COMPARATIVE OVERVIEW OF SMART CITIES INITIATIVES: SINGAPORE AND SEOUL

Dr. Yasmin Mohd Adnan
Dr. Hasniyati Hamzah
Dr. Melasutra Md Dali
Dr. Md Nasir Daud
Dr. Anuar Alias
Faculty of Built Environment
University of Malaya,
50603 Kuala Lumpur
yasmin_alambina@um.edu.my

Abstract

Since the advent of ICT in the mid-1990s, cities in many countries have reined in the potentials offered by technological development in making their cities better for the stakeholders. Smart City concept has been revealed as a city development concept that uses ICT as the foundation of initiatives and programmes that facilitate social and economic activities within the city. The Smart City concept has been adopted by Singapore and Seoul as a strategy to spur and sustain city development. This paper compares the Smart City initiatives of two cities in the region, namely Singapore and Seoul and attempts to provide a valuable insight into the implementation Smart City initiatives with regards to the six smart city dimensions as suggested by Giffinger. The findings revealed that the initiatives at these cities are related to the purpose and function of each city.

Keywords: *Smart City, Initiatives, Dimensions, Comparative*

1.0 INTRODUCTION

All through the world, city developers and managers have presented various city development concepts as an approach to enhance the city's sustainability. Among others, these concepts include Liveable, Green City, Sustainable City and Intelligent City. As opposed to being prescriptive, these concepts offer direction for the advancement and improvement for these cities. As beforehand specified, any proposed idea ought to be tailored to the requirements of the city, keeping in mind of the end goal of achieving the required improvement.

Smart City is a city development concept that has developed in prominence in the most recent decade. Turning into a "smart" city or unleashing the "smartness" possibilities of a city has been perceived as the best approach if a city chooses to remain prominent and sustainably manageable. Smart City principles have been suggested as a way of encouraging development and embracing sustainability.

A few cities have made attempts to make their city 'smart'. Seoul concocted 'Savvy Seoul 2015', touted as the "Fundamental Strategic Plan of Informatization of Seoul Metropolitan City" (Seoul Metropolitan Government, 2014). London and Birmingham have pursued on their "smart" arrangements as far as including smart initiatives, through financing and setting up forum for a coordinated effort (Centre for Cities 2014). For every case, the information and communication technology (ICT) was portrayed as being able to upgrade a city's effectiveness, imperativeness and appeal towards the well-being of its users.

This paper aims to introduce the Smart City concept and identify the various initiatives variations among the cities that have been identified as Smart City from previous studies. The initiatives are then compared so that an assessment can be made in relation to the city's functions and purpose. It has been observed that each city is unique in terms of its level of technology, demographic details, administrative structure, environment, geography and socio-political conditions. What is appropriate for one city may not work for another city. Thus, the implementation of Smart City principles for a city has to be studied within its pre-existing institutional framework in order to ensure a viable enhancement to the city development plans.

The Smart City initiative is seen as one of the solutions to arrest deteriorations due to scarcity of resources, inadequate and poor infrastructure, energy shortages and price instability, global environmental concerns, and human health concerns. Hence some view the Smart City as an icon of a sustainably liveable city. While a majority of discussions present rosy visions and ideal images of smart city (e.g., smart transportation, smart mobility, smart environment, smart energy, smart safety, and so on), little research has been made to identify the enabling factors of a smart city initiative (what really makes cities smart). What is really important to highlight is the notion that the success of Smart City initiatives is portrayed through the relation of these initiatives to the city's function and purpose.

2.0 SMART CITY CONCEPT AND CITY FUNCTIONS

The enormous improvement of information and communication technologies (ICT) and the strength of the Internet have seen the advancement of smart city. A deliberation has developed on new technology-based solutions, and new ways to deal with urban planning and living, which would guarantee future viability and well-being of metropolitan regions (Alawadhi et al., 2012; Dirks et.al. 2009; Nam and Pardo, 2011; Nijaki and Worrel, 2012; Yanrong et al., 2014). It is recognised that the concept of smart city is advancing and the work of characterizing and conceptualizing the term is still ongoing.

Having examined the smart city models from past work globally and locally, this paper intends to highlight the smart city initiatives under the six (6) smart city dimensions identified from the Giffinger's (2007) model for selected smart cities chosen in this study. This model has been selected as it has been adapted in the planning and development of Iskandar Malaysia, Johor in Malaysia whereby the dimensions under this model encapsulate the three (3) pillars of sustainable development: economy, social and environment. Giffenger et. al. (2007) has described smart city and its six characteristics through the evolution of a transparent and easy hierarchic structure, where each layer is described by the results of the previous layer. The six 'smart' characteristics that had been identified are: governance, economy, mobility, environment, people and living. These six characteristics known as dimensions were regarded as the relevant group characterising a smart city. Smart Governance comprises aspects of political participation, services for citizens as well as the operation of the government. Smart Economy includes factors all around economic competitiveness as, entrepreneurship and productivity. Smart Mobility incorporates local and international accessibility which can be portrayed by the availability of modern and sustainable transport systems. Smart Environment is described by attractive natural conditions, pollution, resource management and also efforts towards environmental protection. Smart People may not entirely distinguished by the degree of qualification or education of the citizens, but also by the character of social interactions regarding integration and public life and the openness towards the "outer" world. Ultimately, Smart Living comprises various aspects of quality of life which include civilization, wellness, safety, tourism and others.

It has been recognized from a report by the ITU-T Technology Watch Report 2013 that development of smart city requires thorough planning. It is necessary that national and municipal governments, citizens and every single other stakeholder concur on the smart city definition that they intend to accomplish. The smart city definition or strategy must address two (2) key functions: the city's chosen "functions" and "purposes", with its "functions" refers to the appearance and operation of a city and its "purposes to the benefits promised by a smart city model.

3.0 COMPARISONS BETWEEN SELECTED SMART CITIES

In order to examine the implementation of smart city initiatives from cities in the neighbouring Asian region, Singapore and Seoul were chosen. These cities have declared their smart city initiatives through the various city authorities' sources namely the city authority documents (www.ida.gov.sg, Seoul Metropolitan Government, 2014). Smart City initiatives identified from these cities include the information and data that were compiled through the content analysis of various sources namely the various authorities' websites and accessible official documents. In addition, visits to these cities were also made in an attempt to gather data and make observations. The six (6) Smart City dimensions were used to frame the content analysis. Despite the fact that the study has observed several differences of the smart city initiatives during the comparative exercise, it is found the city function – epitomized in the city's vision and mission – prevents a fair comparison between cities as the city function. Other factors as mentioned by Neirotti et al (2014) that may command the type and level of implementation of Smart City dimensions include elements that incorporate economic and technology-related variables, structural factors and other country-specific effects. A general portrayal of the profile of every cities are as follows:

Case 1: Seoul

Seoul with a population of approximately 10.04 million in 2013 is the capital and the largest metropolis of South Korea. It is ranked sixth (6) in the Global Power City Index and seventh in the Global Financial Centres Index. Seoul also exerts a major influence in global affairs as (7 th) one of the five (5) leading hosts of global conferences (Fischer,2012). The city's Grass Domestic Product (GDP) per capita (PPP) of $39,448 was comparable to France and Finland in 2013.

The electronics, information technology and assembly-type of industries has overtaken the labour-intensive manufacturing industries (Ik-Yu,2013; The primary of Seoul and the Capital Region,2014) and thre capital region, 2014). Seoul is the world's most wired city (16) (Cha & Come,2011) and positioned joint first in innovation status by PwC's Cities of Opportunity Report 2014 (Price WaterHouseCooper,2014). It has also the world's highest fibre-optic broadband penetration, resulting in the world's fastest internet connections with speeds up to 1 Gbps. Seoul provides free Wi-Fi access in outdoor spaces.

In 2013, the city authorities promulgated the city's vision for 2030 – a happy city based on communication and consideration which will be the highest values for the municipal administration of Seoul. Indeed, these values will play the central role in the city's pursuit of its long-term goals of upgrading the quality of life of its people, boosting the city's global competitiveness, building its uniqueness in the global community and securing sustainability as a major global city. A report published by ITU-T Technology Watch Report analysed Seoul's implementation of its 'Smart Seoul 2015' project. The report investigated the conceptual underpinnings of Smart Seoul, the use of smart technologies and mobile-web applications to provide citizen-centric services and the role of technical standards as the precondition for smart city functionality. It has been observed that Seoul has applied three (3) broad phases to the evolution of a smart city comprising: *The First Phase* (individual service level) – ICT application to improve individual city operations such as transportation, safety, environment and culture; *the Second Phase* (the vertical service level) – integration of related processes and services by smart technology within major sectors of a city, enabling the provision of more advanced services; and *the Third Phase* (the horizontal service level) - the point of smart city development at which there is no longer a distinction between different service areas, with all parts now seamlessly integrated within an efficient smart city ecosystem.

Case 2: Singapore

Singapore has a total population of 5.54 million as of June 2015 with 1.63 million non-resident populations (Singapore Department of Statistic, June 2015) . It is a diversified and global economy which depends on foreign trade. It is also one of the world's major commercial hubs with the fourth-biggest financial centre. The country is an important financial centre leading in foreign direct investment. The GDP per capita in Singapore was last recorded at USD38,087.89 in 2014. It is rated highly in economic competitiveness, healthcare and education. The Economic Development Board (EDB) of Singapore has position the vision of Singapore to be a global city, a home in Asia for business, innovation and talent. Within the Smart City context, it has the vision of transforming Singapore by building the World's first Smart Nation by harnessing technology to the fullest with the aim of improving the lives of citizens, creating more opportunities and building stronger communities.

Infocomm Development Authority of Singapore (IDA) has been established to develop information technology and telecommunications within Singapore with a view of transforming Singapore into a smart city. IDA through its active support has seen the growth of innovative

technology companies and start-ups in Singapore. It works with leading global IT companies as well as developing excellent policies and capabilities as well as information technology and telecommunications infrastructure for Singapore.

4.0 SMART CITY DESCRIPTORS

In making the comparison of the initiatives undertaken in the selected cities i.e. Seoul and Singapore, a matrix of descriptors is developed. These descriptors attempt to show the level of implementation of the initiatives undertaken at these two cities. A summary of the descriptors is shown in Table 1 below. By using these descriptors, a comparative review is made on the smart city initiatives through the smartness level which are divided into four, namely, Basic, Medium, Advanced and State-of-the Art. The adoption of the levels of descriptors was a qualitative decision based on an assessment of the Smart City information gathered at both cities. The levels of achievement for each of the Smart City dimension for each city was assigned heuristically, informed by the initiatives gathered through content analysis of the relevant sources which are verified through fieldwork observation. The results of the comparative analysis are then depicted through a radar diagram revealing the smart city initiatives implementation at the two cities.

Table 1: The Descriptors for the level of achievement under each dimension

	Level of Achievement	**Description**
Smart Economy	Basic	Facilitating local economic activities (infrastructure, facilities, economic support system)
	Medium	Economic growth and value creation
	Advanced	Innovative economic growth
	State of the Art	Integrated ICT based economic hub
Smart Governance	Basic	Provision of basic public and social services
	Medium	Public participation in decision-making
	Advanced	Public-private partnership
	State of the Art	Fully Transparent government with ICT that provides real-time policy conveyance and input
Smart Mobility	Basic	Basic transportation and connectivity to ease movement and connectivity
	Medium	Full accessibility and some connectivity that further enhanced movement
	Advanced	Full accessibility and full connectivity together with an efficient traffic management system
	State of the Art	Full accessibility and full connectivity together with a sustainable traffic management system

Smart Environment	Basic	Provisions for safe and clean environment
	Medium	Protection of the environment
	Advanced	Enhancement via green technology in the environmental management system
	State of the Art	Usage of ICT in the sustainable environmental management system
Smart People	Basic	Provision and accessibility to basic level of infrastructure and programmes for the training and education towards enhancement of skills and knowledge
	Medium	Provision and creation of elaborate human capital improvement environment with physical and non physical platforms for the advancement of knowledge, skills and sharing ideals
	Advanced	Creation of a conducive ecosystem that attracts and develops human capital through physical and non-physical platform with advanced technological features for the advancement of knowledge, skills and sharing ideals towards a caring and open mind set
	State of the Art	Development and creation of a conducive ecosystem that attracts and develops human capital through the adoption of state of the art ICT and technology driven educational and training towards the cosmopolitanism, caring and open mind set of the nation
Smart Living	Basic	Provision of communal amenities and cohesive social environment
	Medium	Provision of extensive communal amenities and cohesive social environment
	Advanced	Availability of varieties and options for global communal amenities with cohesive social and living environment
	State of the Art	Creation of comprehensive global communal amenities with cohesive and integrated social and living environment towards community well-being.

5.0 FINDINGS

From the assessment of the various initiatives at the two cities, smartness categories according to the six (6) dimensions are identified. Through a quantitative treatment of associating the smartness categories with numerical values, the scale of 1 is used to indicate the lowest level of achievement whilst the scale of 4 indicates the highest achievement. The level of smartness achievement for the initiatives undertaken for Seoul and Singapore is shown as in Table 2. The results of the determination of the level of provision is then plotted on a radar chart and is graphically shown as in Figure 1 .

Table 2: Level of Smartness Achievement for Initiatives

City	City vision and mission	Smart City Dimension Achievement	
Seoul	A happy city, globa city based on communication and consideration	• Smart Economy	3
		• Smart People	4
		• Smart Governance	4
		• Smart Mobility	4
		• Smart Environment	3
		• Smart Lliving	3
Singapore	A global leader, a great city, a home in Asia for business, innovation and talent.	• Smart Economy	4
		• Smart People	4
		• Smart Governance	4
		• Smart Mobility	4
		• Smart Environment	4
		• Smart Lliving	4

The result of the determination of the value of provision is plotted on a radar chart and is graphically show as figure 1 below:

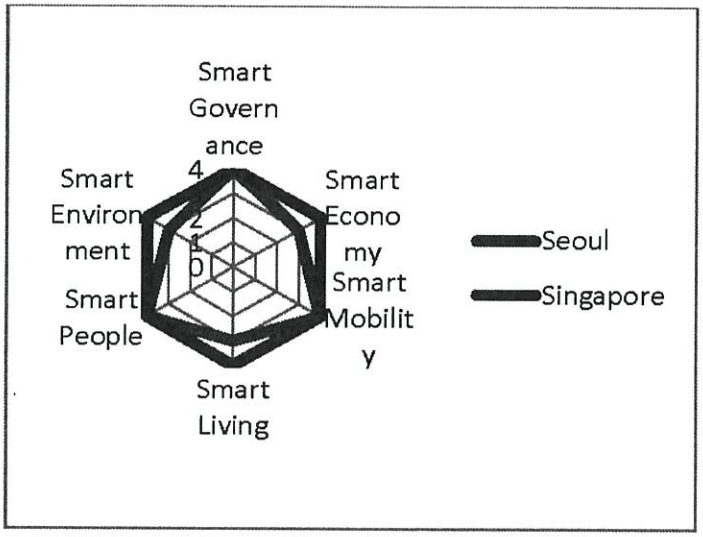

Figure 1: Radar Chart Comparing Smart City Dimensions between Seoul and Singapore

6.0 ASSESSMENT OF OBSERVATION

It is observed that Singapore lead in the provision of the Smart City initiatives under all six (6) smart city dimensions. Each city was developed according to the visions of the city management that could be influenced by the greater national agenda. When comparison are made to the level of achievements for the initiatives under the six (6) Smart City dimensions, both these cities have their own strength catering for the achievement of its vision and mission.

It is clear from the web chart above that the different cities vary from one another in terms of their smartness. Singapore leads when it comes to the provision of smart city initiatives in all smartness dimensions. It is evident that Singapore outperforms Seoul in this respect, scoring as state-of the-art smartness level on three (3) dimensions. Seoul with comparable strengths has shown high achievement for the other three (3) dimensions though these dimensions have not stood up to the achievement made by Singapore. On the other hand, it must be understood that the above radar chart represents a visual reflection of the selected cities at 'first instance' which is without considering the functions and prevalent conditions that have shaped the cities in the past. The greater national agenda of city may have an influence over the purpose and functions of a city when it was developed. In this case, Singapore was supported by its status as a city-nation whereby as both a city and country, there was a substantial motivation for it to be as 'smart' as possible bearing its limited resources and small size.

7.0 CONCLUSION

Smart City has been said to be one of the city development concept that has promotes sustainable city management through the use of ICT. From the review of the various models that have been introduced for Smart City, Giffenger's (2007) model has described as a smart city that encompass the three (3) pillars of sustainable development and potrayed six characteristics through the development of a transparent and easy hierarchic structure, where each level is described by the results of the level below. The six 'smart' characteristics that had been identified are: economy, people, governance, mobility, environment and living. It is widely accepted that there are three (3) major dimensions of sustainable development which are economy, environment and social which has been recognised for the adoption of the Giffinger's model by Iskandar Malaysia. Taking into consideration of this framework and other smart city models, this study has adapted six (6) dimensions of Smart Economy, Smart People, Smart Living, Smart Mobility, Smart Governance and Smart Environment.

When comparative review was made on the Smart City initiatives in Singapore and Seoul, it is revealed that these two cities have achieved the advanced level of implementation in terms of smartness. The functions of the city and the city's prevalent institutional structure play an important role in shaping the smartness of the city. Singapore led as the smartest city, whereby results from the comparative analysis indicated the highest score in all of its Smart City dimensions. It is submitted that Singapore had no choice but to employ the smart agenda to ensure its survival as a city state. Thus, its highest place in the ranking was assured by its full commitment in using ICT to improve all facets of city development.

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