

Utilization of Modern Management Techniques for the Achievement of Green Urban Development

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Abstract

The impact of climate change is currently experienced globally and every government is in attempts to address the concerns. The dwelling habitations are re-organized to make them digital and smart. As such, the cities are planned and established as smart cities. One of the main technology initiatives in this context is that of blockchain Technology. It has been realized that certain technological innovations like the Blockchain are useful not only for the digital currencies, but also for the planning and development of cities, especially for the green urban development. It is anticipated that by making the habitations and all the infrastructures green, the fast-depleting environmental situation can be arrested. Therefore, the current trend is the establishment of green airports, green transport stations, green railway stations etc. in most countries besides developing smart cities for the development of the urban areas. This paper is purported to analyze the issues involved and draw insights from the interrelatedness of the concepts of green urban development, smart cities and the modern technologies like the Blockchain technology.

Introduction

The world is in its smart performance stage – from masses to classes to smartness. The Government of India has also caught the bull by its horns and an innovative and new initiative has been driven to improve the quality of life of the people and enhance the economic growth through an enablement of the local development with a policy of globalization and the technology has been harnessed to create smart outcomes through citizen centric initiatives. The Smart Cities Mission of the Union Government of India is the result of this forward-looking approach for the perceptible changes in the New India.

Local efforts are needed to interconnect the various issues of the cities by using vertical services, such as mobility, energy or security which can be through a single open, accessible, transversal system that is able to exchange data with their inhabitants in real time.

It has been realized that certain technological innovations like the Blockchain are useful not only for the currencies like Crypto Currency of various types – Ethereum, Tether, USD Coin, Binance Coin, Binance USD, XRP, Cardano, Solana, Doge coin, Shib which is a meme coin known as Shiba Inu, Polka dot, Dai, Tron, Avalanche, Wrapped Bit coin, Neu Coin etc. Bitcoin, - but also for carrying out verifications and secure transactions on the Internet. The Block chain for cities will help to coordinate, integrate and control different city services with transparency, efficiency and privacy. Blockchain is a technological marvel which revolutionizes the management of Urban Smart Cities and therefore, it is a modern Management System for the Urban Areas.

The current day cities across the world are built keeping in view the futuristic trends and tendencies. The city administrations like the Urban Management Systems of the various countries have designed both political and administrative systems which would enable technologies to administer on an end-on-end basis. Even though the use of flying cars and androids are not perceptibly visible, the Block chain which is the application of cryptographic technology will help build smart cities and smart metropolis capable of generating very heavy domestic products.

The integration of the Blockchain into cities will have high digitalized systems which are more advanced and sustainable management models. Some of these are already established in the western countries as well as countries like Singapore, Japan and Malaysia in the Asiatic Setting.

In India also the smart cities initiatives have identified over 100 cities across the East, West, North and South regions of India.

There have been researches to find out the feasibility and execution of the Blockchain technology in Urban Management System. The preliminary results of the research, in which 26 experts from various countries took part, highlight in particular the potential of Blockchain for municipal governance because of its capacity to transmit information securely, with no intermediaries. Even so, experts point out the limitations so much so that the deal with this technology per se will not solve all urban management problems and the use is possible only under specific conditions.

This being so, there are several aspects of the usage of the green urban management through Blockchain that warrants a discussion for necessary insights.

Objectives

This paper is purported to achieve the following objectives:

1. To understand the concepts of smart cities and green urban management through blockchains.
2. To gather insights about the interrelatedness of the concepts of smart cities, green urban management and the use of blockchains.

Methodology

This chapter is enabled through the usage of a descriptive, narrative methodology using secondary data as available from the public domains like published books, journal articles and other web sources.

Brief Review of Literature

There have been several studies on the issue of Blockchain Technology and smart cities connecting green energy and carbon emission reduction. Blockchain Technology towards green Internet of Things for their opportunities and challenges was studied. The study discussed the full exploitation of the blockchain's potential for Feather Forking as a Positive Force that incentivizes Green Energy Production in Blockchain-Based Smart cities. Research on the application of blockchain big data platform in the construction of new smart city for low carbon emission and green environment was the focus. (PK Sharma, N Kumar, JH Park, 2020). Achievements in e-government, green ecology, and the convergence of blockchain technology and big data were recorded. The application of blockchain technology can solve various Blockchain-enabled Personalized Incentives for Sustainable Behaviour in Smart Cities. (M Sun, J Zhang, 2020). Incentivisation through tax reduction to promote green electricity was another effort for studies. It was attempted to review whether climate-plus-or-just-hype in incentivization as the objective. Clean crypto and environmental sensing network using blockchain/Internet of Things infrastructure was considered. (A Kahya, A Avyukt, GS Ramachandran, and R. Yniguez 2021). A survey of blockchain technology applied to smart

cities viz-a-viz research issues and challenges was conducted. The focus was on the emerging blockchain technology and the ownership and availability of the crypto currencies. Based on the appropriate and supporting features, it was inferred that applying blockchain technology to smart cities will be helpful. (J Xie, H Tang, T Huang, FR Yu, R Xie, 2019) Block chain as a driver for smart city development and its application in different fields of smart cities was perused. It led to the development of a comprehensive research agenda. The work provided various definitions, most of which include technology as the networked infrastructures as also the critical position of high-tech and creative innovations in smart cities. (H Treiblmaier, A Rejeb, A Strebinger,(2020). Block chain for Smart Cities was another work. It detailed the characteristics and Challenges in green smart city. The discussion included the concept of Blockchain, ad-hoc networks, soft computing, blockchain applications, fuzzy logic, ad-hoc networks, soft computing, block chain and Internet of Things and the related issues. (S Krishnan, VE Balas, J Golden, YH Robinson, (2021).The potential of integrating blockchain technology into smart sustainable city development was another study. The idea which emerged as crypto-currency on Sustainable Energy and city development later included blockchain technology into it. (PF Wong, FC Chia, MS Kiu, 2020). Block chain Technology in Smart cities and blockchain based sharing of services in the city was discussed. (Pieroni A and Suppa T 2018). What blockchain technology can contribute to smart cities was also reviewed. The notion of smart city has grown popular over years. It embraced several dimensions depending on the meaning of the word “smart” and benefits from innovative (J Sun, J Yan, KZK Zhang,(2016). Blockchain technology in the smart city was studied as a bibliometric review. Blockchain can function as a foundational technology with numerous applications as mentioned in the overview of the extant literature on blockchain applications in smart cities.(A Rejeb, K Rejeb, SJ Simske, JG Keogh,(2021). Convergence of blockchain and artificial intelligence in Internet of Things network for the sustainable smart city was another study.(S Singh, PK Sharma, B Yoon, M Shojafar,(2020).In another study, the authors link open overlay panel of blockchain technology. (Saurabh Singh and Pradip Kumar Sharma,2021). An interesting study was the coupling mechanism of green building industry innovation ecosystem based on blockchain smart city. It focused on the ecological development and architectural innovation based on Intelligent city blockchain and the transparency of the blockchain system, the correlation degree, and the green building industry.(Y Jiang, W Zheng, 2021) Challenges for connecting citizens and smart cities viz-a-viz ICT, e-governance and blockchain, e-governance sustainability and the urban planning, green technologies and the smart contracts were the key points to approach technology and citizens.(TA Oliveira, M Oliver, H

Ramalhinho,2020). Application of block- chain technology in smart city infrastructure was studied.(S Li, 2018). Cities are mainly to promote the green development of blockchain. A question raised was whether Blockchain Strengthen green development. A review of architectures, integration trends and future research directions were discussed. (B Bhushan, A Khamparia, KM Sagayam, 2020) Sustainable Cities,2020). Sustainable smart cities and their convergence of artificial intelligence and blockchain was also analyzed. (A Sharma, E Podoplelova, G Shapovalov , A Tselykh , 2021). Next Generation Technologies for Building Sustainable Smart Cities is one of the most emerging technologies that uses blockchain technology. Various researchers have suggested block- chain technology as a facilitator of Internet of Things based smart garden- ing for smart cities using blockChain Technology (TS Raja Rajeswari, P Chinnasamy, 2022).

The research studies have established that blockchain technology can be used in the context of smart cities and green urban management. Some early results of some of the research where 26 experts from various countries participated point out the potential of blockchain for municipal governance because of its capacity to transmit information securely, with no intermediaries. Experts also highlight that the deal with a technology like blockchain will not solve all urban management problems and that its use is effective only under specific conditions. As examples, it is pointed out that Gothenburg is an innovative city as regards mobility, energy efficiency and citizen participation. Chicago has inspired 'Blockchain 4 Cities', a UN initiative to study the blockchain applications in cities. Dubai aims to become the first city in the world to integrate blockchain with all its services. Singapore is a city with one of the world's most advanced and sustainable business models. Saudi Arabia is planning the smartest of all smart cities. Thus there are uses and advantages for blockchain technology as also limitations despite the overwhelming benefits of blockchain technology.

Blockchain Technology and its uses: Blockchain uses and advantages for urban management are such that the researchers observed the following among others as:

1. Transparency and Connectivity :- Transparency and connectivity are increased and improved. Using blockchain vertical services, cities can be interconnected for mobility, energy or security, through a single open, accessible, transversal system that is able to exchange data with their inhabitants in real time.
2. Communication can be direct The urban government departments can digitally interact with the citizens with the help of blockchain, without any intermediaries. This would speed up,

for example, bureaucratic procedures at registries, permissions and approvals of a myriad of agencies.

3. Integrity over information :- Blockchain technology will help encrypt files and the possibility for partial, full and or optimal utilization will be possible. Everything is possible in order to share only the part that is of interest, privately, securely and without the risk of its being manipulated by any other third party.

4. Efficient Management :- The public and city administrative officials can know using the blockchain technology the origin and destination of each resource. Besides, the urban administrative officials can find out how the services of the urban administration are being utilized by protecting the privacy and the people's privacy will not be compromised.

Cities Developed Using Blockchain

Many countries are investing substantially to develop smart cities. In the Middle East, in United Arab Emirates, Dubai aspired to become the first city in the world to integrate blockchain into all its services by 2020 through an investment of US\$ 300,000 million. In 2022, Saudi Arabia is creating a cognitive city Neom with an outlay of 500 billion US\$ to provide its citizens 20-30 years ahead of time. Urban planning and living are at the heart of this model, with 95% of the land being devoted to nature. A green blockchain technology is utilized for this purpose. For urban management, various issues are considered and utilized such as:

1. *Security*: This improves the protection of the personal data collected. Recently, sixty percent of the data collected by a newly started Airlines in India made available publicly jeopardizing the privacy of the flyers. Security ensures the protection of the personal data collected by agencies and people can remain at ease regarding their personal private data when privacy is not compromised.

2. *Energy*: Another critical requirement in any human inhabitation is the essential availability of energy and its safe retention and avoidance of any wastage. Smart blockchain based contracts ensures solar- powered households to automatically trade surplus electricity with other members of the grid. This is a very important requirement in the current ecological environment.

3. *Mobility*: Blockchain technology will help the government agencies to know the mode of use of vehicles by citizens and can have policies to encourage the public to use the public

transport to reduce pollution and use of energy like the oil and gas. In India, the Delhi government introduced the “Odd and Even” system which could be better organized and managed by block chain technology.

4. *Waste reduction and management:* The platforms of Blockchain support the waste reduction through waste collection service with the help of real-time information on containers. The public and administration will know the status of the containers and appropriate arrangements can be made.

5. *Participation:* The security, reliability, transparency and anonymity of public consultation like surveys referendums, elections etc. will be enabled by blockchain technology. With the help of this technology, other uses can also be ensured like water resources management, air quality control or park and garden care.

How is Blockchain technology management executed To enable efficient and effective management of the smart city projects using blockchain management, a technological ecosystem is essential. Such a platform makes the technology functional and develops successfully. Without such an ecosystem, blockchains will become isolated and the systems will not be able to communicate with each other as the machine languages will be different. As such efforts have already taken place to develop a technological ecosystem using different platforms. Among the platforms available, the most prominent ones are as follow:

1. **U4SSC :** An initiative of the United Nations for this purpose is known as United for Smart Sustainable Cities or U4SSC. This platform drives the information and communication technologies (ICTs) towards smart and sustainable cities. A working group has also been formed known as Blockchain Cities which jettied out of the U4SSC.
2. **Fiware :** A Free software Platform known as Fiware was created at the initiative of the European Union. This provides the tools and a suitable ecosystem to developers of online applications and services. It was not the objective of Fiware to support smart cities Yet the design, development and delivery are capable of ensuring interoperability between them.
3. **Down Town :** This is another system which is best adapted to smart cities. This platform has some 13,000 to 20,000 domains in smart cities around the world (including in the USA and UK). This has been experimented in the restaurants of the local region.

Important Blockchain Platforms in general used in 2022 As can be noted from the literature, regardless of the definitions, a Smart City can be understood as an urban area which uses different digital methods and sensors to collect specific data relating to wide ranging activities of the urban management to control, regulate and manage the city in the best interests of the citizens. The Information gained from the electronic data will be utilized to manage the assets, other resources and services efficiently and effectively to enhance the operations of the city across all endeavors. The data will be gathered from different entities like citizens, devices, buildings and assets which will be processed and analyzed to monitor and manage such management will be for controlling and regulating the traffic and transportation systems, power plants, utilities, water supply networks, waste reduction, recycling and reuse, gathering information about criminal activities within the perimeters of the city, information systems relating to, schools, libraries, hospitals, and other community services. According to Mills et.al. "Smart cities are defined as smart both in the ways in which their governments harness technology as well as in how they monitor, analyze, plan, and govern the city"(Mills, David; Pudney, Steven; Pevcin, Primož; Dvorak, Jaroslav, (2022).

It can be noted that the smart cities integrate information and communication technology and various physical devices connected like the Internet of Things to the network to optimize the efficiency of city operations and services and connect to the citizens. The technologies in the smart cities allow administrative officers of the Urban Management team to interact directly with the community and the city infrastructure and helps to monitor the developments in the urban management activities. This helps to reduce the costs of services, generate economy of scales, reduce resources consumption and help posterity. It increases the direct contact of the people with the administrators and help strengthen the democracy even. The technological applications help manage urban flows and help facilitate real-time responses. Smart cities are flexible to respond to challenges than the traditional conventional cities which have impersonal and faceless relations with the citizens. However, there are differences in the views and therefore different interpretations exist. Notwithstanding this, many cities have adopted to smart city technologies using blockchain for the urban management.

It is also argued that Smart city concept is nothing new and in all the ancient civilizations, the urban areas had similar close net operations of the city activities which suggest management similar to the current smart city management. The basic difference being that currently everything is electronic and digital while such technology never existed in the ancient days. It can be noted that the smart cities integrate information and communication technology and

various physical devices connected like the Internet of Things to the network to optimize the efficiency of city operations and services and connect to the citizens. The technologies in the smart cities allow administrative officers of the Urban Management team to interact directly with the community and the city infrastructure and helps to monitor the developments in the urban management activities. This helps to reduce the costs of services, generate economy of scales, reduce resources consumption and help posterity. It increases the direct contact of the people with the administrators and help strengthen the democracy even. The technological applications help manage urban flows and help facilitate real-time responses. Smart cities are flexible to respond to challenges than the traditional conventional cities which have impersonal and faceless relations with the citizens. However, there are differences in the views and therefore different interpretations exist. Notwithstanding this, many cities have adopted to smart city technologies using blockchain for the urban management.

According to Architect Swati Kiran “A 'smart city' does not mean one that is just technologically enabled. It also means the way the city adopts methodologies to enhance performance in key areas like transport, health, hygiene, water and sanitation so that the quality of life of its citizens is improved. Thus any city, no matter how ancient can be deemed 'smart' as long as it adopted sustainable development to ensure infrastructure improvement that impacted its inhabitants in positive ways. By this definition old settlements like those at the Indus Valley and Machu Pichu are sterling examples of cities that were 'smart' eons ago. Their main areas of expertise that benefitted the citizens were in that of infrastructure, roads and plumbing and sanitation.” It is further reported that “A unique study lead by author and anthropologist Scott Ortman found that models used to extrapolate the growth of present day cities are applicable to ancient ones as well. In his words, "There is a level at which every human society is actually very similar, this awareness helps break down the barriers between the past and present and allows us to view contemporary cities as lying on a continuum of all human settlements in time and place." Mathematical estimates show, from an urban settlement system that evolved independently from its old-world counterparts that principles of settlement organization are very general and may apply to the entire range of human history. Thus, it is easy to study technological advancement in settlements of old making them 'smart cities' just as much as metropolitan areas the world over are today. What we know of advanced urban culture in ancient times is thrown up in excavations of the Indus Valley, Mesopotamia in Egypt, areas of Korea and China, African settlements and the Inca villages. These habitations were

sophisticated in their planning and suggest knowledge of urban design far ahead of the times in which they flourished”.

However, the current day smart cities have certain technological gizmos which never existed in the ancient times. These technologically enabled devices that are in use in the current smart cities are:

- 1) **Internet of things (IoT)** :- This is a network of physically connected devices which communicate to each other by exchanging data. The Internet of things connect the technology in a smart city. The devices for the Internet of Things are such as sensors, lights, and meters that collect and analyze data. The Sensors are Electronic, infrared, thermal, and proximity devices which collect electronic signals that are then interpreted by other devices or humans or entities of Artificial Intelligence. Smart cities install sensors for various management needs like monitoring power consumption, lighting, traffic, weather and other similar requirements.
- 2) **Artificial intelligence (AI)** :- It is the simulation of machines designed to mimic human decision making. A duly designed AI can count vehicles, pedestrians, or any other movements and keep track of their speeds. Artificial Intelligence can detect faces, read license plates, and process all satellite data in order to establish patterns necessary for urban planning.
- 3) **Augmented reality (AR)** :- AR allows you to see your real-life environment with a digital augmentation over it. AR technology can enhance smart cities in a number of ways including emergency management and disaster preparedness. For example, AR can provide tips on where to find nearby events, restaurants, retailers, hotels, parking, or transport hubs. AR can also direct people where to find exits and evacuation points during an emergency.
- 4) **Geospatial Technology (GT)** :- Geospatial technology helps geographic mapping by utilizing tools which include such things like the WiFi, Bluetooth Low Energy, Global positioning system and ultra –wide band.
- 5) **WiFi** :- is a basic building block of a smart city. It links everything from smartphones and other devices to wireless sensors. Signals from common WiFi enabled devices like smartphones and wearable can be used to plot a person’s location.
- 6) **Bluetooth Low Energy (BLE)** :- BLE is used in many devices like smart- phones, smart watches, and BLE beacons. These beacons are wireless transmitters that make their location known by broadcasting a signal at regular intervals.

- 7) ***Global Positioning System (GPS)*** :- is a satellite based navigation system that provides positioning, navigation, and timing services.
- 8) ***Ultra-wideband (UWB)*** :- UWB is a radio technology for short-range, wireless communications. It can continuously scan radar, find an object and its location, and communicate with it.

Geospatial technology can help in emergency response situations to improve commute and transportation. It can also play an important role in supporting public health. Geospatial technology can map a disease outbreak, like COVID-19, and track its spread.

With the use and help of the above the smart cities are able to test the air quality, surveillance of the areas with sensors which upgrade the infra- structure and gauge the strains.

Thus, smart city uses the data and the technology to increase efficiencies and enhance the daily lives of the population . The United Nation's prediction is that the majority of the world's population will live in urban areas by 2050. This naturally brings an increase in environmental, societal, and economic changes and challenges. Smart city technology can help overcome some of these challenges and make cities better and comfortable places for the sapiens to exist.

For all these benefits to be enjoyed, the smart cities or business clusters, urban agglomerations or regions depend heavily on the information science and technologies to enable more efficient use of physical infra- structure (roads, built environment and other physical assets) through artificial intelligence and data analytics with a view to supporting a strong and healthy economic, social, cultural development. They engage effectively with local governance by using the processes of innovation and electronic participation, improving the collective intelligence of the city's institutions through e-governance with emphasis placed on citizen participation and co-design and co-creation. The intelligence of the city is enabled through learning, adapting and innovating for responsive actions by the citizens and the urban management.

These forms of intelligence in smart cities have been demonstrated in three ways:

They are Orchestration Intelligence, Empowerment Intelligence and Instrumentation Intelligence. The intelligence act upon the innovation economy, urban infrastructure and governance. The two key elements for this are an Integrated Communication platform and a Dynamic Resilient Grid. They work under different frame works like a Technology Framework consisting of Digital, Intelligent, ubiquitous, wired, hybrid and information city . Yet another

is the human framework consisting of creativity, learning, humanity, and knowledge. To make things happen, there should be an institutional framework as well. Besides this, there should be an energy framework and data management framework. The process involves the definition of the community, studying the community, developing a smart city and engaging the people to make it participative. Therefore, the people, processes and technology together will make a city smart for the achievement of the goals.

The technology used for this is blockchain which is a distributed database or ledger that is shared among the nodes of a computer network. As a database, a blockchain stores information electronically in digital format. Blockchains are best known for their crucial role in cryptocurrencies, systems, for maintaining a secure and decentralized record of transactions. The innovation with a blockchain is that it guarantees the fidelity and security of a record of data which generates trust without the need for another trusted third party.

A major difference between a typical database and a block chain is how the data is structured. A blockchain collects information together in groups that are blocks which hold a set of information. Blocks have certain storage capacities and, when filled, are closed and linked to the previously filled block, forming a chain of data known as the blockchain. All new information that follows that freshly added block is compiled into a newly formed block that will then also be added to the chain once filled”

“A database usually structures its data into tables, whereas a blockchain, as its name implies, structures its data into chunks (blocks) that are strung together. This data structure inherently makes an irreversible timeline of data when implemented in a decentralized nature. When a block is filled, it is set in stone and becomes a part of this timeline. Each block in the chain is given an exact timestamp when it is added to the chain”.

Conclusion Research evidences, policies, practices, and the necessities have ensured that the future is for smart cities only and their management have to be green in all possible avenues. Blockchain technology has been on the spread and it will encompass all activities of a city life sooner than later. Researches and developments are taking place in several areas and easy citizen centric modalities need to emerge. The society is gradually and steadily getting converted into a knowledge society in all the countries and the global situation will hasten the process of smart cities for the benefits of the citizens. It is time greater awareness is created about the role of blockchain technologies for the benefits of all concerned in the society to draw the optimum benefits of the research and developments of block chain technology. Sustainable

smart cities will be the products of green blockchain technology as it unfolds. Sean Lee, CEO of Algorand Foundation said “I think it’s healthy, but also up to us to continue to educate and work with the government entities, the regulators and academic institutions to really think about the nuances of what this technology brings so that we are indeed doing the right thing.” Those efforts also help ensure a longer-term goal: Sustainable blockchain “becomes the fabric of the next generation of technologies and ways that developers and students – the younger generation – can continue to build upon.”

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