

Smart City Development in Taipei City

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Introduction

Nowadays, the global world is facing two global developments, which are urbanization and technological innovation. Both of them occur in urban areas and it will give a negative impact if it is unmanaged. In 2018, the United Nations Global (UN Global) stated that there were 55% of the world's population living in cities. This number is projected to continuously grow and it is predicted that about 68% the world's population will live in cities by 2050. This is a significant number if compared to year 1950 in which at that time, only 30% of the total world population lived in cities (UN, 2019). Within urbanization framework, it is of importance because the rate of population growth in the Asian region has reached nearly 50% .

On the other hand, the Agenda 2030 set out under the Sustainable Development Goals (SDGs) has stipulated its global goals to immediately overcome social, economic, and environmental problems which are intertwined to each other. One of means to overcome these problems is by increasing the role of Science, Technology, and Innovation (STI). STI is conceived to give contribution, solution, and opportunity in improving living standards, productivity, and community welfare which have been the main challenges in achieving SDGs (UNCTAD, 2018). In the urban context, technological innovation becomes an answer to solve city's problems as well as to build community development in the city.

By looking on these two global trends, city has become a battle arena for realizing SDGs at the local level. Cities are challenged to provide tangible and sustainable basic services for their citizens. Moreover, cities in the global world are challenged to find solutions effectively, efficiently and transparently. All of these city's obstacles then push the city government in the world to be more innovative by maximizing the existing technological devices to solve city's problems. There are several innovative models that have been taken by the local

government, such as “compact city”, “green city”, “liveable city”, “smart city”, and many others. However, the most innovative approach of city’s model for the past few decades is “smart city”.

Discussing about smart city is interesting since at this moment, smart city model has been adopted and implemented in many cities in the world. This innovative model has combined between the idea of digital broadband with all its potential and community interaction (Stratigea, 2012). In the smart city framework, the development of technological information and communication system is important. Since its ability has been demonstrate on how to improve the city competitiveness, quality of life, and social inclusion in the urban (Stratigea, 2012). The power of broadband digital has been proven in changing communication pattern and community interaction in urban environments, especially in providing fesible basic services effectively and efficiently. In addition, for many cities in the world, making their city become a smart city such a huge gamble. Since it is not only make their city becomes a *globally-recognized smart city*, but it will also bring more investment, resources, and various other potentials that can increase the competitiveness of their city.

Related to the smart city implementation, one of the most progressive city in the world that has been implemented smart city development is Taipei. Taipei declared as a smart city in 2016, and based on the Smart City Index which released by the IMD World Competitiveness Center in 2019, Taipei places on ranked 7 from 102 cities in the world. Moreover, Taipei also showed their progress by winning an award as Smart Sustainable City from the World e-Governments Organization of Cities and Local Governments (WeGO) on June 28, 2017 in Russia.

The smart city development in Taipei is very interesting to be discussed. As the capital city of Taiwan, which is very well-known as one of the largest technological producing countries in Asia, the development of technological innovation is quite dynamic. There are several paths that have been made by the Taipei city government in realizing smart city and placing them on the top 10 smart city in the global world. This paper aims to see the development of smart city in Taipei.

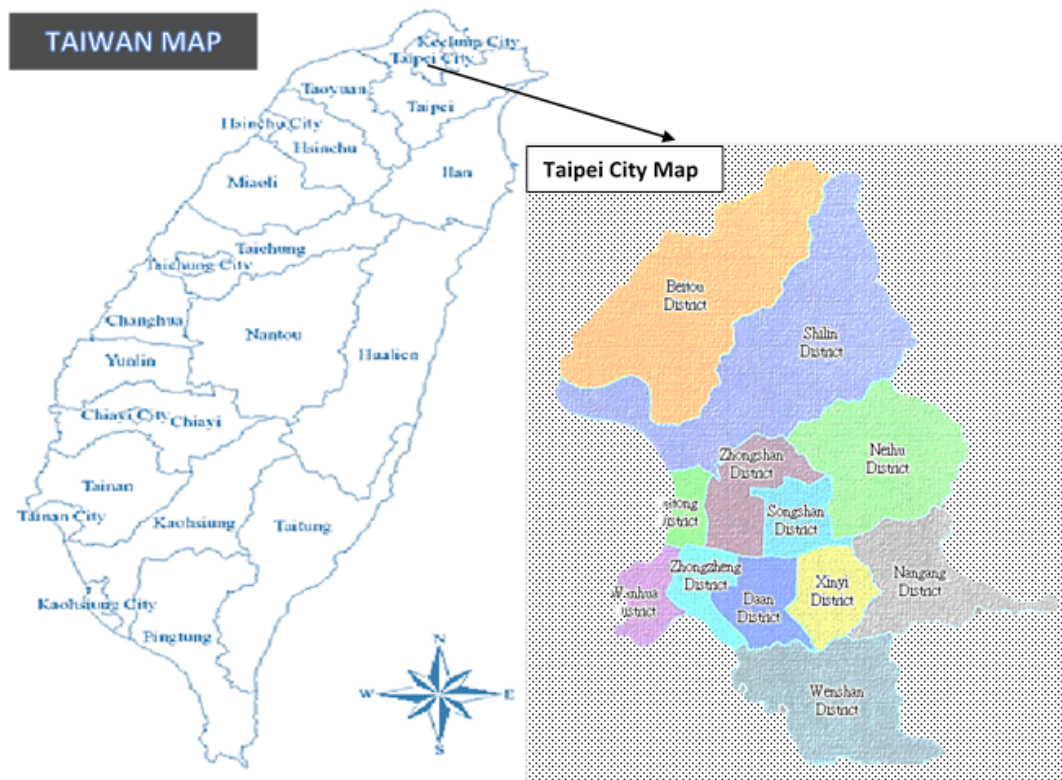
Taipei City and Its Development

As the capital of Taiwan, Taipei becomes the heart of economic, political, cultural and city hub for the East Asia region. Taipei City was formed by the Taipei Planning Commission in 1897, which was then established as a district on October 1920 (Taipei City Statistical Abstract, 2019). In 1932, the Taipei city was increasingly developed with the total area as big as 66.98 km² and city population around 600,000 people.

On August 1945, Taipei has changed their government system. At that time, Taipei was taken over by the central government and made Taipei as Provincial Municipality. Based on the existing boundaries, Taipei divided their administrative system into 10 districts. Until July 1, 1967, Taipei was decided as a special city based on its function, as the center of political, military, cultural, economic and financial of Taiwan. A year after, the population increased up to 1.56 million with the total area up to 272 km² (Taipei City Statistical Abstract, 2019).

Geographically, Taipei is located on the northern part of Taiwan with the total area 272 km². Administratively, Taipei is now divided into 12 districts which are Songshan, Xinyi, Daan, Zhongshan, Zhongzheng, Datong, Wanhua, Wenshan, Nangang, Neihu, Shilin and Beitou (Figure 1). Taipei City is directly adjacent to New Taipei City on each side. Along with the development of infrastructure and geographical development, by the end of 2018, the population of Taipei city increases to 2,668,572 persons. There are three districts which are Daan, Songshan and Datong that have the most densely-populated in Taipei.

Figure 1. Map of Taiwan and Taipei City



Source: Author's Documents, 2019 and Taipei City Homepage, 2019.

Generally, the growth of Taipei city after 1968 is quite rapid, both in infrastructure and population. Based on literature, during period 1968 – 1972, the population of Taipei city has increased up to 77,000 people. The growth in 1980 got slow in 1980 which had only 24,000 people and increased after this year. In 1981 – 1987, the population increased about 50,000-60,000 people a year. The population growth decreased in 1988 to 1990. From 1991 to today, the population growth seems fluctuative.

There are two factors that influence the population growth in Taipei city, which are by natural and social increases. Natural increase is determined by the number of births and deaths that occur in Taipei. Meanwhile, for social increase is determined by the number of immigrants and emigrants in Taipei. The interesting thing that happened in Taipei is, after the restructuring era, the amount of natural increase actually shows a declining trend. Whereas social increase actually fluctuates due to complex variable factors (Table 1).

Table 1. Population in Taipei City from 1968-2018

Year	Population Increase	Natural Increase			Social Increase		
		Number of persons Increased	Birth	Death	Number of persons Increased	Immigrants	Emigrants
1968	78,976	34,452	40,923	6,471	44,524	244,279	199,755
1971	70,073	36,773	43,542	6,769	33,300	277,881	244,581
1981	50,556	35,471	44,019	8,548	15,085	311,249	296,164
1991	-1,667	25,924	36,538	10,614	-27,591	355,300	382,891
2001	-12,672	13,661	26,998	13,337	-26,333	246,335	272,668
2006	15,867	7,140	21,151	14,011	8,727	282,971	274,244
2011	32,196	9,144	25,132	15,988	23,052	242,989	219,937
2016	-9,106	10,010	27,992	17,982	-19,116	198,253	217,369
2017	-12,447	7,575	25,042	17,467	-20,022	191,755	211,777
2018	-14,685	4,947	22,849	17,902	-19,632	201,241	220,873

Source: Taipei City Statistical Abstract, 2019

Related to the age composition, Taipei is included in the “aging society” category. This category is given by the World Health Organization (WHO) since the number of elderly people (over 65 years) increases every year. In general, the elderly population in Taipei by 1968 was only 2.33% of the total population. However, since 2016, the number of elderly people shows an increase. In 2016, the amount was 15.55% and in 2017 it rose to 16.37% of the total population. The latest, in 2018, the number has been reached 17.19% (Table 2).

Table 2. Aged Society in Taipei City Year 2018

District	Population Distribution			Dependenc y Ratio (%)	Aging Index (%)
	Young Age (0-14) Populatio n Rate (%)	Working Age (15- 64) Populatio n Rate (%)	Old Age (65<) Population Rate (%)		
Songshan	14.74	66.50	18.76	50.39	127.25
Xinyi	12.11	69.25	18.63	44.39	153.79
Daan	15.11	64.94	19.94	53.98	131.96
Zhongshan	12.42	69.64	17.94	43.59	144.52
Zhongzheng	16.23	65.98	17.79	51.55	109.61
Datong	13.16	69.27	17.57	44.36	133.45
Wanhua	11.05	70.02	18.93	42.82	171.35
Wenshan	13.82	70.71	15.48	41.43	111.99
Nangang	13.34	71.52	15.15	39.83	113.56
Neihu	14.54	72.90	12.55	37.17	86.31
Shilin	12.85	69.54	17.62	43.81	137.16
Beitou	13.65	70.03	16.32	42.79	119.56

Source: Taipei City Statistical Abstract, 2019

Based on the data above (Table 2), it can be seen that the aging population in Taipei is spread out in every district. However, the highest

elderly population were places in Daan District (19.94%), Wanhua (18.93%), and Songshan (18.76%). The number of elderly people on these three districts is quite higher because those are the residential areas of Taipei city.

Related to the city development, Taipei has their own vision and mission. The vision of the Taipei city government is to develop Taipei as an "Ecological Sustainable City". The purpose of this vision is to make Taipei a safe and comfortable place, not only for its citizens but also everyone who comes to Taipei. Being an International City and a "Happy Home" for everyone who comes to Taipei or lives there are the purposes. In addition, they also set Taipei city to become a city that can maintain and balance between economic development and natural protection. The development planning of Taipei City was designed to realize their city's vision.

The main important part that has been taken by the Taipei city in realizing their vision is to keep innovative and provide good services for its citizens. There are eight key strategic action and priorities in Taipei city governance, which are (1)environmentally sustainable, (2)urban development, (3)cultural diversity, (4)industrial escalation, (5)social support, (6)well education, (7)public health and safety, and (8)good governance. These eight strategies have become the main indicators for Taipei's sustainability.

In the process of Taipei city development, Taipei fully recognizes their city's challenges and strenghts. The awareness as the capital city of Taiwan with an access to resources and eminence makes the government to always improve its quality through an effective and efficient bureaucratic governance. Not only maintaining and regulating the city's functions, how to fullfil citizens expectation to become a liveable and sustainable city is also part of Taipei's city development goals.

Technological innovation has become one of Taiwan's excellence which is used as a tool by the Taipei city government in realizing the city development. Since 2016, Taipei has declared to be a "Smart City". By maximizing of smart technology devices and the provision of supporting infrastructure, it makes Taipei as one of the smartest cities with the most progress city in smart city development. The advantage point of Taipei seems to be a comprehensive

package that can provide a new perspective, not only changing the face of the city, but also adding new value to the lifestyle of its citizen.

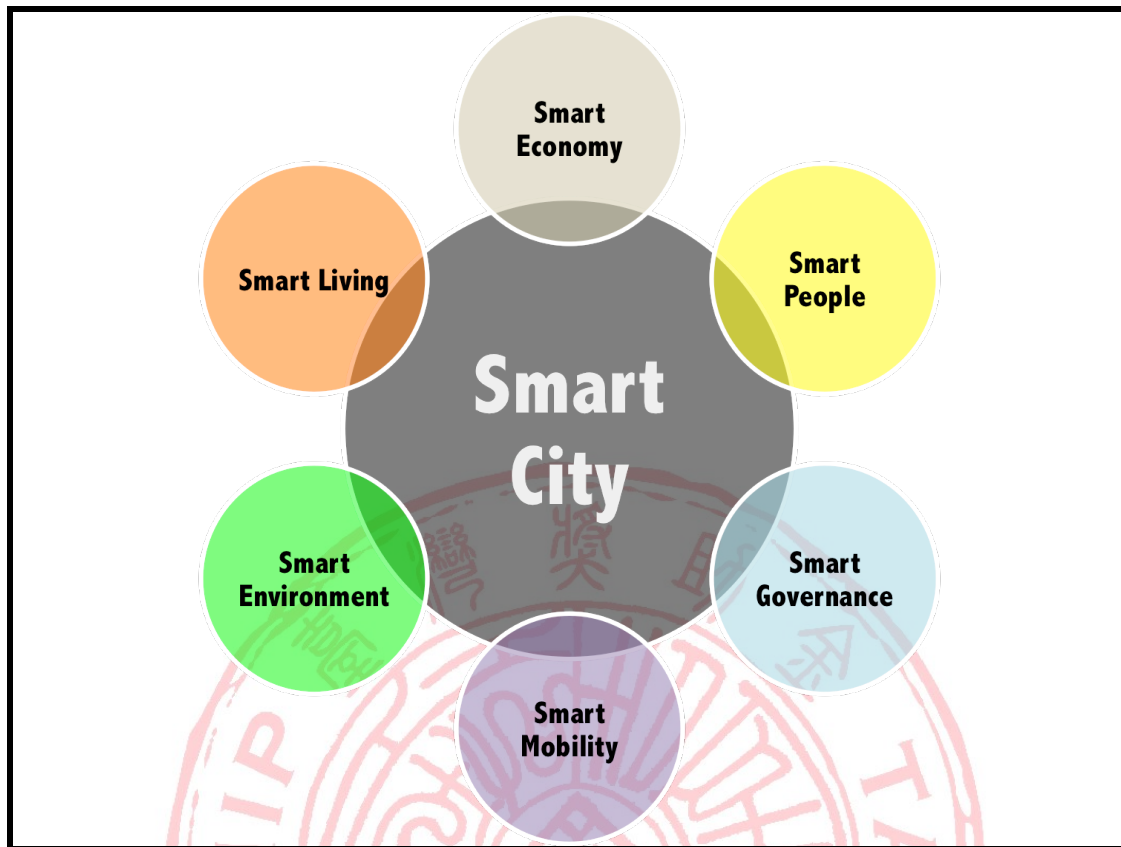
Smart City Development in Taipei: From Definition to Implementation

Until now, there is no precise concept about smart city. However, in academic discourses, the concept deliberating smart city is considered many and remains developing. It depends on what kind of approaches used in the research. The concept of smart city was firstly emerged within the largest ICT company named International Business Machines Cooperation (IBM). Utilizing the IBM's conceptual framework, smart city is described as a city that has interconnected instruments and intelligently function through technological devices so a city can solve their problems in more effective and efficient ways (Supangkat, 2015: 3).

In 2014, the report of International Telecommunication Union showed that there were more than 100 definitions about smart city. Based on their analysis, smart city is defined as "an innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operations and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects." Regarding this definition, in making a city becomes a smart city, the basic infrastructure is the ICT equipment. Based on this definition, it can also be seen that the role of ICT is very important, especially in the city cycle.

However, those definitions are arguably not suitable for social sciences, since the "smart" word is only rest for the ICT infrastructure. If the "smart" is used for smart city, then it will be similar with the other labels of city concept with technology, such as "digital city", "electronic city", "flexicity", "information city", "telicity", "wired city", and others. The "smart" in the smart city will be faded if it relies on technology devices. The different thing between smart city with other technological labels in the city is on how the mindset of the people solves their city's problems. Therefore, in this paper, the concept of smart city used is a city that has an ability to combine the latest technological innovations with smart mindsets of people in the city governance in order to get solutions for their city's problems effectively, efficiently and transparently.

Figure 2. Smart City Components



Source: Illustration from Giffinger, 2007:12

In general, there are several components that can make a city become a smart city. Referring to the report of Smart Cities Ranking of European medium-sized cities, it is stated that there were at least six main components that should be applied in a smart city (Figure 2). Each component in the smart city concept has indicators that must be fulfilled by the city. Following are the indicators of each component;

Table 3. Smart City Components and its indicators

Component	Definition and Indicators
Smart Economy	<p>City becomes a place for economic, productivity and also innovation to increase competitiveness.</p> <ul style="list-style-type: none"> → Innovative spirit → Entrepreneurship

	<ul style="list-style-type: none"> → Economic image & trademarks → Productivity → Flexibility of labour market → International embeddedness → Ability to transform
Smart People	<p>The important part of city is the citizen participation, open-minded people, and escalating social and human capital.</p> <ul style="list-style-type: none"> → Level of qualification → Affinity to life long learning → Social and ethnic plurality → Flexibility → Creativity → Cosmopolitanism/Open Mindedness → Participation in public life
Smart Governance	<p>Related most on how the government create transparency and integrity to fulfill community basic services.</p> <ul style="list-style-type: none"> → Participation in decision-making → Public and social services → Transparent governance → Political strategies & perspectives
Smart Mobility	<p>How city provide ICT infrastructure for transportation system that innovative and safety.</p> <ul style="list-style-type: none"> → Local accessibility → (Inter-)national accessibility → Availability of ICT-infrastructure → Sustainable, innovative and safe transport systems
Smart Environment	Sustainability and living in harmony

	<p>between an advanced technology without any environment degradation, such as waste management, climate change impact, and etc.</p> <ul style="list-style-type: none"> → Attractivity of natural conditions → Pollution → Environmental protection → Sustainable resource management
Smart Living	<p>Related to the community basic needs such as health, education and housing, how do the city can provide those to make sure that the citizen have good quality of life.</p> <ul style="list-style-type: none"> → Education facilities → Touristic attractivity → Social cohesion Cultural facilities → Health conditions → Individual safety → Housing quality

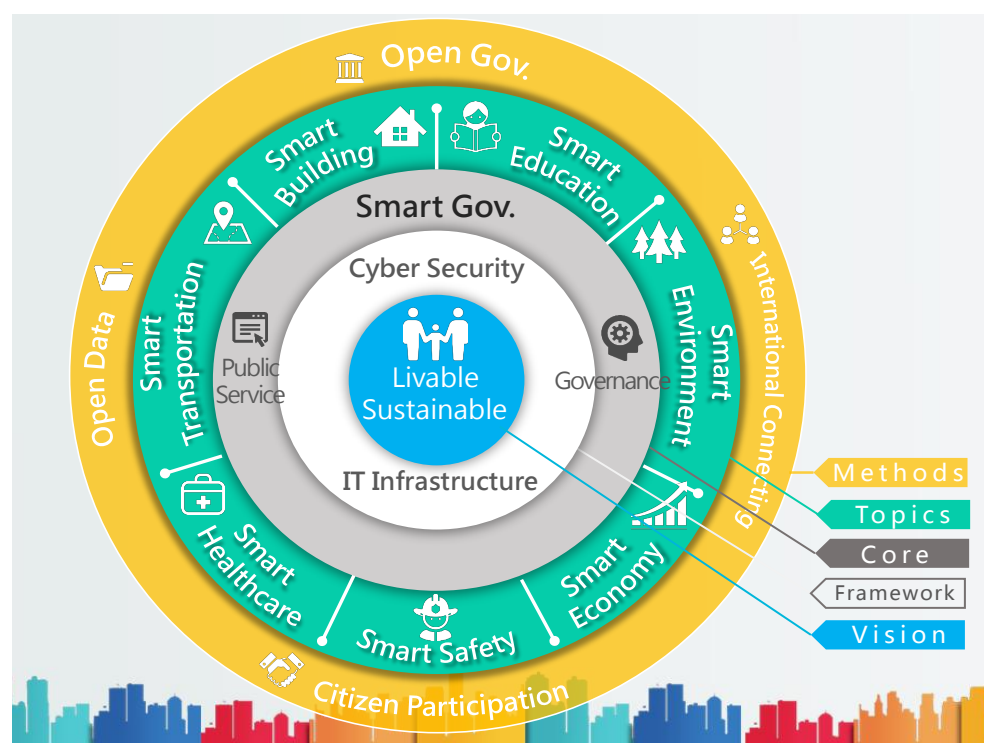
Source: Smart Cities Ranking of European medium-sized cities, 2015.

Besides Giffinger, there are several scholars who also stated about components that must be implemented in a smart city. However, until now, there is no standard components that can determine whether a city is categorized as smart city or not. Every city can be determined and created their own smart city components based on their own needs for city's solutions.

Based on the Taipei city's needs, there are seven cores that become a smart city Taipei. There are (1)Smart Building, (2)Smart Education, (3)Smart Economy, (4)Smart Healthcare, (5)Smart Transportation, (6)Smart Environment, and (7)Smart Safety (Figure 3). These components are the main priorities of Taipei city's government in realizing their city's vision by using smart city approach. These seven components are also aligned with the eight strategic priorities of Taipei's city development, as well as the most frequent problems

that appear in Taipei City. In addition, those are also strongly related to Taipei citizens livelihood. Based on those five components, each of them has their own indicators. The indicators are derivative reference from the Taipei city government. Following are the indicators;

Figure 3. Smart City Taipei Components



Source: Smart Taipei, 2019

1. Smart Building.

The idea of Smart Building is to develop a smart public housing that provides an affordable housing encompassing price and location for Taipei's citizens. Based on the issue, the Smart Public Housing is very related to the Smart Living and Smart Environment from Giffinger. The purposes of this component is to provide a liveable place for its citizen and to improve the urban environment. The Smart Public Housing that has been developed by the government is to show an ideal model of living environment.

The function of the public housing is similar with the previous public housing. The additional value in smart public housing is the integration between ICT and Artificial Intelligent (AR) as the additional facilities of

this public housing. Moreover, this public housing is located in a strategic location that integrates to other facilities such as library, healthcare center, business district, day care, and commercial retails.

Based on the interviews, the Taipei government has planned to build around 12,000 smart public housings. The prototype of smart public housings has been built around Xinyi District, which is very near to the Taipei city center. This smart public housing is built on the land that previously was a park, namely Guangcibo'aiyuan Park (廣慈博愛院公園). The building has been starting to be built since 2018, and it is estimated to be done in 2021.

Figure 4. Development of Smart Public Housing in Xinyi District



Source: Field research, 14 December 2019.

Regarding the rent value that will be determined, the government divides into three categories. These three categories strongly depends on the size of housing it self. The values are 9.000 NTD, 12.000, and 15.000 NTD. This price is quite affordable for people in Taipei, since at this moment, the housing price in Taipei is quite high. However, there are

several concerns from the community around this housing, such as the electricity bills would increase since everything will use digital technology, and there would be the gap between the advanced technology with the users who are mostly elder people.

2. Smart Education.

Education accessibility is one of the basic goals of smart living in Giffinger. Education also looks at a social investment for Taipei, especially for productive ages. As one of the excellence countries in technological innovation, Taiwan has given a big attention to education. The Taipei government is responsible to stimulate the productive age to constantly create an innovation. Community innovation is the main goals of smart education in Taipei, by using several points below;

- a. Taipei Maker Education Initiative. This program aims to build creativity, problems solver, independent thinking, and DIY games in order to develop creative thinker. The Taipei City government has launched the Taipei Maker Education Initiative since 2016 for primary school age students.
- b. Taipei Cooc Cloud. Accessibility issue also becomes a concern for Taipei. Taipei Cooc Cloud is a digital learning that can eliminate the education gap between urban and rural. This system becomes an alternative for school ages in accessing both formal and informal education through platforms.
- c. Smart English Learning. Communicating in English is one of the main obstacles for the most of Taipei communities. Therefore, the Taipei city government has launched the ABC Interactive Theme Park program using the Augmented Reality (AR) and GPS technology. This program is aimed for the early years with attractive process. So, it can gain the interest of young children to learn English in a more fun way. This program now is placed in recreational area at Taipei Children's Amusement Park, that is visited by children in almost everyday.

3. Smart Economy

Another thing that also becomes a concern of the Taipei city government is to make their citizens comfortable in doing some financial transactions.

In addition, this economic cycle can increase the economic growth. Smart Payment is a tool for an integrated payment system. In optimizing the goals, the Taipei city has set out some integrated program such as;

- a. Smart Pay Integrated Platform System. The application platform called “pay.taipei” would be the only payment system. This application is not only applied for Taipei city, but also other cities in Taiwan.
- b. Multi-Function e-Card. Since June 2002, Taipei has been using “Easy Card” as a way to pay MRT. Until now, this card has been used for almost all transactions, not only for transportation but also for small-transaction. By looking the function of “Easy Card”, Taipei has launched “Taipei Card” as an integrated payment mode.

Figure 5. Easy Card Taipei



Source: Author's Document, 2019

4. Smart Health Care.

Another basic needs that should be covered in Taipei is smart health, which is similar with smart living from Giffinger. As mentioned before, one of the most challenging problems for Taipei city is aging society. Based on that point, one of the concern of Taipei city government is how to provide health service for its citizen, especially for the elderly people. Through the smart health care initiated by the government, there are several things that will be covered, which are;

- a. Smart Health Service. The main point of this part is to provide system of health services with people-oriented approach. This health services will be carried out by individual needs and all healthy records, so it can be traced in the future once someone gets sick.
- b. Smart elderly care. The high number of elderly people living alone is the main reason of this part. The smart elderly care is to introduce an application and technology to reduce the high risk accident of elderly. There are several things that will be covered, such as fall detection systems, emergency information systems, and maintenance with robots.
- c. Smart sports center. Another thing related to the health care is to introduce a healthy lifestyle for people in Taipei through a smart sport center. This system is made to make people easier in accessing sports center. Using an application system, people can access online information about sports facilities, make a reservation, and provide training courses based on individual healthy records.

5. Smart Transportation.

Regarding the Giffinger smart city component, smart transportation in Taipei can be concluded as smart mobility. As the capital city, Taipei should provide a good public transportation in supporting citizens mobility. Transportation becomes an important part people of Taipei city, who have active movement and dynamical mobility. Therefore, the Taipei city government is required to provide effective, efficient, and environmentally friendly transportation facilities. In the smart transportation component, there are five concerns of the city government, that are;

- a. Autonomous Vehicle and Testing Field. One of the transportation policies in Taipei is to provide public transportation that can connect people from and to the Mass Rapid Transit (MRT) station or other public transportations with safety and comfort in the future. Therefore, at this time, Taipei is working together with a private sector since August 2017 in build “Autonomous bus”. This “Autonomous bus” is a small size designed to connect technology

to internet of vehicles. One of lanes that will be operated is from Xinyi Road to connect to MRT Station. Even though this “Autonomous bus” has not been operated, but the campaign has been started by giving opportunity for the Taipei community to try it in the Shihlin Beitou Science Park area.

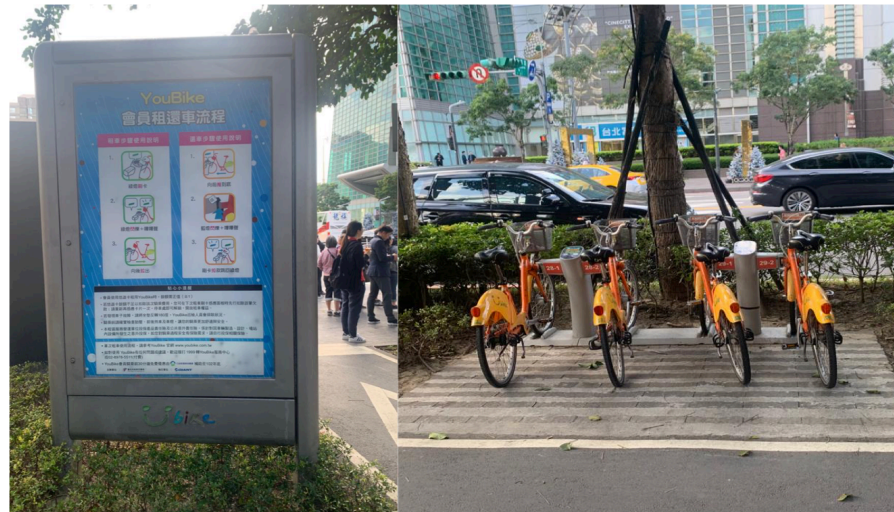
- b. 3U Green Shared Transportation. Another concern of Taipei city government is eco-friendly transportation. Through this concept, they want to introduce their community on how they move dynamically but still can reduce the impact of climate change. This program introduces the concept of environmentally friendly transportation by minimizing the amount of CO² production generated from motor vehicles. There is a program which introduces green economy transportation and shares concepts. This program is involving three main transportations that are used frequently in Taipei, which are Youbike (bicycle), U-Motor (motorcycle), and U-Car (car).

Figure 6. U-Motor in Zhongshan District, Taipei



Source: Fieldwork in Taipei City Expo, 26 November 2019

Figure 7. Youbike in Xinyi District, Taipei



Source: Fieldwork in Taipei World Trade Center, 7 November 2019

- c. Smart Taipei Main Station. As the capital city, Taipei is also the busiest city in Taiwan. Taipei becomes the center of crossing and stop-over for many people. The busiest and most crowded place is Taipei Main Station. This place becomes a hub of various transportation modes, such as High-Speed Railway (HSR), MRT, buses, cabs, and private vehicles. Taipei city government should be able to accommodate 500,000 commuters everyday. Not only accommodating, but also making sure that the people who traveled are safe and comfort is part of the government concerns. Below Smart Taipei Main Station, Taipei government develops an application (Apps) that can integrate all information that might be necessary for the travellers such as tourism, emergency evacuation system, indoor information, and etc.
- d. Smart Friendly Bus Stop. One of the public transportations that is widely used in Taipei is the bus. Even though the bus services are quite good, but the Taipei government wants to improve their services for bus users. At this moment, when waiting at the bus stop, there is only information about the estimated time the bus will arrive. Through this smart friendly bus stop, passenger can have many informative information while waiting, also can easily get various additional facilities that support the passenger needs.

- e. Smart Parking Services. The other problems faced by Taipei is the lack of parking lots for private cars. Most of people who have car they placed it in the parking lots inside the building. However, one family in Taipei has more than one car and the parking lots are limited. In addition, in some area, this causes traffic congestion before entering the parking building. Not only because the payment processes, but also it is because the lack information regarding the number of availability parking lots inside the building. Due to this reason, to solve their parking problems, the government builds an application that provides an integrated information about parking space availabilities, alternative ways to the parking lot, and also an efficient payment system.

Figure 8. Existing Parking System in Taipei



Source: Fieldwork in Taipei around Xinyi District, 10 November 2019

6. Smart Environment

Based on the Giffinger smart city component, smart environment is defined that the city should have proper infrastructure such as roads, bridges, electrical and communication lines and so on. In addition, city also needs to build some infrastucture and good strategy planning in

dealing with several impacts of climate change. This point is very related to the Taipei city's geographical condition. Due to geographical condition and climate weather condition, Taipei is also suffered by the extreme fluctuation of nature. This case may lead to floods or draughts to their daily lives in Taipei.

Based on this experience, there were several projects that have been taken by the Taipei government to protect their environment condition, such as;

- a. Air Box. One of the urban problems is the air quality, it also occurs in Taipei city. Therefore, through Air Box, this program is used as air quality monitoring solution for Taipei city. By using open data “airbox.taipei”, people can see the temperature, humidity, and also PM quality in a real time and sustainable.
- b. iTrash Smart Urban Integrated Waste Recycling. Another problem in the most of urban area is waste management system, including in Taipei. Through a machine namely “iTrash”, citizens are able to do waste reduction and recycling from the beginning. By integrating cloud and IoT technology, this recycling machine can recycle almost 3000 kg of waste recycled, with calculation 25,000 plastic bottles and 10,000 metal cans.

Figure 9. iTrash in Zhongshan District



Source: Field Research, 8 November 2019

7. Smart Safety

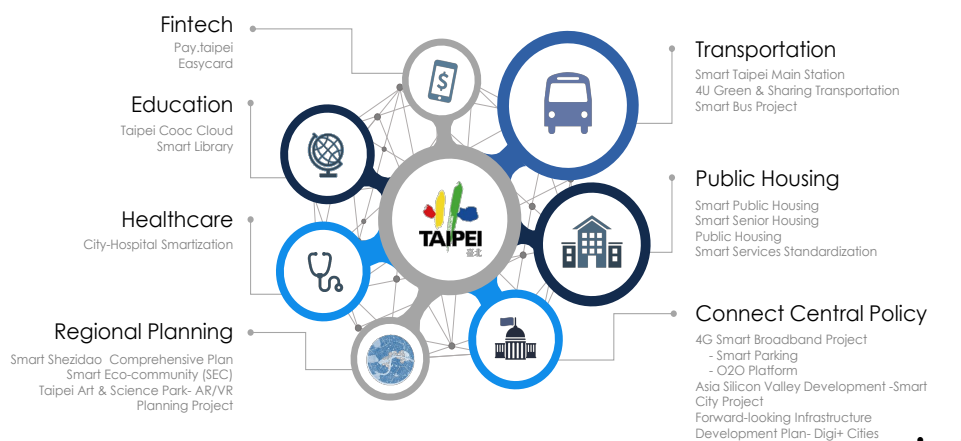
In Taipei, the local government adds a smart safety in their smart city components. This part is important to make the city to be a safer city, since safety is a crucial component of life quality in every city (Lacinak and Ristvej, 2017). Smart safety can be described as an integration of technology and natural environment that increases the effectiveness process in reducing crime, terror threats, quick responses emergencies (Lacinak and Ristvej, 2017). Based on this part, there are several points that becomes Taipei city government's concerns, such as;

- a. Virtual Fences Project. Another technology that supports education in school is Dynamic Spectrum Access (DSA). This technology uses environmental safety in school. The DSA can detect various frequencies and spectrums. It will provide suitable information if someone enters school or campus. This infrastructure is applied in several schools and campuses aiming to improve safety and comfort for school environment.
- b. Shezi Bridge Structure Monitoring. It is initiated by France start-up company who undertook an assessment regarding the strength of construction or building infrastructure. By doing this assessment, the Taipei government will get warning system if the construction has not worked well. So, by this information, it can mitigate the worst thing happened in the future.
- c. Visual 119 for Emergency Rescue. This application is used for emergency rescue. By only clicking the application "199" through cell phone, citizen can report or ask emergency rescue. This platform is a cross-boundaries integration between the Department of Information Technology, Transportation, Information and Tourism, and private companies. The information given to the Rescue Department is a real time video, online live instructions, and GPS Position.

Integrated Collaboration for City Solution

In its planning development, the Taipei city government is using two approaches, namely top-down and bottom-up approach. In the top-down development planning process, the Taipei city government provides various basic facilities for citizen's needs. In addition the city government also makes policies that are tailored to the needs of citizens in the implementation process. Top-down approach in planning development is entirely the responsibility of the city government in synergy with other stakeholders on its implementation. Furthermore, the top-down approach in the smart city framework is not build with new policy. Smart city is an added part of the grand planning outlined in Taipei's city vision and mission. Some examples of top-down smart city policies such as smart public housing policies, smart security policies and transportation infrastructure development, and others (Figure 10). If take a look from the example of the program that carried out, the top-down approach in smart city development in Taipei is the basic elements and the most important elements that should exist in the city. However it is more bureaucratic and strategic action.

Figure 10. Top Down Projects in Taipei Smart City



Source: Smart Taipei Presentation, 2019.

Another development approach that also used by the Taipei City Government is the bottom-up model. Unlike the more strategic top-down approach model, the bottom-up approach gives space for the community and other stakeholders to contribute, gives more to the provision of benefits, the

development of technological innovations, and needs-based solutions. Moreover, in developing their smart city, Taipei city government has four methods to realize bottom-up process. Those four methods are (1)Open Data, (2)Open Government, (3)International Connecting, and (4)Citizen Participation (see Figure 3). Each method has its own goals to be implemented based on the needs. Following is the explanation of each method;

1. Open Data. In the smart city context, open data is a pool of information that might be needed by the stakeholders and provide some insight for their purposes (Ayre and Craner, 2017). Open data is particularly engaging to many public administrations of the world, under the strong pressure of stakeholders who consider (open) data a form of democracy and an opportunity for business (Molinari, et.al: 2014).

The idea of open data is to give the information services about Taipei that shows qualitative and quantitative data. The data gained from census that has been grabbed by the government. However, this information can only be accessed by the Taiwanese citizens or people who know Chinese letters. Based on the interview, through application or engine search to <http://data.taipei>, people can find the data that they needed. In addition, the data provided by the government is legally used for anyone who needs it.

Figure 11. Open Data Taipei Website



Source: Author Documents, 2019.

2. Open Government. It is almost similar with the Open Data. The Open Government is also a platform built by the government. However, the function is quite different. If open data is more about data information, the purpose of Open Government is to gain information from the citizen. The Open Government has more extensive functions which are for monitoring and as a platform for citizen to influence the government's decision. The Open Government is a tool for bridging the government vision and citizen voice, especially in decision making process (Meijer, et.al: 2012).

Taipei also has the Open Government to understand the citizen's needs. Based on the interview, this process has been undertaken since 2016. This platform is used for two ways communication, from the government to the citizen, and vice versa. One of the platforms that Taipei city's has is i-Voting, through this platform, people can give their voice whether they agree or disagree with the government planning programs.

Figure 12. Platform i-Voting Taipei



Source: Author's Documents, 2019.

3. International Connecting. Another methods used by the Taipei city government is by spreading out their information. The Taipei city government is very active to connect to other cities in the world which has been implementing smart city. Through this linkage, the Taipei city government

shares their experience and also learns together about smart city development from other cities in the world.

As mentioned before that Taipei has declared as a smart city in 2016. To show their progress, they also active to connect with other smart cities around the world. The connectivity build through international events and conference. Eventhough Taipei Smart City implemented on 2016, but their activity has been started before. Since 2014, Taipei City become the host of Smart City Summit and Expo every year and also very welcome for the seminar or other activity that can contribute for their city development.

Based on the information, Taipei has doing collaboration with over 30 international cities and still continue until now in exchange the ideas and topics. Taipei also joined Global Organization of Smart Cities (GO SMART) for develop practical corporations with international colleagues, that involve testing field from local and international ICT vendor in create solution in smart city.

4. Citizen Participation. In the Taipei Smart City symbol there is a quite profound philosophy. The word "gate" (in the Taipei Smart City symbol (Figure 13.) is interpreted as disclosure of information, whether given or obtained from various sources. Moreover, Taipei Smart City opens itself to anyone who wants to contribute to the city development or even provides intelligent solutions to the Taipei city's problems. The openness given is not only limited to the citizens of the city, but also to other institutions or individuals from outside Taipei and even abroad.

Figure 13. Logo Smart City Taipei

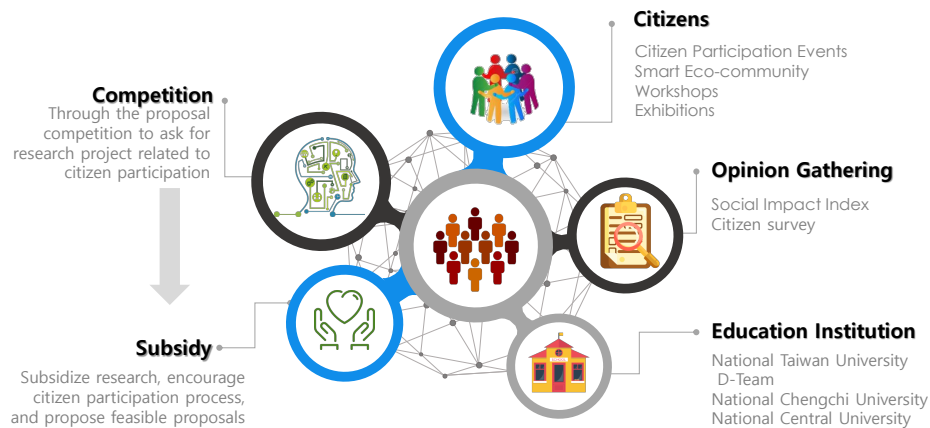


Source: Smart City Taipei, 2019

Furthermore about the community participation in smart city development, there are at least a number of ways to encourage community participation (Figure 14), such as citizen participation, opinion gathering, education institutions, competition, research subsidy, and many more. Taipei City

Government provides space to collaborate and make Taipei City a laboratory, especially for those who have ideas and innovations.

Figure 14. Community Participation in Taipei Smart City



Source: Smart Taipei Presentation, 2019.

In the Taipei smart city development process, community participation has quite important role in it. Community participation in the smart city development process has several objectives, including as a source of information and policy in decision making, as a supporter of planned development activities, and also as an evaluation of monitoring of the ongoing development process activities. Participation in the process of building a smart city in Taipei is key to achieving the ultimate goal set forth in the Taipei vision and mission.

Based on those two development approaches that used by the Taipei City Government, it can be seen that in the process of achieving a "perfect" development, it is done through merging of two approaches, namely top-down and bottom-up. However, Taipei smart city development planning approach more looks like a system that formed and must be able to interact with humans on it. The Taipei City Government not only statedt that a smart city as their main goal, but saw it as a tool that could be used to achieve their vision and mission.

Adapting from the concept of anatomic city that introduced by the City Protocol, it presents that the structure and society can be connected because

of the interaction in it. "Structure" in that position is described as basic and must be fulfilled but not of value if not used properly. As for the "Society" it is described as a component of life in the city, which gives meaning, value, and function to the "Structure" component that existed earlier. Between the two connecting is "Interactions" who work as mediators of both. "Interactions" can be in the sense of functions, fulfillment of economic, socio-cultural, and information communication needs (TAFT-ancha, 2014). "Interactions" in this position provide a process of development and transformation of the city, with the aim of influencing the quality of life of the people in it.

In this regard, the Taipei city government has understood very well the forming components in the anatomy of the city. Through this understanding, the division of composition and portion of responsibilities can be better understood and divided according to ability and willingness.

Conclusion

In addition to the five main components of smart city that have been delivered, other things that are also part of the process of embodying the smart city of Taipei are innovation and collaboration. As the capital of Taiwan, the Taipei city government realizes that "other energy" is needed to revive and realize Taipei as a smart city. The city government understands very well that the portion they have to do is provide basic services for their citizens and open access to information and equal opportunities for all citizens. While innovation comes from those who have the knowledge and the need to get effective and efficient solutions.

In implementing smart city, Taipei is supported by its people, government policy, and innovation technology. All three are related to one another and cannot stand alone. Smart city becomes successful because of the carrying capacity of technological infrastructure, but that does not mean the quality of smart city can be said to be good because of its technology. In the process there is a human element as a giver of meaning in this concept becomes important because it affects how existing technology is used.

In general, the implementation of the smart city concept that exists today is quite massive. But what needs to be underlined is that smart city is not the

main goal of the success of a city. Smart city is seen as a tool to realize the vision and mission of the city which is more than just using sophisticated devices, the vision and mission of the city is still held as a main reference.

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Reference

- Ayre, Lori. and Jim Craner. 2017. *Open Data: What it is and Why you should care*. Public Library Quarterly. Available online on https://www.researchgate.net/publication/317666305_Open_Data_What_It_Is_and_Why_You_Should_Care
- Department of Budget, Accounting and Statistics. 2019. *Taipei City Statistical Abstract 2018*. Hsiu-Chu Liang Publisher. Available online on <https://www.ws.gov.taipei/001/Upload/367/refile/45669/8040144/bb5087eb-caec-4d1e-8cc4-6cf29b84bb43.pdf>
- Giffinger, R., Fertner, C., & Kramar, H. 2007. *City Ranking of European Medium Sized Cities*. Vienna University of Technology & Delft University of Technology.
- Lacinak, Maros. and Jozef Ristvej. 2017. *Smart City, Safety, and Security*. Science Direct. Available online on https://www.researchgate.net/publication/317832332_Smart_City_Safety_and_Security
- Lim, Tai Wei. 2019. *Industrial Revolution 4.0., Tech Giants, and Digitized Societies*. Palgrave Macmillan. Available online on <https://books.google.co.id/books?id=9uORDwAAQBAJ&pg=PA55&lpg=PA55&dq=smart+taipei+philosophy&source=bl&ots=U7qtMJc1Mw&sig=ACfU3U1W0ffRbI1JwXPBVXC3wj1fg8hWMA&hl=en&sa=X&ved=2ahUKEwi g56GciuroAhXP9nMBHRKuBMQQ6AEwA3oECAsQKQ#v=onepage&q=smart%20taipei%20philosophy&f=false>
- Meijer, Albert. J. Deirdre Curtin and Maarten Hillebrandt. 2012. *Open government: Connecting vision and voice*. Available online on <https://journals.sagepub.com/doi/pdf/10.1177/0020852311429533>
- Molinari, Andrea., et.al. 2014. *Big Data and Open Data for a Smart City*. IEEE-TN Smart Cities White Papers. Available online on

- https://www.researchgate.net/publication/323415029_Big_Data_and_Open_Data_for_a_Smart_City
- Open Data Taipei. <http://data.taipei>
- Sadiku, Matthew N.O., et.al. 2016. *Smart Cities*. International Journal of Scientific Engineering and Applied Sciences (JSEAS). Vol. 2, October 2016. Available online on https://www.researchgate.net/publication/309204708_Smart_Cities
- Smart City Taipei. <https://smartcity.taipei/about?locale=en>
- Stratigea, Anastasia. 2012. *The concept of 'smart cities'. Towards community development?*. Networks and communication studies. Available online on <https://journals.openedition.org/netcom/1105>
- Supangkat, Suhono Harso. 2015. *Pengenalan dan Pengembangan Smart City*. e-Indonesia Initiatives, Institut Teknologi Bandung (ITB). Bandung.
- TAFT-ancha. 2015. *City Anatomy: A Framework to support city governance, evaluation, and transformation Version 1.0*. Available online on https://cpsociety.sharepoint.com/sites/cptf/CPTSC/Private%20Documents/Publications/CPA-I_001-v2_City_Anatomy.pdf?&originalPath=aHR0cHM6Ly9jcHNvY2lldHkuc2hhcmVwb2ludC5jb20vOmI6L3MvY3B0Zi9DUFRTQy9FYnczSnM2OTBMVkVpNF9Q0Q0FQeFNfQUI1Ull3T2JYX3RyRmMzcnhNQlB1eG53P3J0aW1lPU1HYWZwNGpoMTBn
- Taipei city Government. 2019. https://english.gov.taipei/Content_List.aspx?n=02D12F5BE6C0FC93
- United Nations. 2019. *World Population Prospects 2019: Methodology of the United Nations population estimates and projections*. Department of Economic and Social Affairs Population Division. Available online on https://population.un.org/wpp/Publications/Files/WPP2019_Methodology.pdf
- United Nations. 2018. *Technology and Innovation Report 2018: Harnessing Frontier technologies for Sustainable Development*. United Nations Conference on Trade and Development (UNCTAD). Available online on https://unctad.org/en/PublicationsLibrary/tir2018_en.pdf
- Wu, Shiann Ming., et.al. 2018. *Smart Cities in Taiwan: A Perspective on Big Data Applications*. Available online on https://www.researchgate.net/publication/322258662_Smart_Cities_in_Taiwan_A_Perspective_on_Big_Data_Applications