance the degree of openness. Government departments should try to increase the openness of information. For the information cannot be disclosed, the government should think about in what kind of way that this part of information can be expressed appropriately.

7. Green building and intelligent building is a global trend. In Hong Kong, what are the obstacles in developing these buildings? (e.g. Is this feasible in a high density and high population density environment? Are there any policy support? Social acceptability? Any infrastructure support?)

A high density environment could pose obstacles in creating a green neighborhood. For example, it might be hard to plan cycling paths. One of the concept in Smart City is sharing the water and electricity delivery through common use of pipes. However, the current pipe network in Hong Kong is messy and not well-joint. It is difficult to construct a huge pipe for share usage because it would involve a relatively long period of street closure and street activities would be heavily intervened. However, it is worth trying out in new towns.

8. Does Hong Kong have an elderly community? (i.e. a community planned specially for the elderly). In your opinion, how can technology be applied in planning for an elderly community?

Hong Kong doesn’t have an elderly community yet but there are buildings 樂融軒 (Harmony Place) catering the elderly by the housing society. This kind of integrated housing would be a trend in the future in Hong Kong.

9. What would be the challenges and breakthrough for Hong Kong to develop as a smart city?

First of all is to enhance multiple stakeholders’ collaboration. A government agent is required to oversee the whole Smart City development. A long-term vision for Smart City development is essential, the government should not cut the budget for ICT simply because of no short-term result shown. Moreover, a testing field for testing new technology is needed. It is different in nature compared to Science Part and Cyberport. Besides, crowd-sourcing and input from the community plays an important role in Smart City development.
Interview with interviewee H

1. What are the difficulties of data collection in Hong Kong? Are they only collected from your own customers?

Green Button in US provides data to the third party, they ask whether the customers are willing to provide their data to them so the problem of privacy is fully addressed and more data could be collected for use. Usually, we don't need much data for electricity usage, just during peak demands, i.e. summer. This could significantly reduce the use of less energy-efficient power machines.

2. What data do we need for energy analysis except electricity?

Data like traffic flow, noise, temperature and radiation, generally is data from our environment all affect the use of electricity. Air ventilation will also affect the use of electricity and air-conditioning. Energy analysis aids end-users to set up their living and working environment.

3. Is the data provision enough in Hong Kong?

Data provision is definitely not enough in Hong Kong, but certain data is provided from the in Hong Kong Observatory for third party uses. Population census could also provide some insights to us. However, most of these data is not real-time, like census.

4. Is there any problems for data processing in Hong Kong?

Yes, of course. The most difficult part is formatting the data collected. Usually, the data scientists would spend more than 75% of their time to clean up all the data. Hong Kong government should take the lead and standardize all the data.

5. Do you think Hong Kong government has carried enough initiatives to promote Smart City?

Singapore has a better and overarching IT teams which Hong Kong doesn’t. In Hong Kong, different departments have their own IT teams. It’s difficult and ineffective to unify the data from all the departments before other uses.

6. What is the students' response to smart technologies in HKU residential hall?

They show interests while the electricity usage actually decreases without any new policies and implementations. There are real-time data showing in every floors of the buildings. 20% of reduction is recorded may be due to the data showing and they have more initiatives to reduce their use. The data is also presented interestingly like what your electricity bills are and how much it will equal to. This can build personal and closer relationship with your own electricity consumption. However, currently in most of the buildings, there are only one or two meters showing the electricity consumption of the whole building instead of each household.
7. Besides from HKU, what are your suggestion to enhance Smart Living in other residential buildings?

Tenants would use lots of electricity, air-conditioning and many other kinds of devices. We should build a database for energy consumption. Metering is essential for financing. More meters should be installed like in public housings. Forming partnership with large developers or Housing Authority can have stronger impacts.

8. Would smart technologies eventually increase the usage of energy in the end?

Smart Home technologies are not only for branding, but with purposes like strengthening security and improving energy performances. Most Smart Home technologies are rechargeable and requires low usage of electricity. Sensors are applied to minimize electricity usage. Hardware costs are required. Mobile apps won't increase any energy usage. Most hardware are durable but maintenance costs are needed.

9. What are difficulties start-ups are facing in developing smart technologies?

There are constraints for the operation of the government. There are lots of procedures for them to ensure the implementations work. Everything needs to be step by step. The government should democratize these processes and regulations by providing more platforms for communications. Also, we need to find ways to attract more talents and enhance the education of ICT development.

Written interview with interviewee I

1. How would you comment on the current development of Smart City in Hong Kong?

We are not very smart beyond the basics. Problem is we tend to rely on proven technology as the bureaucracy is risk averse and does not invest in new technology or develop its own. Our last “smart” win was the implementation of the octopus card, and subsequent export of the technology.

Moreover, our standards, guidelines and practices are outdated and with the senior management of government focused on constitutional and political issues since 1982 - we fail to run the city as a city and allocate adequate time to manage the change.

2. What are the strengths and weaknesses for Hong Kong to develop as a Smart City?

Hong Kong is an ultra-high density city, we have our own financing and full control over the management of the city as a city. However, we are lack of political will and focus, and we don’t have enough understanding of “smart”.

3. What kind of urban planning strategies would you suggest to make Hong Kong smarter?
The issue is not planning but implementation. There are many aspects which Hong Kong can be smarter. For instance, common enclosures for private and public utilities so that we don’t have to break open the road, district cooling for residential but not just for government and transport, high speed broadband for both cable and mobile throughout the city, the right of public access to all operational data of public service providers, whether these are commercial operators (electricity, buses, minibuses) or government departments (survey and mapping office), electronic road pricing, smart parking meters and smart parking garage, etc.

4. In what ways do you think the use of ICT can help the public utilize public spaces and community facilities?

Constraints on the use of public space and community facilities have little to do with ICT. And “smart” is not just ICT as set out above.

5. In what extent, do you think Smart City initiatives can help Hong Kong Government solve urban problems or improve the current situation?

Examples under Qs. 3 will result in reduction of congestion, air pollution, etc. Improved broadband (improve mobile spectrum, roll out cable to the smallest villages, etc) will liberate talent from high cost offices and enhance innovation and creativity.

6. With regard to transportation, do you think Hong Kong should introduce smart transportation system (i.e. real time public transport information and electronic road pricing system)? What are the challenges in implementing these strategies?

This is simple stuff. We just need to get on with it.

7. How would Hong Kong Government, District Councilors, Planners and etc. engage with the community in the development of Smart City?

Just do it.

8. What are the potential opportunities and threats for Hong Kong to transform into a Smart City?

No threats. See qs.6 for some of the many benefits. There will be considerable concern over data privacy and “big brother” (or in Hong Kong’s case “grandpa”) is watching you.

9. In terms of regional collaboration, especially with PRD, what will be the future direction for Hong Kong to develop into a Smart City as part of a Smart region?

Open and public access to data relevant to Hong Kong including air quality, water quality, agriculture ground conditions, etc are just some examples of smart region actions which would benefit Hong Kong.

**Written interview with interviewee J**

1. How would Planning Department comment on the current development of Smart City in Hong Kong?
Smart city development is gathering momentum in Hong Kong. At a policy level, the Government has been taking proactive steps in promoting smart city development. You may wish to visit the following websites for a quick reference:

The 2015-16 Budget Speech:  
Central Policy Unit:  
Energizing Kowloon East:  
Transport Department:  

The pilot project at Kowloon East, for example, is providing a good test-bed for smart city development in the urban context. Apart from government initiatives, the private sector is also taking part in promoting smart city development, including the Zero Carbon Building to showcase the state-of-the-art green design and technologies, the mobile application launched by the Mass Transit Railway Corporation to provide updates of its train schedules, etc. Looking ahead, a holistic framework for bringing together different stakeholders and initiatives is instrumental to further pursue smart city development in Hong Kong.

2. What are the strengths and weaknesses of Hong Kong to put forward the notion of Smart City?

Hong Kong has made tremendous efforts in public and private sector alike in promoting smart city developments. Our efforts have been recognized internationally. According to “The 10 Smartest Cities in Asia-Pacific 2013” published by Boyd Cohen, an internationally prominent expert in smart city, Hong Kong was ranked fourth. In it, Hong Kong scored the highest in its ranking for smart mobility. Nevertheless, the Global Innovation Index 2014 suggested that Hong Kong is relatively weak in the knowledge and technology output. While the benchmarking indexes should not be taken in earnest as different indicators may have different assumptions which cannot be compared directly and the data quality may vary, they are useful in providing a bird’s eye view of the global positioning of Hong Kong and serve as a reference to gauge the areas requiring further improvement. Building upon the existing strengths such as a compact development pattern which promotes economy of scale in provision of new services and infrastructure, telecom infrastructural network and leveraging the foundation established by both public and private sectors. Hong Kong should have good potential to take forward the smart city notion.

3. In terms of regional collaboration, especially with PRD, what will be the future direction for Hong Kong to develop into a Smart City as part of a Smart region?

The concept of smart city development will be taken into account in the ongoing updating exercise of the territorial development strategy, viz., “Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030” (the Hong Kong 2030+). It aims to examine the strategies and feasible options for overall spatial planning and land and
infrastructure developments for Hong Kong beyond 2030, in the light of our latest needs. It will continue to champion sustainable development as in the Hong Kong 2030 Study promulgated in 2007, including good resources management. As the study is still ongoing, it is premature to answer these questions in details at this juncture. Nevertheless, study findings will be made available to the public in the public engagement process in due course. As regards the Hong Kong Planning Standards and Guidelines (HKPSG), it is an established practice for the government to duly review them to take account of policy and development needs, where appropriate.
Interview with interviewee A

1. How would you comment on the use of social media and mobile application?

People use social media like facebook and instagram to share locational information. There are more and more location-driven applications which people are willing to expose their privacy in social media and mobile application.

2. Is high population density an advantage to develop Smart City?

The use of technology is to solve problems. High density cities generate different social problems. In the past, we mainly used human minds to solve problems. Nowadays, we can rely on ICT and GIS technology to help us. Hong Kong is definitely is a high dense city which creates spatially related problems. Technology could help in solving these problems, for instance, real time data can improve the arrangement, management, scheduling of construction work and reduce disturbance to neighborhoods. Development of smart city is a way out in alleviating problems in high population density cities.

3. Can smart strategies solve housing problem in Hong Kong?

We should view housing problem in Hong Kong from both quantity and quality perspective. For quantity, GIS can help to search for available lands for housing development. To improve the quality of housing, we can also use GIS for re-arranging the high density area where has too many public housing. It may also use GIS to create a model for green spaces and improve the quality of life of citizens.

4. What should the Government do to push the development of Smart City?

EKEO is a pilot scheme of Smart City development in Hong Kong, which has been running quite well. However, the largest obstacle which Hong Kong is facing now is to coordinate different departments in terms of data sharing. Smart city development is more about the quality of the data, in other words, the readiness of data usage and availability of data, instead of the quantity of data. Although there are more than 5000 data sets provided by the government currently, these data sets do not have the same data definition and base map, which is difficult to carry out further data analysis or application. SDI is needed to improve the data definition among different departments. Most importantly, an API is needed to develop in order to create a platform for different users to access those data and facilitate data application. ITB maybe an opportunity as it is trying to cope with the standards of various data sets.

5. Do we need to plan the land use for Data Centers?

Currently, there is data center policy and some industrial land uses are redesigned for data centers. The development of Cloud service needs data centers to support and planning has a role to play in this area.

6. From financial perspective, what are the challenges to Smart City development in Hong Kong?
Recurrent cost is the biggest challenges for the development. Financial Bureau is not willing to commit the recurrent cost every year to develop a system for data management and collaboration. This prudent financial management style hinders the development of smart city. Besides, outdated regulation and rigid regulatory framework is another challenge. Of course, filibuster in LegCo may also affect the financial situation and budget approval. Moreover, data from government is not always free. Lands Department sells Geo Information Data and add value to the projects. This increase the cost for data usage and application.

7. Why Hong Kong has not yet developed its API?

This is mainly about the institutional arrangement. There should be one government department responsible to develop the API and share it to other departments. This requires better institutional structuring.

8. What should be done to promote Smart Transportation in Hong Kong?

There are many aspects that Hong Kong can explore in Smart Transportation. For example, providing traffic time data, parking information and real time congestion information, improving EV chargers location and developing applications like the KMB apps.

9. We noticed that KMB has cooperated with ESRI and developed its applications. Could you share this experience with us?

KMB has initiated the project and approached us. We have cooperated for more than ten years and there are various stages of development. At the beginning, KMB seeks to improve the passengers’ enquiry system and use GIS to build a model and input data on webpage. The second stage we aimed at enhancing efficiency by data integration and streamlining the process. At stage three, we focused on fringe management which allowed us to know the buses and drivers locations. At later stage, our development became more customer oriented and started developing mobile application for customers. Nowadays we can even calculate the transition time and walking distance between two bus stops to facilitate passengers.

10. As one of the members of Smart City Consortium, can you tell us more about the role of Smart City Consortium in Hong Kong?

It is a platform for different stakeholders to share ideas. Integration with Mainland is one of our major focus. Frankly speaking, Mainland Smart Cities are much more mature than Hong Kong. We will use Mainland standards as reference and hope to create synergy through cooperation. There is possibility for both parties to join ISO jointly.

11. How could GIS facilitate public engagement and settling controversial issues?

Public engagement requires institutional arrangements, however, data can be one of the support factors and provide evidence.

12. How would you comment on Digital divide problem in Smart City development?
Digital divide has been alleviated in this generation since the devices become much more affordable to the public and NGOs provide help to the needy.

13. Talents are essential foundation in Smart City development. What should be done for talents cultivation?

Coding and GIS courses should be provided to the students. In fact, ESRI is providing GIS materials to primary and secondary schools nowadays.

Interview with interviewee B

1. Does KMB employ ICT into your daily operation?

Basically we look at data to see how they can be harnessed to improve our efficiency and we have invested money into changing the way buses operate and give information.

2. Does the government provide any help?

In Hong Kong, government doesn’t provide anything. If the government really hands out money to transport operator, one disadvantage of this is to hand out money to public services. If government provides money, there will be less innovation. And in the end, everyone will be doing everything the government wants to do.

3. How do you see the role of KMB in the development of Smart City in Hong Kong?

KMB has a very key role in Smart City since KMB’s public transport market share is the second largest, with 4000 buses and 4000 bus stops, 2000 drivers and 12000 staff plus drivers. If you map our network on a Hong Kong’s map, you will find a very wide coverage.

4. Can you tell us more about sharing data?

Data that can be shared include arrival info, how full the bus is, as well as forward journey time. The problem of sharing data is that under a market-led environment, nobody wants to share. The ideal situation will be putting data in an open platform for the sake of achieving better quality. Right now, there is no common standard so nothing can be integrated. You just can’t make sense of the data with a single platform. Therefore, the government should set clear industrial data so that everyone will comply and to share basic data available in public domain.

5. We have seen interactive bus stations during our field trip to Singapore, do you have any comments on such devices?

All bus stations in Singapore are by NDA. It is a difficult task to enhance a bus stop in Hong Kong. Say I want to upgrade the bus terminal, saying that KMB is willing to invest in such upgrading process, but since they are all maintained by Highway Department, we are not allowed to change a lightbulb.

For bus shelters, since they are structured on public land, getting a power connection to station is also difficult. We only have 1000 bus stations with power out of 4000 bus stops.
Even for the ones with power, there are high restrictions of what we can do. For example, at least LED screen for bus arrival info, end of 2017 all the bus stops with power.

Speaking of electric power, it is known that electric buses need charging facilities. We need extra power for charging electric buses and we have been telling CLP that we want to build a sub-station and we will pay for them. But the point is that CLP has no incentives on transport.

6. How do you comment on Intelligent Transport System in Hong Kong?

No. There is no such thing in Hong Kong. We are lagging 20 years behind, such thing doesn’t exist in Hong Kong. What the city can do is to establish a basic system - central traffic management centre like those in Singapore, Taipei and Seoul. They all are real time. The centre will be responsible for management interdependency on transport. For instance, if MTR breakdown and needs buses to help transfer its passengers, this single platform will decide how many buses will be needed. But now since there is no communal platform sharing data, KMB often over- or under-deploy buses.

We also need intelligent junctions. Those in Hong Kong are running like robots. They don’t have prediction-based timing advanced vehicle management system.

Private cars in Hong Kong increase tremendously. Illegal parking is another issue. In Hong Kong, if see illegal parking, no prosecution will be carried out by the police but in other countries corresponding authority will take actions. This issue also affects bus operators. Bus stations are sometimes occupied by loading and unloading while buses can’t go in. For example, Canton Road outside Apple store.

In Seoul, they have cameras, as soon as there is illegal parking, the camera will take more than 30 pictures, taking a picture of you license plate and no staffs have to come.

7. Could you comment on KMB application?

Right now our mobile app is popular but we will be bringing our app to the next level. At present we have app usage data but little personalization but new version will be more intelligent built.

Privacy and personalization are different issues since for personalization, your phone will do the work. Your phone just need to know your behavioral pattern. But for privacy, we have to identify the person or obtain personal data. We have to have many clear handling policies like customer hotline, setting customer services.

8. How do you see e-shopping trend in Hong Kong?

E-shopping is growing fast even in Hong Kong but the delivery of satisfaction is much poorer than other countries. In the US, delivery is very clear, perfectly packed but in Hong Kong, logistics supply chain discourages e-shopping. E-shopping in Hong Kong is not really cheap sometimes.

9. What do you think about implementing electronic road pricing (ERP) in Hong Kong?
ERP feasibility studies was done 10 years ago and Hong Kong did a pilot, spending HKD 100 million. The pilot was successful and this can show that we have available data and ERP can indeed happen in Hong Kong. But why we still don’t have it now? It’s because of the opposition of the drivers etc.

In Singapore they have a device in the car. Everyone has a card and put the card in the device. If the car passes by a toll area, the money will be deducted right away. They don’t have to stop their cars and start counting money to pay the fare, like in Hong Kong. We need a signal poster linking 10 to 20 junctions together. Hong Kong has developed this but Hong Kong needs to put more efforts at area control system.

10. What is your comment on Uber?

Speaking of Uber, from a regulatory perspective, Uber poses challenges since it is an unregulated market. Buses were like Uber back then. There was no regulation to for bus operators to apply for. As long as you bought a bus, you could drive. And since everyone did the same it soon became chaotic and incidents occur. Uber is exactly undergoing the same cycle. Uber costs problems like illegal parking. They stop at non-stop areas and they have poor driving behavior.

For electric signage in Hong Kong, there are very few. We don’t have IDS backbone. If we have this backbone running in highway, screens displaying info and that info has to come out from somewhere.

11. What are your suggestions in making Hong Kong smarter?

Smart City intends to build a network of networks. Bus system can do that very soon. We don’t even need to connect to a center, we can make buses talking to each other, just like machine to machine communication. We should build a web of information and distill real-time data.

Interview with interviewee C

1. What are the difficulties to introduce a Neighborhood Sharing Mobile Application? Residents’ readiness is one of the challenges and which is not enough now. Hong Kong people do not have mutual trust and they do not rely on their neighbors, especially in gated community. In the old days, people shared food and service, i.e. television, child caring services and this would help to tie everyone together and build a strong social link between the neighbors. Nowadays, in contrast, people living in gated community are not really ready to share their things with neighbors and not ready to build relations with their neighbors. For instance, there was a Tseung Kwan O bazaar in the gated community, but no one would like to come due to a lack of community spirit. However, there were some successful cases, i.e. the Tung Chung Dogs Club which occurs to fight for their own interests. People use ICT, i.e. whatsapp, to communicate and organize people to deal with the conflicts. ICT solve problem as a painkiller to tackle the pain points (problems) and it has to be down to the earth. Hence, the use of ICT makes Smart City much more effective and efficient by reducing the cost and time.
2. How to enhance spatial planning with the use of ICT?

EKEO has developed an application for the pedestrians to locate different alleys and graffiti. Hysan Place may also incorporate some smart technologies in their design. Ms Chan Pik Ki (陳碧琪) and HKIE will also be helpful for the research of Smart City.

3. What do you think the Hong Kong government can do to support the development of Smart City?

Hong Kong is lacking of a well-defined government funding which is not looking into quick return. Currently, for instance, the Cyberport Incubatee Fund cannot really help to facilitate the development since it has too many restrictions (need to rent Cyberport office, restricted marketing budget). For the Matching Fund System, it is not helpful because young start-ups are very hard to attract Venture Capitals. Every big thing must be driven by the government, for example, to establish ITB to coordinate the development of Smart City. ITB should do the 5-years plan with the VMV (Vision, Mission, Values) and every departments should do annual report about the use of big data.

4. How would you comment on the current development of Smart City?

The current development of smart city technology is mainly profit-driven. MTRC has adopted the prudent financial management principle since it is a listed company which means that it has to be responsible to its shareholders. In addition, it has to fulfill some requirements of Sustainability and Corporate Social Responsibility (CSR). Environmental auditing and energy efficiency have also taken into account since it can reduce cost and increase profits. With regard to a unified public transport app, since it is customer-driven, so if there is a demand, someone will do it.

5. How would you comment on the development of FinTech?

Taking the mobile application of DBS bank which has its branches address and e-banking services. It brings convenience to customers, but Hong Kong people do not have trust in technology. Fin Tech in mainland is quite common, like TaoBao, Wechat pay, Alipay. Chinese government use institutional arrangement to push the development. Clouding funding may be risky, but the regulation system can be adjusted and revised. The widespread of Octopus card mainly because of its flexibility to accommodate different functions, like residents card and staff cards. However, Octopus Card Company has been required to use bank license and it may be one of its constraints of its development.

6. How to strike a balance between privacy and the use of big data?

It is a kind of trade off and everyone can have their own judgment. There are two types of people. The first type of people will adopt the new trend of technology and less care about privacy, while the second type of people stress on privacy more.

**Interview with interviewee D**
1. How would you interpret the concept of Smart City?

I think smart city is a concept related to city development and urban governance. Hong Kong is facing population growth and this is a challenge for the government. Technology may provide a solution to the city to improve our quality of life.

2. How would you comment on the current development of Smart City in Hong Kong?

Hong Kong is lagging behind. Although it has good IT infrastructures and high mobile penetration rate, there is no agent to lead the development of smart city. Currently the development of smart city is only done by a small department of the EKEO. The new Innovation and Technology Bureau (ITB) does not have a clear positioning so it is doubtful whether it could be the agent. In addition, Hong Kong is currently lacking a set of standards for data.

3. What are the strengths and weaknesses for Hong Kong to develop as a Smart City?

I think the strength is that Hong Kong has good ICT foundation. For example, our wifi hotspot is everywhere and we have octopus card which you can use it in public transport, supermarket and convenience stores. Also, Hong Kong has existing legislation and government body to protect data privacy of our citizens. However, the weakness for Hong Kong is that it lacks a cross-departmental collaboration, ICT talents, a Smart government and data transparency. For example, there is no mobile app about parking vacancy because all data are owned by the private company.

4. What elements do you think the Hong Kong Government should take into consideration in developing Smart City strategies?

I think Hong Kong needs a cross-department task force in order to develop smart city. The task force should draw representatives from different government departments and to coordinate data from different department in terms of its format and standards. Also, the government also take into consideration society’s mindset. I think that currently our society still have think that IT talents are worse off than businessmen and thus parents don’t encourage their children to pursue a career in ICT industry. The government should consider making ICT compulsory in the school curriculum. I think the future development of Smart City in Hong Kong should be a Public-private partnership model. However, it is challenging to ask the public transport service providers to share their data due to a lack of incentives, hence, the government should make open data as a condition when renewing the franchise. Hong Kong should have a platform to collect all the parking information and share to the public.

5. In terms of regional collaboration, especially with PRD, what will be the future direction for Hong Kong to develop into a Smart City as part of a Smart region?

There is a need for Hong Kong to make reference with the international and mainland standards of Smart City. For example, there should be a common standard of cloud computing. Also, Hong Kong and China can have more cooperation. For example, China has a vibrant e-shopping platforms such as Taobao and Alipay. The platform could be expanded to Hong Kong.
Interview with interviewee E

1. As quoted in the The Hong Kong Institute of Surveyors Annual Conference 2014, “Smart city development strategy will transform Hong Kong into a quality city which enables it to attract people, capital and ideas”. Can you elaborate some of these strategies?

In Hong Kong, we have sufficient data but still it is not fully concentrated. In the spatial scale, Smart City innovation using ICT can help improve developments like public space. For example, the use of Google Map or similar web applications can help improve information for public to access public space. On a related note, the public spaces should also be reconsidered to find ways. The government’s Innovation and Technology Bureau (ITB) can take lead on initiating ICT based strategies and refining the ordinance to promote data integration in various government departments.

2. What affect does Smart City have to address the growing ageing population?

Smart City has potential to cater and address to the growing ageing population in Hong Kong. The traditional notion of the senior cares centers or underwhelming and does not provide any positive moral for those who are reaching the senior age bracket. ICT can provide better living conditions for elderly so that they can continue to live at home alone. For instance, alert systems or cameras could be placed in homes to make sure medical services are alerted in case of any irregular activities. ICT can also help improve ways of daily chores. Lastly, innovation in how we design homes can better prepare seniors in their existing homes.

3. Based on the current government environment, do you feel developments towards a smart city (e.g. enhancing homes with ICT) will be feasible within the next 2030 plan?

As mentioned earlier, there is sufficient data available for use for ICT. However, the data is not fully utilized when compared to neighboring regions such as Shanghai. Currently there is no transparency for the data, which reduces credibility and accuracy. With better transparency of these data, both government and the private sector can benefit from the use of the datum.

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**Interview with interviewee F**

1. What do you think is Smart City?

Smart City is not only about IT technologies. People is the most important part behind this concept. It should focus on resource allocation & sharing, with respects without discriminations. For example, sharing the old clothes to someone who needs through mobile apps & internet through apps such as Around Hubs or Around Neighbors. Apps alone cannot connect people. They cannot be too commercial but for better resource allocation among people.

2. Is Hong Kong ready for Smart City development?

Hong Kong is not ready for Smart City development. For instance, Uber in Shanghai is legal and there is over 1000 types of cars can be rented through apps in France but these apps are not in Hong Kong. We could also rent cars instead of really own and buy a car. There is another example of sharing and better resource allocation. Kai Fong apps which advocates sharing and renting services in Hong Kong. These new ideas and thoughts can make a real difference.

Besides, people would not move in the same pace. Some people will move faster. There are new concepts emerged in Hong Kong like co-working and co-living, such as sharing your kitchen, co-housing, Nine Floors and Airbnb. You can rent a room for strangers and earn money. In daytime, your sitting room can be rented out as working place, you only need to provide free Wi-Fi which turns into co-working place. You could also chat around and share information among each other.

3. What are the problems of Hong Kong developing into Smart City?

The regulations of Hong Kong are too outdated, for instance, strict regulations in open spaces. Assemble in UK was initiated by a group of young architects, they are turning spaces under flyover into an outdoor cinema. In Hong Kong, leadership is too sensitive. All the ideas are thought as related to politics, only some occasional street markets can be found in Hong Kong. Even in Guangzhou, all people can form a street market in open space.
The regulations are more relaxed. Only when there are too many people, the police would intervene. Sharing is about design and respect.

In Hong Kong, street markets are occasional instead of permanent. Bicycle trials are not continuous like Tin Shui Wai. Many deadends are found, which are poor urban design and planning. In Hong Kong, roads are dominated by cars though many people own a bicycle. Bicycle trials should be designed to be safer. In London, people take their bicycles on train. Then, they cycle to their working places instead of driving. People’s behaviors are changing but not the government.

4. Are the Smart City development affected by the problem of trust?

Yes, people are still not in trust with new technologies. In Seoul, there are apps for people to share their dinner to strangers. People can cook, eat and chat with strangers. In Germany, people could share their excessive meals to strangers through apps. In Hong Kong, there are mistrust for inter-generations, i.e. between youth and elderly. However, Smart City should aid for those elderly, 60-75 years old are those retired but still active. Apps could aid these elderly to work or be volunteers. Also, there could be travel and hiking apps. People can form hiking team and hike together in Hong Kong.

5. Should Hong Kong strengthen the education in ICT for promoting Smart City development?

We don’t need ICT experts. More importantly, we need those who have the ability of observation. For example, Dog Bnb for people to keep their dogs to strangers’ home when they are out for travel. Also, the government should be more willing to listen. There should be more public engagement instead of public consultation. There are lots of solutions instead of one. We need more face-to-face communications instead of more ICT experts alone.

Interview with interviewee G

1. How GIS or spatial data can be applied into urban planning? Compare to traditional planning, what are the advantages of this type of smart planning?

From the perspective of planning phases, spatial data can be majorly used in preparation phase, the baseline review of a city. GIS containing all aspects of information serves as a city portfolio. Secondly is the planning and designing phase, which also includes public consultation. GIS serves as a tool to interact with citizens which offers all alternatives to citizens and encourages them to propose their own design. Lastly is the evaluation phase, demonstration showcase for planning projects. GIS can present the planning projects before implementation to predict and avoid problems caused by inappropriate planning.

From the perspective of planning types, spatial data can be widely used in overall planning. While some controlling-detailed planning and community planning will also benefit from GIS. This kind of Smart Planning, compared with traditional planning, has more foresight and accuracy because it celebrates an integrated and comprehensive data bank.
2. Is this type of smart planning widely used in Hong Kong or worldwide? Are there any obstacles and opportunities applying GIS or spatial data into urban planning in Hong Kong?

For Hong Kong, the application of GIS and spatial data visualization is preliminary. We are still in the process of exploring and developing. Actually, we do have plenty of information controlled by different departments like Planning Department, Lands Department, Transport Department and Water Supply Department etc. These kinds of data should have been all contained by GIS system for planning and other positive uses. But since different departments have different ways to record and operate the data of their own field, there has been enormous difficulties to unify the fragmented data in GIS and plan as a whole and comprehensive system.

From my view, there are three major obstacles keeping spatial data being used in spatial planning. First, there was no dedicated department to manage and unify all kinds of spatial information before 2015. Also there is no integrated programme to record and present all data as a whole system. The opportunity is, for now, we have Innovation and Technology Bureau. If it succeed to solve those problems, it is just a matter of time to popularize GIS. Moreover, some spatial data is confidential such as military information. If the government can consider to open data and keep appropriate transparency, much more ideas and innovations can emerge. In addition, Government do not have enough trust towards citizens to share and open their information, concerning they use the data negatively.

3. What kind of technology can be used to facilitate citizens in using open space?

Open space in Hong Kong is enough. However, why are most people feel there is a shortage? Simply because the lack of awareness. Some pocket open spaces are concealed and barely idle. If there is a technology that can tell people what facilities and spaces are around them wherever they are, such problems will be solved. "People-oriented" technology will encourage citizens to use not only open space but also all kinds of services.

4. In terms of regional collaboration, especially with the PRD, what do you think will be the ways for Hong Kong to develop into a smart city as part of a smart region?

Spatially, we already have interconnected bridges and roads. If we can simplify customs clearance procedures through some approaches, the connectivity would be enhanced. We often talk about that we live in one hour transport circle. This could be true only if we improve the commuting efficiency. For cooperation, actually I think it is most likely for Hong Kong to cooperate with some areas including Hengqin, Qianhai and Nansha, which are some free trade areas that are still in their initial stage of the development. On the one hand Hong Kong can participate into the development of these areas. On the other hand, Hong Kong will seek opportunity for its own development through a larger platform.

5. Is it necessary to have local supporting industry to support the development of smart city?

It is true that compared with Singapore and Mainland China, Hong Kong has been behind in terms of information technology industry for too many years. Development of information technology industry is still at an initial stage in Hong Kong. Actually government of Hong Kong has concerned about this. However, we should acknowledge that cultivating the
system of industry, research and relevant talents is a long term process. It is not possible for us to see significant results within just a few years. I think it takes at least ten years or even twenty years that we can gradually catch up with other cities and regions. But this is definitely a direction of our development.

6. What would be the possible models of smart city development in Hong Kong? E.g. government-led, PPP, cross-regional collaboration. What would be the challenges in using the model?

As just mentioned before, on the one hand, there is still not a department that can coordinate the whole things of smart city development. On the other hand, each department may have some confidential information that is inconvenient to open to the public. These two aspects are the obstacles to the development of partnerships. The key point of opening data is how to balance the degree of openness. Government departments should try to increase the openness of information. For the information cannot be disclosed, the government should think about in what kind of way that this part of information can be expressed appropriately.

7. Green building and intelligent building is a global trend. In Hong Kong, what are the obstacles in developing these buildings? (e.g. Is this feasible in a high density and high population density environment? Are there any policy support? Social acceptability? Any infrastructure support?)

A high density environment could pose obstacles in creating a green neighborhood. For example, it might be hard to plan cycling paths. One of the concept in Smart City is sharing the water and electricity delivery through common use of pipes. However, the current pipe network in Hong Kong is messy and not well-joint. It is difficult to construct a huge pipe for share usage because it would involve a relatively long period of street closure and street activities would be heavily intervened. However, it is worth trying out in new towns.

8. Does Hong Kong have an elderly community? (i.e. a community planned specially for the elderly). In your opinion, how can technology be applied in planning for an elderly community?

Hong Kong doesn’t have an elderly community yet but there are buildings 樂融軒 (Harmony Place) catering the elderly by the housing society. This kind of integrated housing would be a trend in the future in Hong Kong.

9. What would be the challenges and breakthrough for Hong Kong to develop as a smart city?

First of all is to enhance multiple stakeholders’ collaboration. A government agent is required to oversee the whole Smart City development. A long-term vision for Smart City development is essential, the government should not cut the budget for ICT simply because of no short-term result shown. Moreover, a testing field for testing new technology is needed. It is different in nature compared to Science Part and Cyberport. Besides, crowd-sourcing and input from the community plays an important role in Smart City development.
Interview with interviewee H

1. What are the difficulties of data collection in Hong Kong? Are they only collected from your own customers?

Green Button in US provides data to the third party, they ask whether the customers are willing to provide their data to them so the problem of privacy is fully addressed and more data could be collected for use. Usually, we don’t need much data for electricity usage, just during peak demands, i.e. summer. This could significantly reduce the use of less energy-efficient power machines.

2. What data do we need for energy analysis except electricity?

Data like traffic flow, noise, temperature and radiation, generally is data from our environment all affect the use of electricity. Air ventilation will also affect the use of electricity and air-conditioning. Energy analysis aids end-users to set up their living and working environment.

3. Is the data provision enough in Hong Kong?

Data provision is definitely not enough in Hong Kong, but certain data is provided from the Hong Kong Observatory for third party uses. Population census could also provide some insights to us. However, most of these data is not real-time, like census.

4. Is there any problems for data processing in Hong Kong?

Yes, of course. The most difficult part is formatting the data collected. Usually, the data scientists would spend more than 75% of their time to clean up all the data. Hong Kong government should take the lead and standardize all the data.

5. Do you think Hong Kong government has carried enough initiatives to promote Smart City?

Singapore has a better and overarching IT teams which Hong Kong doesn’t. In Hong Kong, different departments have their own IT teams. It’s difficult and ineffective to unify the data from all the departments before other uses.

6. What is the students' response to smart technologies in HKU residential hall?

They show interests while the electricity usage actually decreases without any new policies and implementations. There are real-time data showing in every floors of the buildings. 20% of reduction is recorded may be due to the data showing and they have more initiatives to reduce their use. The data is also presented interestingly like what your electricity bills are and how much it will equal to. This can build personal and closer relationship with your own electricity consumption. However, currently in most of the buildings, there are only one or two meters showing the electricity consumption of the whole building instead of each household.
7. Besides from HKU, what are your suggestion to enhance Smart Living in other residential buildings?

Tenants would use lots of electricity, air-conditioning and many other kinds of devices. We should build a database for energy consumption. Metering is essential for financing. More meters should be installed like in public housings. Forming partnership with large developers or Housing Authority can have stronger impacts.

8. Would smart technologies eventually increase the usage of energy in the end?

Smart Home technologies are not only for branding, but with purposes like strengthening security and improving energy performances. Most Smart Home technologies are rechargeable and requires low usage of electricity. Sensors are applied to minimize electricity usage. Hardware costs are required. Mobile apps won't increase any energy usage. Most hardware are durable but maintenance costs are needed.

9. What are difficulties start-ups are facing in developing smart technologies?

There are constraints for the operation of the government. There are lots of procedures for them to ensure the implementations work. Everything needs to be step by step. The government should democratize these processes and regulations by providing more platforms for communications. Also, we need to find ways to attract more talents and enhance the education of ICT development.

Written interview with interviewee I

1. How would you comment on the current development of Smart City in Hong Kong?

We are not very smart beyond the basics. Problem is we tend to rely on proven technology as the bureaucracy is risk averse and does not invest in new technology or develop its own. Our last “smart” win was the implementation of the octopus card, and subsequent export of the technology.

Moreover, our standards, guidelines and practices are outdated and with the senior management of government focused on constitutional and political issues since 1982 - we fail to run the city as a city and allocate adequate time to manage the change.

2. What are the strengths and weaknesses for Hong Kong to develop as a Smart City?

Hong Kong is an ultra-high density city, we have our own financing and full control over the management of the city as a city. However, we are lack of political will and focus, and we don’t have enough understanding of “smart”.

3. What kind of urban planning strategies would you suggest to make Hong Kong smarter?
The issue is not planning but implementation. There are many aspects which Hong Kong can be smarter. for instance, common enclosures for private and public utilities so that we don’t have to break open the road, district cooling for residential but not just for government and transport, high speed broadband for both cable and mobile throughout the city, the right of public access to all operational data of public service providers, whether these are commercial operators (electricity, buses, minibuses) or government departments (survey and mapping office), electronic road pricing, smart parking meters and smart parking garage, etc.

4. In what ways do you think the use of ICT can help the public utilize public spaces and community facilities?

Constraints on the use of public space and community facilities have little to do with ICT. And “smart” is not just ICT as set out above.

5. In what extent, do you think Smart City initiatives can help Hong Kong Government solve urban problems or improve the current situation?

Examples under Qs. 3 will result in reduction of congestion, air pollution, etc. Improved broadband (improve mobile spectrum, roll out cable to the smallest villages, etc) will liberate talent from high cost offices and enhance innovation and creativity.

6. With regard to transportation, do you think Hong Kong should introduce smart transportation system (i.e. real time public transport information and electronic road pricing system)? What are the challenges in implementing these strategies?

This is simple stuff. We just need to get on with it.

7. How would Hong Kong Government, District Councilors, Planners and etc. engage with the community in the development of Smart City?

Just do it.

8. What are the potential opportunities and threats for Hong Kong to transform into a Smart City?

No threats. See qs.6 for some of the many benefits. There will be considerable concern over data privacy and “big brother” (or in Hong Kong’s case “grandpa”) is watching you.

9. In terms of regional collaboration, especially with PRD, what will be the future direction for Hong Kong to develop into a Smart City as part of a Smart region?

Open and public access to data relevant to Hong Kong including air quality, water quality, agriculture ground conditions, etc are just some examples of smart region actions which would benefit Hong Kong.

Written interview with interviewee J

1. How would Planning Department comment on the current development of Smart City in Hong Kong?
Smarter city development is gathering momentum in Hong Kong. At a policy level, the Government has been taking proactive steps in promoting smart city development. You may wish to visit the following websites for a quick reference:

The 2015-16 Budget Speech:
Central Policy Unit:
Energizing Kowloon East:
Transport Department:

The pilot project at Kowloon East, for example, is providing a good test-bed for smart city development in the urban context. Apart from government initiatives, the private sector is also taking part in promoting smart city development, including the Zero Carbon Building to showcase the state-of-the-art green design and technologies, the mobile application launched by the Mass Transit Railway Corporation to provide updates of its train schedules, etc. Looking ahead, a holistic framework for bringing together different stakeholders and initiatives is instrumental to further pursue smart city development in Hong Kong.

2. What are the strengths and weaknesses of Hong Kong to put forward the notion of Smart City?

Hong Kong has made tremendous efforts in public and private sector alike in promoting smart city developments. Our efforts have been recognized internationally. According to “The 10 Smartest Cities in Asia-Pacific 2013” published by Boyd Cohen, an internationally prominent expert in smart city, Hong Kong was ranked fourth. In it, Hong Kong scored the highest in its ranking for smart mobility. Nevertheless, the Global Innovation Index 2014 suggested that Hong Kong is relatively weak in the knowledge and technology output. While the benchmarking indexes should not be taken in earnest as different indicators may have different assumptions which cannot be compared directly and the data quality may vary, they are useful in providing a bird’s eye view of the global positioning of Hong Kong and serve as a reference to gauge the areas requiring further improvement. Building upon the existing strengths such as a compact development pattern which promotes economy of scale in provision of new services and infrastructure, telecom infrastructural network and leveraging the foundation established by both public and private sectors, Hong Kong should have good potential to take forward the smart city notion.

3. In terms of regional collaboration, especially with PRD, what will be the future direction for Hong Kong to develop into a Smart City as part of a Smart region?

The concept of smart city development will be taken into account in the ongoing updating exercise of the territorial development strategy, viz., “Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030” (the Hong Kong 2030+). It aims to examine the strategies and feasible options for overall spatial planning and land and
infrastructure developments for Hong Kong beyond 2030, in the light of our latest needs. It will continue to champion sustainable development as in the Hong Kong 2030 Study promulgated in 2007, including good resources management. As the study is still ongoing, it is premature to answer these questions in details at this juncture. Nevertheless, study findings will be made available to the public in the public engagement process in due course. As regards the Hong Kong Planning Standards and Guidelines (HKPSG), it is an established practice for the government to duly review them to take account of policy and development needs, where appropriate.
## Annex III: Work Programme

### Task Name

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