

A Survey on Blockchain Technology and Municipal Corporation System

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Abstract - Probably the most invaluable resource of a city is its residents. Smart municipal corporation system is the contemporary urban concept which is absolutely necessary for residents of city to have a quality life. It is expected to provide predominant services in productive responses of smart municipal corporation system. Blockchain is a modernistic technology, which has gained a lot of attention in the previous years, mainly due to its use as a backbone for cryptocurrencies. While most applications of the blockchain hang on cryptocurrencies, the blockchain can be used in many other fields, such as finance, distributed data storage, health and medicine, automation, etc. We could control various future extensions of blockchain technology.

This review paper is written with the goal of implementing blockchain technology for a municipal corporation environment by collecting all the admissible research. The objective of this paper is to understand the current research topics, challenges and future directions from a technical point of view. This paper can arouse interest and practice in further discussions and research in these areas.

Key Words: Blockchain, Municipal Corporation System, Government, Smart City.

1. INTRODUCTION

Governments around the world are some of the entities that are leading towards digital transformation through digital technologies. The adoption of Blockchain technology for digital solutions helps to give power to citizens and build a more connected digital world. This digital growth around the globe will improve their citizens quality of life through the use of technology. Digital technology has positive impacts on nearly every aspect of modern life. Travel, work, shopping, entertainment, and communications are just some of the areas that have been revolutionized in recent years. It's now rare to find an electronic device or piece of machinery that doesn't integrate digital technology in some way. Digital technology means that devices can be lighter, faster and more versatile. Huge amounts of information can be stored locally or remotely and moved around virtually. The term "information" has broadened to include various media files and does not refer to only words and numbers.

This digital growth around the globe can be efficiently used for huge number of populations. These large community needs to be managed properly for the quality life. This ease of life could be brought in picture using effective municipal corporation system. Such systems used in

countries like India to manage over growing population. Increase in the population and the essence of comfortable living gave a tremendous growth in the urban areas leading to the urbanization [2]. The growing population and urbanization in various cities of India were in need of a governing body that can provide necessary community services like transport, housing, medical care etc. by collecting various taxes and grant from the State Government. Digital India scheme was launched by the Prime Minister of India Hon. Mr. Narendra Modi to ensure the Government services are made available to citizens electronically by improved online infrastructure and by increasing Internet connectivity or by making the country digitally empowered in the field of technology.

Digital India promises to transform India into a connected knowledge economy offering world class services at the click of a mouse for the huge population. This improvement can be achieved with the use of technology such as blockchain. The reason for the importance of the use Blockchain in Digital Identity is its primary features that provide security, data integrity and anonymity without the need of a third-party organization in the middle or in charge of the transactions[1]. Using blockchain technology it reduces the cost of online transactions with simultaneously increasing authenticity and security. Blockchain concept is mostly used to protect sensitive records and to authenticate the identity of users. By design, Blockchain is a distributed database and decentralized transaction data technology. It is applied for the first time in Bitcoin cryptocurrency in 2008 since the idea was introduced [1]. In terms of technology, cities must apply information technology, and more advanced analytical tools, to develop a more citizen-oriented approach of services where the citizen must be at the center of change, being the main beneficiary of the new urban paradigm [3].

The objective of this paper is to find the current research papers with technical perspective of corporation system and blockchain. Here we determine what services of corporation systems have been implemented and how they are applied. The rest of paper is defined as follows: Section 2 defines concept of blockchain and corporation system. Section 3 covers the methodology used for research and questions. Section 4 will present challenges of such systems and need to use blockchain for corporation system with advantages. Finally challenges and conclusion is illustrated.

2. BLOCKCHAIN AND CORPORATION SYSTEM

2.1 Blockchain

Blockchain technology was introduced in 2008, as a platform for secure, anonymous transactions, using a decentralized network of computers or devices. The first application of blockchain technology was the crypto currency [4]. The blockchain network is similar to distributed ledger technologies (DLT), which are distributed datasets over multiple locations, using peer-to-peer networks, where every change in the ledger is reflected in all copies over the network. A blockchain is a series of blocks that records data in hash functions with timestamp and the link to the previous block. These blocks are anonymously stored with other collaborator within a network. This eliminates centralised points of vulnerability. One important feature of blockchain technology is data immutability [4]. Once a block has been validated by the network, its resulting hash is used in the next block. If a participant would try to change an existing block and broadcast it to the network, it would not be accepted, as it would change its computed hash and all subsequent blocks hashes. The network would reject such a block, as long as the computing power of the network remains neutral. This novel approach ensures that no one entity can have control over the data[4].

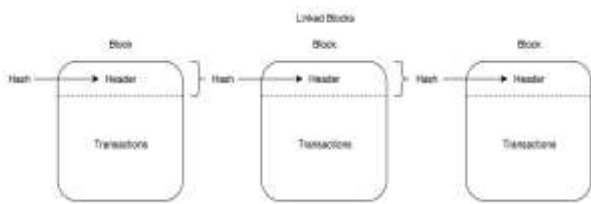


Fig - 1 : A Simple Blockchain System

2.2 Municipal Corporation System

The civic regional ministry which works for the advancement or expansion of any cosmopolitan or metropolitan city with a population of more than one million is known as the Municipal Corporation in India. The members of the Municipal Corporation are directly put in power by the people and are called Councilors. The Municipal Corporation consists of a committee which includes a Mayor with Councilors. The Corporations provide necessary support services to the Cosmopolitan Cities.

A Municipal Corporation works in regulation with the State Government for the effective execution of the various plans and programs.

All municipal acts in India divide services, powers and liabilities into the following two categories:

- Obligatory
- Discretionary

Some obligatory functions:

- Supply of pure and clean water

- Development and maintenance of streets
- Lighting and watering of streets.
- Cleaning of streets, places and sewers.
- Regulation of offensive, dangerous trades and callings or practices.
- Maintenance or support of public hospitals; establishment and maintenance of primary schools.
- Registration of births and deaths.
- Naming streets and numbering houses.

Some discretionary functions:

- Development and conservation of public parks, orphanages, museums, libraries, rest houses and rescue homes for women.
- Planting and maintenance of roadside and other trees.
- Housing for low income groups.
- Conducting surveys.
- Organising public receptions, exhibitions, entertainment, provision of transport facilities.
- Promotion of welfare of municipal employees.

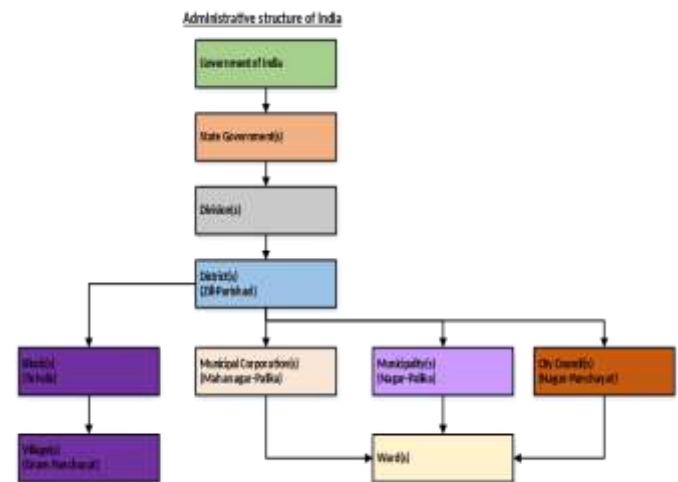


Fig - 2 : Administrative Structure of India

3. SMART CITIES MISSION, GOVERNMENT OF INDIA

Smart cities mission was launched by prime minister of India Hon. Mr. Narendra Modi in year 2015. Smart City Mission, is an urban renewal and retrofitting program by the Government of India with the mission to develop 100 cities across the country making them citizen friendly and sustainable. The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities.

A smart city is a designation given to a city that incorporates information and communication technologies (ICT) to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall cost.

Technology framework used in development of smart cities -

Several concepts of the Smart city rely heavily on the use of technology; a technological Smart City is not just one concept but there are different combinations of technological infrastructure that build a concept of smart city.

1. Digital City
2. Virtual City
3. Information City
4. Intelligent City
5. Ubiquitous City (U-City)
6. Cognitive Smart City

The core infrastructure elements in development of smart city includes –

1. Adequate water supply.
2. Assured electricity supply.
3. Sanitation, including solid waste management.
4. Efficient urban mobility and public transport.
5. Affordable housing.
6. Robust IT connectivity and digitalization.
7. e-governance and citizen participation.
8. Sustainable environment.
9. Safety and security of citizens, particularly women and children.
10. Health and education.

Challenges in developing and implementing Smart Cities –

1. Channeling finance to smart cities
2. Quick approval and clearance
3. Co-ordination among multiple stakeholders
4. Retrofitting existing cities
5. Human resource
6. Availability of utility services
7. Current state Urban Local Bodies (ULBs)

4. METHODOLOGY

Every city is different and dependent on their history, geography, economic and social conditions. In terms of corporation system, there should be a Master Plan to solve a specific set of challenges to provide a better quality of life to citizens. Some corporation systems are facing challenge such as the scarce of water, energy source or dealing with pollution, natural disasters as flooding, earthquakes, etc. Having proposals to reduce and deal with the local challenges of the cities, develops a city's knowledge and expertise to deal with that set of challenges would be very effective from small to big corporation systems [3].

The research methodology selected for this paper was a Systematic mapping study. The objective of a systematic mapping study is to present a summary of a research area, to

establish if research evidence exists. This process consists of five stages that begins with some of the research questions as the first of them, then the search for relevant articles must be done later to proceed to a screening of the articles found, proceeding subsequently to obtain of keywords obtained from the abstracts to finish with the stage of extraction of data and creation of the map. A more comprehensive description of this process is given below:

The research questions are intended to help determine the direction in which the main goal of the systematic mapping study should be directed. This goal stands to identify the quantity, type of research and results obtained through the study. The search for primary sources can be done by conducting a search for terms either in scientific databases or by performing a manual search in conference reports. It is also suggested that the search terms be structured based on terms of population, intervention, comparison and results.

On the other hand, the screening of articles by inclusion and exclusion criteria related to research questions is the third stage of the systematic mapping process. The inclusion and exclusion criteria can handle the type of documents that will be taken into account for the search as well as the context of the terms that appear mainly in the abstracts of the works. The fourth stage of the systematic mapping process consists in the use of a classification scheme based on the obtaining of keywords from the abstracts of the papers considered after the screening. This classification scheme ensures that existing studies are taken into account. In case the abstract does not contain relevant keywords then the search for them is done in the introductory sections and conclusions. Once you have all the keywords, these are used to make groups of research works and thus to form the classes of the map.

The last stage of the process of systematic mapping consists of extracting data from the relevant articles in order to sort and classify them based on the scheme developed in the previous stage. Once this stage is completed, the results obtained from the frequencies obtained for each classification are presented. This last part allows to visualize in which categories has been emphasized in research already made, as well as research gaps and therefore to find opportunities in this respect.

The systematic mapping process was selected as the research methodology of this paper because its primary objective is to explore the existing studies related to blockchain technology and its applications in the digital services that currently exist in systems similar to municipal corporation.

5. CHALLENGES

Urban government institutions or municipalities are responsible for the maintenance and proper development of urban areas and quality life. The findings of this study show that governments in India continue to remain occupied by numerous problems, which affect their performance in the efficient implementation of their duties and responsibilities. This problem severely affects the municipal decision making process, transparency in the planning and execution of infrastructure projects, and level of productivity in various municipal management and finance practices. It is concluded that fresh thinking is very necessary and needed to resolve the problems confronting urban local governments in India.

A. Crowding

Crowding (density of population) and people's apathy to other person's problems is another problem growing out of city life. Some city neighborhoods are extremely over-crowded and gets difficult to manage in terms of garbage and water supply. Overcrowding has very dangerous effects as the resource needed by public gets increased and it becomes a burden for corporation systems.

B. Water Supply and Drainage

We have reached a stage where no city has proper full day water supply. Intermittent supply results in a exhaustion being created in empty water lines which often suck in toxin and pollutants through disclose joints. Cities like Chennai, Hyderabad, Rajkot, Ajmer, and Udaipur get water from municipal sources for less than an hour a day. Many small towns have reduced water rain supply and are dependent on tube wells if any. Even a nearly prepared and serviced city like Delhi has now to reach as far as 180 km to the Ramganga for intensification of water supply.

C. Transportation and Traffic

The transportation and traffic picture in all Indian cities is extremely unsatisfactory and sad. A majority of people use buses and tempos, while a few uses public transport system. The increasing number of scooters, motorcycles, mopeds and cars make traffic problem worse by every day. The number of buses plying in metropolitan cities like Delhi, Mumbai, Chennai and kolkata is not adequate for growing population and commuters have to spend about one to two hours to get into a bus, which means leaving home two hours in advance in the morning to reach their place of work and reaching home two hours late in the evening.

D. Power Shortage

The use of electrical gadgets has remarkably increased in cities, on the other hand, the formation of new industries and the expansion of the old ones have also enlarged dependence on electricity. Most states are not in a position to generate the power that they need. They are dependent on neighbouring states. Dispute over disposal and feed of power among states usually undergo disapproving power situations in cities.

E. Sanitation or Waste

Municipalities and municipal corporations in Indian cities are so infest with mishandling that they have time for cleanlines of their cities, especially look upon removing garbage, cleaning drains, and unclogging septic tanks. Sweepers infrequently and cautiously perform their assigned services and every few months threaten to go on strike on the issue of wages, etc.

6. RESULTS

In last section we have seen problems faced by corporation system. These problems are big and time consuming to be solved. Even if residents complaint about these problems it takes time by system officers to resolve issues. Each complaint will go through the hierarchy seen in figure 2. Hence we can use blockchain in this hierarchy to solve some problems and to make process more efficient. In order to understand the full potential of the blockchain, one needs to understand the basic attributes of blockchain which makes this technology unique:

F. Shared Ledger

It is an adjoin distributed system shared across the business network, which makes the system volatile by eliminating a 'single point of failure'. That is user complaint gets deleted by mistake it won't wipe out completely out of system as every block will have same information of appropriate user.

G. Consensus

A transaction is only committed when all parties concede to a network confirmed agreement. Here one department can only make status of application as done when all others agree to it.

H. Provenance

The integrated antiquity of an asset is available over a blockchain. Every detail of complaint of user will be maintained from start to end.

I. Immutability

Records are enduring and cannot be meddle with once dedicated to the shared ledger, by that composing all

information authentic. That is if once the complaint is registered it cannot get deleted from system by anyone.

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7. CONCLUSIONS

In this paper we have given a comprehensive survey of blockchain technology and municipal corporation system. The success of blockchain has moved the technology to a very wide range which ultimately provided a huge amount of convenience in terms of transparency and security without any third party.

This paper discusses about the various methodologies involved in municipal corporation system. We have discussed various aspects like – Blockchain technology, roles and functions of Municipal Corporation, current methodology, various challenges, their results and the steps that could be taken to overcome various challenges.

Thus the overall survey says that the blockchain technology could be brought in picture with respect to municipal corporation system via the important aspects of blockchain like – Greater transparency, enhanced security, improved traceability, increased efficiency and speed, less involvement of third party.

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