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FUTURE APPROACH FOR ECO – FRIENDLY AND ORGANIC SMART CITIES

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Abstract

A city is considered smart whenever investments are made in its people and social capital, traditional transport, and modern ICT infrastructure to enable sustainable economic growth, high quality of life, ecofriendly with organic cities and responsible resource management through participatory government. Globally, there are 88 organic smart cities, a four-fold rise from 21. By 2017, 178 towns, from Melbourne to Copenhagen to San Francisco, had launched 250 smart-city initiatives. The paper covered areas like history of smart city, characteristics and features of a Smart City, the pivotal components of a smart city, the level of implementation of some world's organic smart cities like Singapore, Dubai, Moscow and Milan among others was also discussed. challenges smart of cities and ways to overcome them were also highlighted. Although there are many different ways to conceptualize a "smart city," any project that succeeds will center on five essential areas in a thorough and integrated manner: the supporting infrastructure, city and community leadership structures, sustainable delivery of services, innovative and technological advancements, and civic amenities within the community.

Keywords: ICT, Organic Smart cities, Urban development.

INTRODUCTION

A technologically advanced urban setting known as a "smart city" employs various electrical devices and sensors to gather certain data. That data's information is utilized to manage resources, services, and assets effectively; in turn, that information is used to enhance operations throughout the city (Mark, 2011). Organic smart cities are those that use technology effectively in their governance, monitoring, analysis, planning, and day-to-day operations (David et al., 2022). In order to improve the effectiveness of municipal operations and services and interact with inhabitants, the smart city idea integrates information and

communication technology (ICT) and numerous physical devices connected to the Internet of things (IoT) network (Marta, 2016). Advances in traditional transportation, new ICT infrastructure, human and social capital, and resource management that balances participatory governance leads to sustainable economic growth and excellent quality of life in cities (Huaxiong et al., 2021). ICT is one of the most crucial technologies utilized to support the smart city plan (Dameri, 2013); as a result, the terms "digital city" and "smart city" are frequently used interchangeably (Dameri, 2012). As noted by Molpeceres Arnáiz (2017), a smart city seems to be the city of the future.

On organic smart cities, a lot of literature has been written. Smart city definitions and comparisons to similar ideas can be found in (Anthopoulos and Fitsilis 2010; Nam and Pardo, 2011). Although the terms "digital city" and "smart city" are conceptually related to each other, as are "intelligent city," "virtual city," "ubiquitous city," and "information city," we will compare these terms in this article because they encompass the majority of activities. According to (Nam and Pardo, 2011), organic smart cities use latest technology of self-monitoring and self-response systems to solve complex social problems like resource scarcity, inadequate and poor infrastructure, energy shortages and price instability, global environment, and human health. Digital cities offer innovative services based on broadband communication and service-oriented computer technology

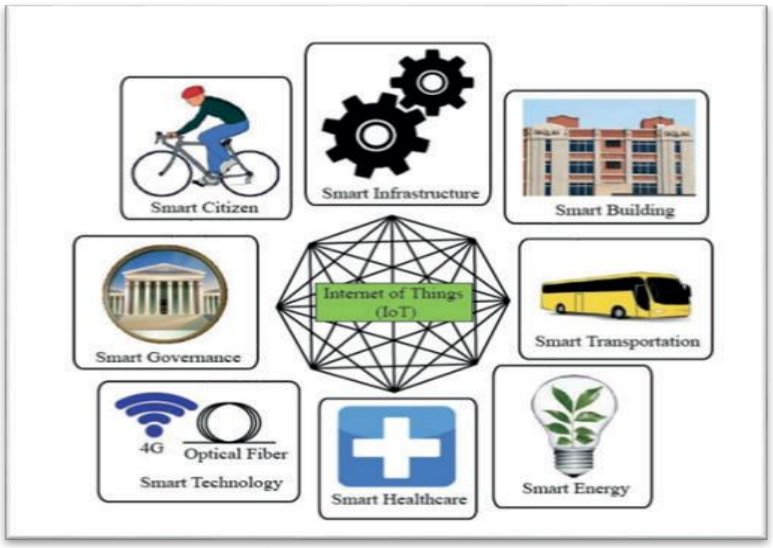

Figure 1. A Comprehensive Overview of Smart City Elements

Fig. 1 shows a broad overview of the numerous elements required for a smart city. Cities can become smart by combining any number of different smart components. Not every element must be present for a city to be considered intelligent. The cost and state of the art technology determine how many smart components are used. Globally, there were 88 organic smart cities in 2015, which is a fourfold increase from 21 in 2002. In 2017, 178 towns, from Melbourne to Copenhagen to San Francisco, have started 250 smart-city projects. According to these statistics, urbanization is accelerating globally, and officials in municipalities and cities are attempting to figure out how to deal with it. The Saudi Arabian government intends to develop 200 organic smart cities. To further the use of artificial intelligence in making cities smarter, safer, and healthier, it has launched a new initiative termed "SMARTATHON" (Wael and Wael, 2022).

HISTORY OF ORGANIC SMART CITY

Organic Smart city concepts and implementation are very recent. The idea of the "organic smart city" is focused on a city's use of ICT in urban problem-solving, following in the footsteps of "Wired Cities" and "Intelligent Cities." Among the early cybernetic interventions in urban planning, the Community Analysis Bureau in Los Angeles used computational statistical analysis in the late 1960s (Vallianatos, 2015), and Singapore established the National Computer Board in 1981. (Jose, 2020). In 2008, IBM started its marketing campaign for "Organic Smarter Cities," citing among its initial patents a technique for the automated calculation of population information for the United States Census Bureau in 1897. (Bosch, 2022). In collaboration with San Francisco, Amsterdam, and Seoul, Cisco Systems launched its Connected Urban Development program in 2010 with $25 million from the Clinton Foundation. 6000 participants from 50 different nations attended the Organic Smart City Expo World Congress in Barcelona in 2011 (Burksiene, Dvorak, and Burbulyt, 2020). The Organic Smart Cities Marketplace was established by the European Commission in 2012 as a focal point for urban initiatives inside the European Union (2020). In the United Kingdom's 2015 Chancellor's Budget, it was planned to allocate £140 million toward the creation of organic smart cities and the Internet of Things (Laurence, 2015). The People's Republic of China won the International AI City Challenge in 2021 in all categories, showcasing the country's dedication to Organic smart city initiatives. According to some estimates, China is home to half of the world's organic smart cities. Khari (2021) predicts that as time goes on, the proportion of organic smart cities will keep rising, and by 2050, up to 70% of the planet's population is anticipated to live in a city (GlobalData, 2020).

FEATURES OF A ORGANIC SMART CITY

It is challenging to narrow down a specific definition of a Organic smart city due to the variety of technologies that have been adopted under the title. According to Deakin and Al Wael (2011), a Organic smart city includes the following four characteristics:

i. The integration of various electrical and digital technologies into urban areas and communities.

ii. Using ICT to change living and working conditions in the area.

iii. The incorporation of such information and communications technologies into systems used by the government.

iv. Territorialization of activities that integrate ICT and people to boost their capacity for innovation and knowledge.

Deakin and Al Wael (2011) states that for a city to be considered smart, the community must be involved in the process and the city must use ICT to meet market demands that is the city's residents.

CHARACTERISTICS OF A ORGANIC SMART CITY

In order to support robust and healthy economic, social, and cultural development, it has been proposed that a Organic smart city (also community, business cluster, urban agglomeration, or region) uses information technologies to:

i. Make more efficient use of physical infrastructure (roads, built environment, and other physical assets) through artificial intelligence and data analytics (Hollands, 2008).

ii. Effectively participate in local governance (Fleur, 2021) by utilizing open innovation processes and e-participation, enhancing the institutional collective intelligence of the city through e-governance, with a focus on co-design and public involvement (Deakin, 2007; Deakin

and Allwinkle, 2007).

iii. Increase the city's intelligence through learning, innovation, and adaptation so that it can respond to changing conditions faster and more successfully (Nicos, 2013; Coe, Paquet and Roy, 2001).

Organic smart cities progress toward a thorough integration of all facets of collective intelligence, artificial intelligence, and human intelligence in the city. Digital telecommunication networks (the nerves), ubiquitously embedded intelligence (the brains), sensors and tags (the sensory organs), and software (the knowledge and cognitive competence) are increasingly effective combinations that make up a city's intelligence (Mitchell, 2007; Atlee and George 2006).

ORGANIC SMART CITIES DEVELOPMENT MILESTONE

Different governments at both the national and sub-national levels across the globe have initiated various organic smart cities programs. The Organic smart cities listed below are the major milestones in the organic smart cities theme, as identified by Global Data. Table 1 shows these milestones.

THE PIVOTAL COMPONENTS OF A ORGANIC SMART CITY

Despite the fact that there are many different ways to conceptualize a "Organic smart city," any project that is successful will focus on five key areas in a thorough and integrated way: the supporting infrastructure, city and community leadership structures, sustainable service delivery, technological and innovative advancements, and social infrastructure within the community.

Grid modernization lays the groundwork for intelligent growth.

Modernizing "the grid," the foundational infrastructure of every Organic smart city, is necessary to launch connection efforts. The foundational building elements for the city as a whole are modern telecommunications, mobility, and smart buildings, which are built on top of the electrical infrastructure as part of the grid modernization process. The grid is necessary for technologies like electric vehicles (EVs), artificial intelligence (AI), the internet of things (IoT), and others (Vince and Morrissey, 2020).

Table 1: Organic smart cities Development Milestones

S/N	Milestone	Year
1	The "A Cluster Analysis of Los Angeles" study was the first urban big data project created in Los Angeles.	1974
2	De Digital Stad (DDS), a virtual "digital city," was established in Amsterdam to encourage Internet use.	1994
3	Cisco invested $25 million over five years for Organic smart city research.	2005
4	The IBM Smarter Planet initiative examined how to use sensors, networks, and analytics to address urban problems.	2008
5	IBM introduced its $50 million Smarter Cities effort to improve city operations.	2009
6	Projects using the US's smart grid received financing from the American Recovery and Reinvestment Act (ARRA).	2009
7	By 2020, 80% of users were expected to have access to smart meters thanks to the EU Electricity Guideline.	2009

8	Yokohama was selected by the Japanese government to serve as a model Organic smart city project.	2010
9	Out of 200 applicants, IBM selected 24 communities as Smarter Cities winners.	2011
10	The first Smart City Expo World Congress was attended by 6000 people from over 50 nations in Barcelona.	2011
11	Barcelona implemented data-driven urban systems for the city's transportation, parking, and lighting.	2012
12	China unveiled its initial group of 90 cities, districts, and towns as pilot smart cities.	2013
13	To help guide London's digital technology policy, the mayor of London established the Smart London Board.	2013
14	China launched second batch of 103 pilot smart cities.	2014
15	Vienna City Council published the Framework Strategy for Organic Smart City Wien till 2025.	2014
16	The "Organic Smart Cities Mission" was introduced by Indian Prime Minister Narendra Modi for 100 Indian cities.	2015
17	Columbus won US Dept of Transportation's $50m Organic Smart Cities Challenge	2016
18	Hong Kong launched Organic smart city blueprint	2017
19	Toronto and Google offshoot Sidewalk Labs announced plan to develop smart waterfront area	2018
20	Sidewalk Labs' Toronto planning document fiercely criticized over data privacy implications	2019
21	Vietnam to start work on new $4.2bn Organic smart city close to Hanoi, with completion target of 2028	2020
22	By 2030, there will be 43 cities with a population of more than 10 million.	2030
23	Up to 70% of the world's population is anticipated to reside in cities by 2050.	2023

Source: Global Data, 2023

Legislation, leadership, and policy.

Flexible regulatory frameworks, fearless leadership, and futuristic policies must be put in place to establish a genuinely Organic smart city. In order to scale up infrastructure to meet future needs in a secure, equitable, and cost-effective manner, government officials, parliamentarians, and local and community leaders must create a new paradigm. Some of the main issues at the moment include a lack of thorough decision-making, challenges acquiring suitable funding, and diverse regulatory entities handling issues that need to be handled uniformly.

Resilient services

Research shows a significant relationship between a city's affluence and environmental performance. Municipal governments are required to implement sustainability plans and, in some cases, measures for adapting to climate change. This necessitates a rapid acceleration of the

switch to a cleaner, healthier, and more financially viable urban expansion through investments in renewable energy technology, efficiency gains, and necessary legislative change. Environmentally friendly urban infrastructure, transportation, land-use, and development policies must also be implemented. If this modification is not done, there are increasing risks to finances, public health, and safety. As digital infrastructure advances, the risks of cyber intrusion rise, thus consideration must also be given to digital security and safety.

Collaborations

What is meant by "interconnectedness" is far more than just sensors and apps. Technology may help cities improve community values including parks, communities, public spaces, and commercial opportunities when used efficiently. It's not necessarily true that something is brand-new when it's being used with cutting-edge technology. Advanced analytics can integrate and improve present systems by utilizing data that has already been obtained for other purposes, boosting efficiency and bringing down the price of providing services. Cities, which typically operate on tight budgets, as well as residents stand to gain significantly from this.

Community participation

Urban environments are mostly concerned with people. The purpose of community and Organic smart city programs should be to enhance urban residents' quality of life. Whether existing digital and physical infrastructure is improved or upgraded, or a new city is built where none previously existed, the objective of the city is to serve as the home, workplace, and playground for its residents.

To create broad public support for any Organic smart cities/communities' program, considerable outreach to and engagement with community anchor institutions as well as with individual stakeholders is required. Only if its members utilize and engage with the tools and services provided will a smart community thrive.

WORLD'S ORGANIC SMART CITIES

The cities that have adopted Organic smart city initiatives are listed below and are arranged not based on any order. These cities are ranked in the Organic Smart City Index by the Institute for Management Development and Singapore University of Technology and Design. Singapore was in first place among the top ten smartest cities in the world according to the Organic Smart City Index 2021, which also included three Swiss cities: Zurich, Oslo, Taipei City, Lausanne, Helsinki, Copenhagen, Geneva, Auckland, and Bilbao.

Singapore

Singapore, a city-state, has embarked on transforming towards a "Smart Nation", and endeavors to harness the power of networks, data and info-comm technologies to improve living, create economic opportunities and build closer communities.

Dubai

In 2013, the Smart Dubai project was initiated by Shaikh Mohammad bin Rashid Al Maktoum, vice president of UAE, which contained more than 100 initiatives to make Dubai a Organic smart city by 2030. The project aimed to integrate private and public sectors, enabling citizens to access these sectors through their smartphones. Some initiatives include the Dubai Autonomous Transportation Strategy to create driverless transits, fully digitizing government, business and customer information and transactions, and providing citizens 5000 hotspots to access government applications by 2021 (Smart Dubai 2021; KPMG, 2015).

Columbus, Ohio

In the summer of 2017, the City of Columbus, Ohio began its pursuit of a Organic smart city initiative. The city

partnered with American Electric Power Ohio to create a group of new electric vehicle charging stations. Many Organic smart cities such as Columbus are using agreements such as this one to prepare for climate change, expand electric infrastructure, convert existing public vehicle fleets to electric cars, and create incentives for people to share rides when commuting. For doing this, the U.S. Department of Transportation gave the City of Columbus a $40 million grant. The city also received $10 million from Vulcan Inc (Chris, 2017).

Amsterdam

The Amsterdam Organic smart city initiative which began in 2009 currently includes 170+ projects collaboratively developed by local residents, government and businesses. These projects run on an interconnected platform through wireless devices to enhance the city's real-time decision-making abilities (Amsterdam Smart City, 2015a). Amsterdam Smart City (ASC) is a unique partnership between businesses, authorities, research institutions and the people of Amsterdam. Together, our goal is to develop the Amsterdam Metropolitan Area into a smart city. A city is smart when investments in capital and communication infrastructure fuel sustainable economic growth and a high quality of life, in combination with an efficient use of natural resources. The Street lamps in Amsterdam have been upgraded to allow municipal councils to dim the lights based on pedestrian usage. Over the past three years, the Amsterdam Metropolitan Area has worked successfully to become a Organic Smart City.

To promote efforts from local residents, the city runs the Amsterdam Smart City Challenge annually, accepting proposals for applications and developments that fit within the city's framework (Amsterdam Smart City, 2015b) An example of a resident developed app is Mobypark, which allows owners of parking spaces to rent them out to people for a fee (Amsterdam Smart City, 2015c). The data generated from this app can then be used by the city to determine parking demand and traffic flows in Amsterdam. A number of homes have also been provided with smart energy meters, with incentives provided to those that actively reduce energy consumption (Amsterdam Smart City, 2015d).

Taipei

Taipei started the "smart taipei" project in 2016, where the major concept of is to change the culture of city hall government to be able to adopt new ideas and new concepts called bottom-up mechanism. The Taipei City government established the "Taipei Smart City Project Management Office", also known as the "PMO", to implement and governance the development of Organic smart city. Thereafter, building an innovation matchmaking platform to combine industry and government resources to develop smart solutions that satisfy public demands. PMO accept proposals from industry and help to negotiate with relative department of Taipei city to initiate new proof of concept (PoC) project, with the help of a matchmaking platform which allows citizens access necessary innovative technologies. There are more than 150 (UNESCO, 2019) PoC Project established, and only 34% project finished.

CHALLENGES OF ORGANIC SMART CITIES

i. Infrastructure Must Be a Foundational Element. The basic elements of a Organic smart city today are stitched together from various stakeholders, vendors and technologies, which creates a fragmented ecosystem.

ii. Smart City IT Infrastructure Must Be Agile and Flexible to Scale. Infrastructure that is not scalable will be useless as smart city capabilities continue to evolve.

iii. Cities Need Effective and Efficient Data Processing and Analytics. The ability to effectively and efficiently capture, store and analyze ever-growing amounts of IoT

data.

iv. Cities Must Protect Residents' Data to Assuage Privacy Concerns.

v. Political Differences Can Be a Roadblock to Organic Smart City Deployments. The intricate dynamics and continuous cycle of politics is another ongoing challenge that could impede Organic smart city initiatives.

RECOMMENDATION

It is interesting to notice the increase in the number of Organic smart cities across the globe over the last three decades. This depicts the rate at which the world is evolving. Similarly, there are many ways to followed by governments at all levels in order to conceptualize a Organic smart city, but any successful initiative will target these five basic areas in a holistic and integrated manner: backbone infrastructure; city and community leadership structures; sustainable provision of services; developments in technology and innovation; and community social infrastructure.

CONCLUSION

Also, in this pandemic period, the use of technology of the global community has increased involuntarily at this time. The values that can be achieved through information, increasing the quality of human life and urban and global technology in this limited environment have been achieved with the help of the identities that cities have gained globally thanks to technological development and digitalization. The Organic smart city philosophy is spreading and developing in Europe and in the world. In addition, health checks and information systems caused us to question the digital infrastructures and smart equipment of cities again (New China TV, 2020). Perhaps it's time to re-examine which is the smartest city or country in the world. Lastly, with the support of web-GIS and smart visualization, will surely help the implementation of Organic smart city models and smart grid models and the inclusion of citizens in the management of cities and countries. There are numerous ways to conceptualize a "Organic smart city," but any successful project will focus on five fundamental areas in a comprehensive and integrated way: the supporting infrastructure, city and community leadership structures, sustainable service delivery, technological and innovative advancements, and social infrastructure within the community.

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