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SMART SUSTAINABLE CITIES: DUBAI AS MODEL

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Abstract

This study deals with a fundamental problem about the transformation towards smart cities for sustainable development, by examining the characteristics of smart cities as one of the innovations of the information technology era, and linking the characteristics of these cities and achieving sustainable development.

The study will address the most important concepts related to smart cities, their advantages, and their relationship to sustainable development, and conclude the most important mechanisms that can be applied in transforming existing cities into smart cities through smart governance and smart society, And a model study of smart sustainable city: Dubai

Keywords: Smart city; Sustainable; Intelligence; Development; Dubai; Infrastructure;

1.0 INTRODUCTION

Man's transition from agriculture to industry, manufacturing and specialization of work led to the growth of modern-day cities. This has had positive and negative consequences at the same time. People move to cities in search of better opportunities to live, education, work and get higher incomes.
Recent decades have seen the urban population grow by an average of 70 million people annually.

In 2014, there were 28 mega-cities in the world, and since 54% of the world's population now lives in urban areas, cities suffer from a range of different problems resulting from the increase in internal migration (rural to city). These problems include scarcity of essential facilities and high levels of pollution. All of these crises seem to be tearing the fabric and infrastructures of different cities.

The idea of smart cities re-planning these infrastructures and providing social services, with the aim of transforming existing cities into more sustainable and smart living environments.

In light of the above, we have raised the following problem:

How interconnected are the principles of smart cities and principles of sustainability in contemporary urban trends of cities of the twenty-first century?

2.0 DEFINITION OF SMART CITIES

The origin of the concept of Smart Cities can be traced back to at the least the Smart Growth of the late 1990s. find the roots of the concept earlier, namely from what they call the "cybernetically planned cities" of the 1960s, in proposals for networked or computable cities in urban development plans from the 1980s onwards.

To a great extent, Smart Cities is today a concept advanced by the business sector. It is a catchword that draws enormous interest from companies involved in ICT and infrastructure.
From the business side, repacking ICT solutions in a "smart city" framework holds the potential of launching a kind of wholesale concept, and to direct this to the public sector of city administrators.

Most of the ICT included in the smart city concepts already exist. The novelty is thus not so much the individual technologies, products or services but the interconnection and the synchronization of these and the systems they include, so that they work in concerted action. This is also where the challenge is and what makes the market so interesting for the big companies that have the potential to develop those broad solutions [1].

3.0 DEFINITIONS OF SMART CITIES BY RESEARCHERS

Most of the literature on Smart Cities focuses on either specific types of ICT, we can found more examples of smart city definitions:
"A city were the information and communication technology strengthen the freedom of speech and the accessibility to public information and services" [2].

"Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and financing to catalyze sustainable economic development, resilience and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society" [3]. "A smart City is a place where the traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefit of its inhabitants and businesses" [4].
"Effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens" [5].

"Smart cities have been discussed under different approaches, mainly related to understanding the dimensions that characterize them, the drivers that enhance their intelligence and identifying how smart city is, usually through indicators. Aiming to understand the dimensions and characteristics of smart cities, established four main themes: society, economy, environment and governance, which are addressed considering four attributes: sustainability, quality of life, urban aspects and intelligence" [6].

4.0 SUSTAINABLE CITIES

The initiatives on 'sustainable cities' have typically focused on technical solutions for a more efficient urban metabolism. The sustainability of a city has typically also been focused on sustainability impacts occurring within the city's administrative boundaries. Together, these two practices result in a situation in which only part of the challenges and solutions related to sustainable urban development are identified.

The main reason for this is that few cities are self-sufficient. To support the life of its citizens, the city is dependent on hinterland, from which resources are taken to which pollutants and waste are disseminated. In the historical past, this hinterland was located in close proximity to the city, more or less starting on the other side of the city wall. However, due to the processes of industrialization, urbanization and globalization, an increasing share of the goods consumed in the city is produced further away. This means that the environmental impacts of the consumption taking place in a city are scattered over the globe, and, consequently, that the environmental impact of a city cannot be delimited to the urban metabolism within the city boundaries. Thus, a better understanding of the concept of sustainable cities requires a global perspective in which sustainability assessments and urban developments are made in a way that takes into account the global consequences of local action or inaction.

A global perspective can be taken in essentially two different ways. One is to use a production-based accounting approach with a full life cycle assessment, meaning that the impact of a city is determined by the production taking place within the city boundary, including all impacts upstream and downstream of the production. The second way is to use a consumption-based accounting approach by which the impact of city is determined based on the consumption of city's inhabitants, no matter where the production of the consumed goods take place.
A consumption-based account thus builds on relational understanding of space and emphasizes

both intra and inter-generational justice. As a result, the system boundary delineating where ICT solutions can be used includes not only the infrastructures, technologies and everyday life in the city, but the entire life-cycle of products services consumed by the citizens.

To abate global environmental problems as well as the distributional inequities of environmental and social costs and benefits, a consumption-based accounting perspective is the only feasible way forward.

The issue of system boundaries is also relevant when looking at the social aspects of sustainability. Here all of the smart city concepts found focus entirely on the use phase of ICT completely disregarding the quality of life of people involved in the other phases of ICT's life cycle [7].

5.0 SMART CITY PROJECTS IN THE ARAB WORLD

The population of the Arab countries doubles nearly every three decades, and is expected to rise from about 430 million people in 2019 to 851 million people in 2050. However, this population increase will not be distributed evenly between rural and urban areas, even though about 66% of the countries 'population Arabs today live-in cities (compared to 55% of the world's population) The Arab region is witnessing a rapid urbanization, with its urbanization rate growing at an annual rate of 2.5%. This means that the percentage of urban population in the Arab world will remain higher in the future than the expected percentage of urban areas in the world, which is estimated at 68% by the year 2050 [8].

The acceleration of urban transformation in the Arab countries places many challenges on the shoulders of their governments and places them in the face of double tasks, as they must, on the one hand, work to slow this transformation by continuing to develop the countryside and enhance the attractiveness of living in it, and on the other hand it must absorb the increasing number of inhabitants in the cities, but without being satisfied. By maintaining the level of the status quo in it or seeking to curb its decline under the pressure of an increase in the population, but rather it must make strenuous efforts to improve it by ridding its cities of slums and transforming them into safe and sustainable cities that provide adequate housing at reasonable prices with modern transportation, green spaces and fast government services as well as promoting Her skill in planning and management, attracting companies, innovation and effective contribution to the growth of the country's economy, the economic role of cities is great in all countries, as they generate about 80% of the gross domestic product in the world.

Responding to these challenges requires governments to work on multiple economic, social and organizational axes. That is why global and Arab interest in the concept of "smart cities" has emerged to meet the growing needs of the population by taking advantage of the technical developments accompanying the Fourth Industrial Revolution, and expectations indicate that the global market for smart city technologies will grow to reach To $ 1.7 trillion by the year 2023, although the concept of a "smart city" is still in the process of development, and for this we have at least 120 diverse definitions of a smart city from experts and academic sources [9] for example, as the International Telecommunication Union defines it as "an innovative city that uses information and communication technology, the efficiency of urban operations and services, and the ability to compete to improve the quality of life, while meeting the needs of current and future generations in terms of economic, social, environmental and cultural aspects." But the realistic definition of a smart city concerns the position that the city wants to reach, its capacity, its vision, the orientations of those responsible for it, and the activity of those who live in it.

The core areas for developing a smart and sustainable city include: quality of life, infrastructure and services, information and communication technology, intelligence and information, society, environment and sustainability, governance and administration, economics and finance, and transportation. Among the main technical pillars of the smart city are: the development of digital governance, transportation systems, the power generation system and its smart distribution network, the provision of water, in addition to its initiatives related to data collection and public participation in decision-making. Indeed, the smart city project represents a major socio-technical transformation revolutionizing the way of life of hundreds of thousands of city residents.

6.0 MODEL SUSTAINABLE SMART CITIES: DUBAI

The United Arab Emirates provided a role model at the regional level in the field of transformation to smart cities, and was able - according to official reports - to achieve Arab leadership in this vital field, whether in terms of the number of smart cities, or in terms of the volume of investments in these cities, as well in terms of future growth expectations in the expansion of smart cities.

The reports confirm that financing is one of the main elements to ensure the success of the expansion plans in the transformation of smart cities, explaining that one of the most important options for

Arab countries to finance their smart projects is partnership contracts between the public and private sectors instead of traditional outsourcing contracts to take advantage of financial and administrative capabilities, innovation and risk tolerance [10]. In the private sector, and providing services and smart infrastructure with high added value, including attracting foreign direct and specialized investments in the field of smart cities, provided that this is preceded by the provision of an appropriate regulatory and legal framework, and the application of industrial policies that include a system of incentives, including providing some support during The early stages of implementing smart projects to prevent the private sector from reluctance to enter those projects, which may carry financial risks, in addition to market risks.

Dubai has pioneered the digital transformation of a smart city in the Middle East and North Africa region on more than one occasion, in addition to the achievements it has distinguished in the world in the same field. These achievements came as a result of cooperation between Smart Dubai and its partners from the government and private sectors, and at various levels, to be the first city in the region and at the forefront of the world's cities that launched the smart city transformation initiative.

Dr. Aisha bint Butti bin Bishr, Director General of Smart Dubai, said: "We are approaching the end of another year full of achievements for Dubai, and we are proud that, with all our partners from the government and private sectors, we form part of the integrated team that has achieved these achievements. The journey of smart transformation for Dubai, thanks to the vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, and the directives and follow-up of His Highness Sheikh Hamdan bin Mohammed Al Maktoum, Crown Prince of Dubai and Chairman of the Executive Council, to achieve many global scoops In cooperation with our partners, this has enabled Dubai to elevate this position as the digital capital of the Middle East and North Africa.

She added: "Our ambition is not only to maintain the first place in the region, but to achieve the first place at the level of cities in the world as a whole in translating the vision of the wise leadership that set the first position as a goal in the field of government excellence to serve people not only in Dubai or the UAE, but also to remain Dubai. A global beacon of development and development that always puts the good and happiness of the human being at the forefront. "

The "Global Competitiveness Center" of the International Institute for Management Development (IMD), one of the largest academic bodies specialized in this field in the world, has given Dubai the lead among cities in the Middle East and North Africa region in the "Smart Cities Index 2019" issued in October. 2019 includes 102 cities from different parts of the world, while the Dubai World Ranking came ahead of many major cities such as Paris, Rome, Brussels, Tokyo and Beijing.

Last February, Dubai also came at the top of the cities in the Middle East and North Africa region in the "Smart Cities Index" 2019 issued by the University of Glasgow, which included 27 cities, while it surpassed the 14th in the world according to what was mentioned by the index on major global cities such as Los Angeles and Stockholm. Melbourne, Tokyo, Vancouver, Vienna, Shanghai, Copenhagen, Beijing and Brussels.

Government without paper: Last October, His Highness Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum issued directives to government agencies to provide all customer services through the "Dubai Now" application, and to gradually close individual customer applications and limit the development of new applications, in order to complete the complete paperless transformation of government work in Dubai by December 12, 2021.

Dubai, through the "Dubai Paperless Strategy", has succeeded in dispensing with 158 million papers that were consumed in government transactions in 19 government agencies. The volume of savings achieved reached 684 million dirhams, in addition to the significant positive environmental impact that equated to saving about 19 thousand trees. As of the beginning of October 2019, the number of smart services provided through the "Dubai Now" application has reached 88 services provided by 30 participants.

6.0 THE ETHICS OF ARTIFICIAL INTELLIGENCE

In the field of artificial intelligence, Dubai came first in the Middle East and North Africa region and ranked first for cities in the world uniquely by launching an artificial intelligence strategy and laboratory to assist government agencies in cooperation with Smart Dubai to develop realistic use cases in the city based on artificial intelligence techniques. Dubai has risen ahead of the world's cities by being the first to issue ethical guidelines for artificial intelligence, and a tool that helps those who want to implement them make them easier to use.

Dubai also took the lead in establishing a board of directors to implement the guidelines and ethics of artificial intelligence, which includes in its ranks an elite of experts in the government and private sectors. And it succeeded in finding 43 cases of use of artificial intelligence technology, in cooperation

with 10 government agencies, which are testing the feasibility and effectiveness of their application.

7.0 THE DATA INITIATIVE…THE FIRST IN THE WORLD

Dubai has strengthened its position as the digital capital of the MENA region by launching the most innovative and comprehensive data initiative in the world, as it is the first city in the world to launch a data institution and issue laws and policies that regulate the process of opening, sharing and benefiting from data, as well as the first to launch a platform for open and sharing The data is Dubai Pulse, which has attracted more than two million visits to view and download the data sets available on the platform.

Dubai also took the initiative as the first city in the region to publish a report on the "economic impact of data", which showed that the process of disseminating and exchanging data in the public and private sectors in Dubai will lead to an increase in the total value added of the emirate's GDP by 10.4 billion dirhams annually by 2021. The publication of government data will in itself lead to an increase of 6.6 billion dirhams annually in the total value added by 2021, equivalent to 0.8% -1.2% of the expected GDP of Dubai by 2021.

8.0 THE GLOBAL "BLOCKCHAIN" CAPITAL

Dubai preceded the world by launching the blockchain strategy to become the first city to announce that it will transfer government transactions (compatible with this technology) on the blockchain network by 2020 to become the global blockchain capital. Dubai also took the lead in launching the "Dubai Policies for the Application of Blockchain Technology" through the "Dubai Council for the Future of Blockchain" during the Ninth Global Summit and Conference for Smart Cities that was held in Barcelona in November 2019 to precede world cities in this field, while Dubai also succeeded, across both sectors. Government and private sector, in finding 26 cases of using blockchain technology in the emirate, which is another global precedent for which it is recorded.

9.0 SMART CITIES: CHALLENGES AND SOLUTIONS

Smart sustainable cities need a stable, secure, reliable and interoperable communications infrastructure to support the massive volume of ICT-based applications and services.

The recent developments in the internet, artificial intelligence, smart grids and smart meters all lead and support the development of smart sustainable cities around the world.

The Internet: in reference to a rapidly growing network of computing devices to communicate with each other and exchange data and includes sensors and software - enabling billions of devices and objects equipped with smart sensors to communicate with each other, collect information in real time, and send this data, via communications Wireless, to central control systems. These, in turn, contribute to traffic, reduce energy use, and improve a wide range of urban operations and services.

Artificial intelligence allows extremely large sets of data to be analyzed computationally to reveal patterns that are used to inform and enhance municipal decision-making.

And smart grids, by which we mean electricity supply networks that use digital communication technology to detect local changes in usage and interact with them - help to optimize energy use in cities. Smart meters and smart sensors with IP addresses can transmit information on energy use by end users to the energy supplier, giving end users more control over their consumption.

While the third and fourth generation networks that are used by mobile phones today pose a number of problems in supporting a range of services required for sustainable smart city applications, the development of fifth generation technology, which refers to the fifth generation of mobile communication technologies, provides the ability to connect devices reliably. Internet and other devices, transferring data at a faster speed, and processing massive amounts of data with minimal delay.

10.0 DUBAI SMART CITY DIMENSIONS

Smart Dubai aims to encourage collaboration between the public and private sectors and achieve to designated target in six smart focus araes or strategic dimensions: smart people, smart environment, smart living, smart economy, smart governance, smart mobility and smart ICT infrastructure (see figure 01).

Further move, the success of the smart Dubai strategy is premised on three basic principles: communication, integration, and cooperation, which aim to move away from departmental silos and promote concerted efforts.

Dubai's six strategic dimensions reinforce the delivery of the smart city across specific vertical sectors in the city additionally, this structure has facilited the assessment of the KPIS' applicability to

Dubai, as they are coherent with smart sustainable city dimensions and sub-dimensions identified within the KPIS developed by the ITU[11].

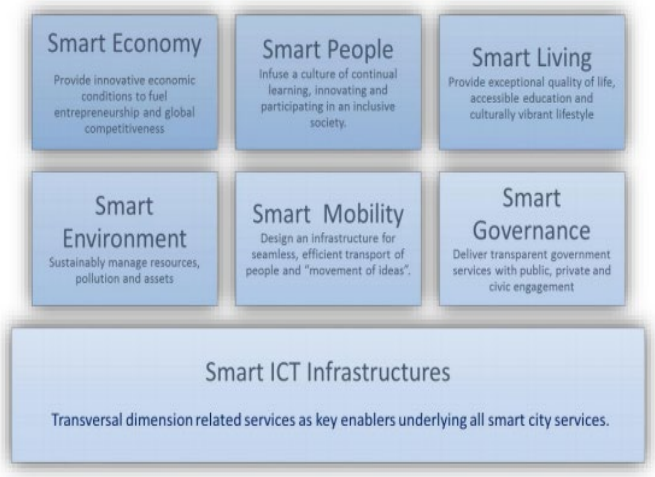

Fig.1. Dubai Smart City Dimensions [12]

11.0 CONCLUSION

During this study, we touched on the topic of smart sustainable cities and chose Dubai as one of the most successful modern models that made a quantum leap in transforming existing cities into smart cities.

Dubai has adopted a very modern infrastructure through the development of information and communication technology, and the rapid growth in the exchange of vast amounts of data and software.

The study also indicated the most important mechanisms that Dubai has produced to implement smart cities for sustainable development, through smart cooperation, smart governance, and a smart society, and it is still striving to achieve the best.

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