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Managing Information in the Smart City: A Proposed Framework

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Abstract. The city is a large town where many people live together and complete their daily routines. The city provides facilities and high-quality services. As we all know, the city is the place where people can generate their income, wealth, use their creativity and innovative skills to make things better, and also the place where citizens can enhance their expectations for daily comforts. In contrast, communication and systematic facilities make their life more beneficial. There are six (6) characteristics of the smart city such as smart economy, smart people, smart governance, smart mobility, smart environment and smart living, which discusses in this paper to provide an insight to others. The Smart City Framework is a straightforward and direct choice system that empowers both the public and private areas to plan and execute the Smart City activities adequately is discussed based on the extensive literature survey. The smart city future platforms are Cisco, Verizon, and InterDigital is also presented to highlight that they are leading the way of public urban technology deployments support. Finally, the paper discusses the Information is the key to the smart city.
Keywords: Information Management**,** Smart City, Information, Challenges, Framework of Smart City

1 Introduction

The city is a large town where many people live together and complete their daily routines. It is the place where people can generate their income, wealth, use their creativity and innovative skills to make things better, and also the place where citizens can enhance their expectations for daily comforts. In contrast, communication and systematic facilities make their life more beneficial. The urban communities and networks far and wide face the intractable difficulties including increased popula-

tions, polarized economic growth, increased greenhouse gas emission and decreased budgets. These issues can be alleviated through the selection of adaptable arrangements that exploit data and correspondence innovation to build efficiencies, lessen the expenses, and upgrade personal satisfaction. The urban areas that adopt this strategy are regularly alluded to as Smart Cities, frequently bantered in urban arranging and city arrangement circles around the world. It is a city that utilizes information and correspondence innovation to increment operational proficiency share data with the general population and also enhance both the nature of government organization services and native welfare. The key factors that encourage the adoption of the smart city are the emerging trends and raising patterns such as mechanization, automation, machine learning and the Internet of Things (IoT). Truthfully, any region and area of the city administration can be fused into the smart city innovative steps. The components of the smart city are smart manufacturing, smart government, mobility and wi-fi access, smart digital citizens, smart health services, open data, smart building, smart agriculture technology, smart energy conservative technology, and smart transportation system. The examples of smart cities are Columbus in Ohio, Kansas City in Missouri, Pittsburgh in Pennsylvania, and Boston in Massachusetts. These smart cities focus on open access data to solve problems and improve their lifestyle.

2 Literature Review

Characteristics of the Smart City

There are six (6) characteristics of the smart city such as smart economy, smart people, smart governance, smart mobility, smart environment and smart living, which will be discussed. All of this will evolve and reflect one and another. In Malaysia, the Smart Cities Initiatives introduced during the 11th Malaysia Plan (2016-2020) aimed at incorporating the Internet of Things (IoT) and encompassing some of the following aspects:

Smart Economy

The smart economy is to create competitiveness and enlightened entrepreneurial leadership. A smarter economy is a vital aspect of the Smart City movement to create economic opportunities. The impression has a broad meaning however it can be broken down into three different components such how Smart City technologies are changing the nature of commerce, the Smart City as an economic driver and the economics behind Smart City. The smart economy also can be defined as cooperation among public and private sectors, development of social circle of small and medium enterprises. According to T.M. Vinod Kumar and B. Dahiya (2017), a smart city is driven by innovation and supported by universities that focus on cutting-edge research, not only for science, industry, and business but also for cultural heritage, architecture, planning, development, and the like. It is also to derive the innovation,

welcomes the new idea and to value creativity. Besides, a smart city's inhabitants strive for sustainable natural resource management and understand that without this, its economy will not function indefinitely.

Smart People

Smart city built by the smart people to smart citizen. Without smart people, the smart city will be failed. In order to deliver smart people, several initiatives need to be taken in terms of education such provide the intensive training; enhance the R&D among the people. People knowledge and skills are major influence factors in a smart city. According to Bob Moritz (2017), three areas where cities need to get people driven for future success are *training those brains, future workers of the world and the human element. "Train Those Brains" is related to education and training.* Strong talent, businesses are taking on a bigger role in training their employees. Smart cities may need to encourage partnerships between the private sector and schools and universities. While "*Future Workers of the World*" is, consider as top talent with mobility, flexibility, and connectivity with essential components of their work environment and their personal life. Yet the *"Human Element*" is referring to how we interact with each other, what we value, how we work, and how we view ourselves.

Smart Governance

Smart governance refers to how to improve Government Services to people through public participation in the decision making process, efficient public and social services, private-public partnership and transparent governance. It also deals with the government decision to improve the citizens' quality of life. Smart governance is defined as the capacity of employing intelligent and adaptive acts activities of looking after and making decisions about somethings (Scholl and Alawadhi, 2016). The decisions made by using evidence such as data, people, and other resources to deliver a result, which meets the needs of citizens. According to Alawadhi and Scholl (2016), smart governance in the smart city may consider as reshaping administrative structures and processes across multiple local government agencies and departments as well as stakeholder involvement in governance.

Smart Mobility

A smart city, in combination with smart mobility, offers residents, visitors and stakeholders a quality of life and ease of experience that pre-emptively addresses their needs, desires and transport systems and requirements (Neckermann, 2018). Mobility is one of the most difficult topics to face in large metropolitan areas. It involves both environmental and economic aspects and needs both high technologies and virtuous people behaviours (Benevolo et al., 2016). Transportation infrastructure should be improvised if the intent is to halt the ever-increasing delays, friction, costs and irritation that are becoming main features. Most of the city transportation infrastructure should be upgraded significantly at suburban living with low environmental impact, with individuals driving to and from city centres, and commercial products

distributed by truck, typically at any time. Reimagining transportation approaches such car-free zones, enabling a seamless transition between mobility modes, separating paths and infrastructure for commercial traffic, integrating accommodation for shared mobility, and public transport and widely accessible charging infrastructure. It also means modernizing and expanding light rail, efficient road accessibility, traffic light, intelligent traffic management in the city, subway and bus transit systems. In Malaysia, the MRT project and myBUS service initiatives can be looked as a vast smart mobility approach as a smart city initiative.

Smart Environment

By leveraging sensor technology can create a sustainable environment through reducing greenhouse emission, low-carbon lifestyle with a focus on energy efficiency, renewable energy and green technology through a clean environment, green infrastructure, environmental infrastructure such time management of waste collection, embedded environmental sensors, pollution detection, smart metering and if possible to achieve zero waste. Yet to sustainable resources management such as electricity. In Hong Kong, they have "Climate Action Plan 2030+". According to Office of the Government Chief Information Officer, Hong Kong (2016), with this initiatives plan, they tend to reduce the carbon intensity by between 65% and 70% by 2030 compared with the 2005 level. They wanted to phase down coal-fired electricity generation gradually and replace with natural gas and non-fossil fuel sources. Coal as a proportion of the fuel mix will be reduced from 47% as of 2016 down to about 25% in 2020. They also intend to apply renewable energy on a larger scale based on mature and commercially available technologies lead by the public sector. Besides, they would like to further promote energy efficiency and conservation in the community with a particular focus on buildings and implement other measures to achieve carbon emission reduction by phases.

Smart Living

Smart living is an effort to improve the quality of life. It seems that Malaysia is willing to make all the efforts needed. The City Brain initiative is developed on Alibaba Cloud's cloud computing infrastructure and seeks to support Malaysia's digital transformation with cloud technology and artificial intelligence (Bragg, 2018). Some of the smart living initiatives are Wi-fi connected city, cashless or digital payment, healthcare support, education facilities, housing quality and individual safety. In Malaysia, one of the initiatives done for smart living is most of the shopping mall implemented the indoor-parking guidance and surveillance system, which gives parking users the tranquillity and satisfaction of finding a parking space quickly by using the light signal and having their vehicle watched by a CCTV in 24 hours. It has proven to increase revenues in a shopping mall by increasing customer loyalty, improving security and creating happier shoppers.

3 Proposed Framework

The Smart City Framework will eventually help in comprehend the procedure that empowers urban areas to decide on the person that will operate the city components, the controller and influencers of organization's behaviour, and the roles of ICT and government in the Smart City initiatives. As its centre, a Smart City Framework is a straightforward and direct choice system that empowers both the public and private areas to plan and execute the Smart City activities adequately. This organized technique not exclusively will enable efficiencies in city frameworks, yet additionally transparencies into how urban communities function. The Smart City Framework is as followed; city objectives (social, environmental, economic), city indicators (appropriate & matching), city components (utilities, transportation, real estate, city services), and city content (best practices & policy examples). The four levels of this structure give a consistent stream that empowers the stakeholders to move forward and test activities.

Level 1 – City Objectives

On this level, the managers and the stakeholders of the Smart City will focus on the objectives that they desire to achieve. It can be whether to improve social, environmental, and economic pillars or to enhance public safety. They will focus and aim to improve the services that will benefit them in many ways. The city's objectives can change contingent upon the individual's job and viewpoint, furthermore, are frequently hard to reply in anything other than subjective terms.

Level 2 – City Indicators

It is critical to connecting the city to existing distributed city pointers to measure the performance and benchmark urban areas utilizing particular characterized techniques. This is because the city goals are high to some degree transient. Level 2 of Smart City Framework is about matching the indicators to the city's goals and objectives. An alternate arrangement of indicators might be required for various urban communities. In the perfect world, there would be just one single arrangement of city indicators.

Level 3 – City Components

Level 3 is all about enumerating the city's valuable resources. Most Smart City activities show themselves in a city's physical area (e.g., railway station) and industry division (e.g., transportation). This framework level offers the elements of the physical parts of a city, such as utilities, transportation, land, and administrations, which are then connected to city targets, pointers, and substance.

Level 4 – City Contents

This level focuses on how the arrangements of the Smart City are actualized. It joins directly to Level 3 and afterwards to the Level 1, which is the city's objectives and

goals as it gives data and empowers the recognizable proof of data the is applicable to the city targets. A great part of the itemized substance expounded on urban community's diagrams imaginative arrangements and thoughts as of now conveyed, but the substance is composed and recorded in various routes, with no genuine structure for comprehension and the potential to recreate the Smart City arrangements, or for sharing substance.

Platforms And Technologies

The smart city future platforms are Cisco, Verizon, and InterDigital. They are leading the way of public urban technology deployments support.

Cisco Kinetic

Cisco is giving an incorporated domain to urban areas moving to the Internet of Things (IoT) based arrangements and in the meantime putting its brilliant city program onto a more grounded business premise. Cisco Kinetic is a cloud-based stage that enables clients to remove, figure, and move information from associated things to IoT applications to convey better results and administrations. Cisco Kinetic gets the correct information to the proper applications at the opportune time, crosswise over the edge, private cloud, open cloud, and crossover conditions.

Verizon

Verizon is a worldwide innovation organization conveying the guarantee of the advanced world to a great many clients consistently. Verizon smart city arrangements focus on the safety of the public, vitality administration, and transportation activities. Verizon believes that a smarter city is not about the technology innovation but intended to think about the human factor in the community. Verizon smart cities arrangements are based on the biggest 4G LTE organize in the country and the portfolio of innovation solution.

InterDigital

InterDigital. Inc. is a versatile innovation innovative work organization that gives remote advances to cell phones, systems, and administrations around the world. Since their establishment in 1972, their specialists have planned and built up a wide variety of developments that are utilized in advanced cell and remote items and systems, including 2G, 3G, 4G and IEEE 802-related items and systems. For more than four decades, InterDigital has been a pioneer in portable innovation and a key supporter of worldwide remote guidelines.

Information is the key to the smart city. While communication makes the citizens have access to information by electronic data transfer. According to Merlin Stone *et al.* (2018), a key characteristic of smart city evolution is the rapid growth in the depth, breadth, frequency, volume, quality, reliability and accuracy of data flows, not just between public authorities and others but between all the players. When talking about the information and data transfer in a smart city, it will reflect Information Se-

curity Management (ISM) as well. Information Security Management (ISM) can be defines as the state of being protected against the unauthorized use of information, especially electronic data, or the measures taken to be achieved.

According to the article written by Adel S. Elmaghraby and Michael M.Losavio (2014), the knowledge of such surveillance could have a negative impact on freedoms of speech and association with others as well as provide the government with immense private information subject to misuse. There are three security concerns in order to handle the information by the system such as the privacy and confidentiality of the information, the integrity and authenticity of the information and the availability of the information for its use and services. The management of information security is essential for protecting the interest of shareholders and the business. This relies on information-based services that are widely available today. Information security maturity and control is not an investment but a necessity for survival in the modern world. The role of ISM within organizational governance is to define best practices, a means of managing costs efficiently, improve employee behaviour, strengthen business controls and define accountability (Mohamad Amin Hasbini et al., 2018).

While the Internet of Thing (IoT) enable smart city framework with an issue such cybersecurity, data integration and sharing, the *Internet of things* (*IoT*) is the network and computer concept that describes the ideas of physical devices, vehicles, home appliances, and other *items* embedded with electronics, software, sensors, actuators, and connectivity which enables these *things* to connect, collect and exchange data. There are some essential best practices in order to connect in smart cities by creating a policy around IoT data privacy, and data use to ensure against misuse, protect personal identities by synchronizing access credentialing, secure information at the source. Besides, they need to standardize the need to know by using the protocols and options for access and implementing appropriate deterrents.

4 Challenges

The initiatives of the smart city aim to assist the citizens, investors, entrepreneurs, and city guest. The pioneers of the city must not just bring up the issues to light the advantages of the smart city advancements being executed, yet additionally, advance the utilization of open equalized information to the natives. The people are more likely to engage after they knew the advantages of their participation (Saleh, Ismail, Ibrahim, & Hussin, 2018).

Digital and Data Security

The smart city competitors stress that the city supervisors and managers will not keep information protection, data privacy, and security best of mind, dreading the data exposure that is daily produced by the citizens to the danger and risk of hacking and abuse. Moreover, the sensors and cameras everywhere might be seen as an attack on privacy or government reconnaissance. The smart city gathered information need to be anonymized and must not be personally identifiable data.

Information Policies Issues

Well-articulated data policies are missing both at the full scale and small scale levels. Data approaches on the national level are expected to characterize a structure for participation among the different specialists in the data frame of the nation and to guarantee more extensive access to outside (global) wellsprings of data and besides universal access to national data sources (i.e., to introduce them in the worldwide data frameworks and systems).

Sensory Overload

According to Zeine (2017), smart city communities depend on information. On the off chance that you need information, you require detectors. Dislike streets, structures and road lights will wake up mysteriously and begin visiting about the climate. We require sensors to see, hear, smell, taste and feel for their sake. A stage would then be able to total every one of their information and utilize it to make choices at paces surpassing human limit. The detectors will gauge temperature, movement designs, pedestrian activity, air quality and foundation uprightness, among numerous different things. Lux Research, development research and warning firm, has a report that proposes the world will send 1 trillion sensors by 2020.

5 Conclusion

Looking at Malaysia smart city initiatives, the Selangor State government introduced the Smart Selangor Blueprint in 2015. This blueprint looked at the whole management and rolled-out smartphone apps for the delivery of Governance, Infrastructure, Disaster Management, Buildings, Safety & Security, Energy, Water & Waste Management, Agro & Food production, Transport & Mobility, Healthcare and Education to its populace via IoT. It is encouraging that Selangor has initiated development in some of these sectors. While in 2016, Melaka rolled out Smart metering for electricity monitoring. Besides, Johor's Iskandar Regional Development Authority (IRDA) created a partnership with MIMOS Bhd. to develop smart technologies for deployment in Kulai and Sedenak (International Trade Administration US, 2018). It can be concluded that more research is needed in order to solve the issues arise to the essential of information for smart cities such the data security, IoT and any other issue related to information in order to best comply with needs and requirements besides helping the control and management of future cyber threats. A smart city is a city that uses many different types of electronic data collection sensors to supply information which is used to manage assets and resources efficiently in order to serve citizens in better ways. In Malaysia itself, the initiatives to create smart cities as stated in 11th Malaysia Plan (2016-2020) will be a realization by the government as the government stick with what stated in there, yet the collaboration and support by the private sectors also needed.

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