

## CHALLENGES AND TECHNOLOGY FOR BUILDING SMART CITIES IN INDIA

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**ABSTRACT:** *The cities of every nation plays important role to increase economy, including India. To achieve specific growth, comprehensive development of physical, institutional, social and economic infrastructure is required. These remain the key factors in improving the quality of life and motivating people to invest in the City, setting in motion a virtuous cycle of growth and development. Development of Smart Cities is a step in the right direction. Cities in India and around the world is a process that evolves gradually. It's not a sudden decision with preplanned infrastructure. The concept of Smart city has made us think in a planned city with such an impact that each activity conducted in the city is identified, monitored and controlled by the technology. The idea to have Smart City is to support cities that provide good transportation and give a good quality of life to all the citizens, a hygienic and sustainable environment and application of 'Smart' Solutions.*

*Internet of Things (IoT) is an emerging technology in the world of IT that can be explored to its zenith to achieve the goal of building a Smart City. Just building is not enough, but maintaining and sustaining its identity is a herculean task. Integrity and authenticity is another responsibility to be thought processed and implemented.*

*There are various challenges in making a city SMART in India as there are various implicit and explicit hurdles that are to be confronted. A model of Smart City is not a solution as every city is unique in its existence. But a prototype development is need of the hour to have a logical layout of the Smart City using IoT.*

**Keywords:** *Economic infrastructure, Smart City, Technology, Cloud Computing, IoT.*

### INTRODUCTION

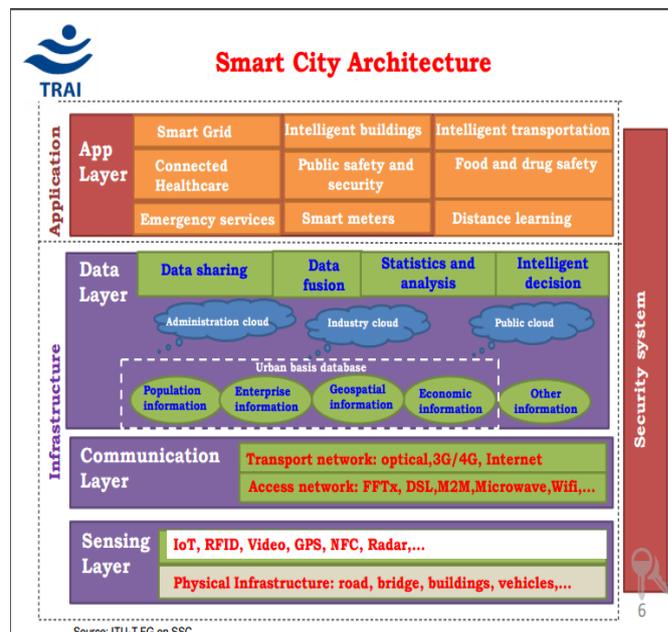
For every nation cities are the engines of growth for the economy, including India. Nearly 31% of India's current population lives in urban areas and contributes 63% of India's GDP (Census 2011). With increasing urbanization, urban areas are projected to house 40% of

India's population and contribute 75% of India's GDP by 2030. This requires comprehensive development of physical, institutional, social and economic infrastructure. All these are significant in humanizing the quality of life and attracting people and investments to the City, setting in motion a righteous cycle of growth and development. Development of Smart Cities is a step in that direction [9].

Making of cities, in the world, is an evolutionary process. People migrate to locations where they are facilitated by better and convenient way of acquiring basic needs of living like food, shelter and clothing. But human needs are endless. They strive to makes their lives more easy and adaptable by using technology (facilities that enrich people's lives). In today's world, Internet is a resource that helps to achieve this task. Today is the age of technology; and internet has accomplished a lot in managing various tasks at a click of the mouse. Now the global village (term used for world) is trying to work even smarter and get connected to every part of the world instantaneously with much ease.

## SMART CITY

“A smart sustainable city is a novel city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it caters the desires of present and future generations with respect to financial, collective and environmental aspects” [9].



To give with the aspirations and desires of the citizens, urban planners ideally aim at developing the entire urban eco-system, which is represented by the four pillars of comprehensive development — institutional, physical, social and economic infrastructure. This can be a continuing ambition. Cities can work towards developing such all-inclusive infrastructure incrementally, adding on layers of ‘smartness’ [9].

The objective is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of ‘Smart’ Solutions. The focal point is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a light house to other aspiring cities. The Smart Cities Mission of the Government is a bold, new initiative. It is meant to set examples that can be replicated for both, Smart City and its peripheral cities, catalyzing the creation of similar Smart Cities in various regions of our country. The core infrastructure elements in a Smart City would include:

- i. Sufficient water supply and electricity supply,
- ii. Hygiene and sanitation,
- iii. Waste management,
- iv. Urban mobility,
- v. Affordable housing, especially for the poor,
- vi. Robust IT connectivity and digitalization,
- vii. Good governance, especially e-Governance and citizen participation,
- viii. Wellness of citizens, predominantly women, children and the elderly [9].

Application of Smart Solutions will enable cities to use technology, information and data to improve infrastructure and services. Comprehensive development in this field will yield improve quality of life, create employment, enhance incomes, especially the poor and disadvantaged, leading to the holistic up-liftment of the standard of the mass.[9].

(Source: <http://india.smartcitiescouncil.com>)

The cities are made more and more people-friendly and accommodate all that is needed to them. Keeping a vision of 2050, new concepts of SMART CITY are emerging.

A Smart City is a city that is intelligent. It helps to make our work easier that could only be imagined. All the devices are connected to each other. The data can be collected from every part of the devices that are around us and that would help us in future predictions. This can be

achieved by establishing interactivity between humans, machines, hardware devices and software.

Internet is a mode that helps to achieve this interaction. Using wired and wireless mode of transmission, Internet is penetrating in every strata of life. It is been used not only in sectors related to technical aspects but also in non-technical fields as well where there was less scope for its usage.

Features of overall development in Smart Cities are as given under:

- i. Promoting mixed land use in area-based developments.
- ii. Housing and comprehensiveness — expand housing opportunities for all;
- iii. Creating walkable localities — reduce congestion, air pollution and resource depletion, boost local economy, promote interactions and ensure security.
- iv. Maintaining and developing open spaces — parks, playgrounds, and recreational spaces in order to enhance the quality of life of citizens, reduce the urban heat effects in areas and encourage eco-balance;
- v. Promoting array of transportation options — Transport opportunities like hyperloops and other such quasi technology can be implemented.
- vi. Good Governance — increasingly rely on online services to bring about accountability and transparency, reducing service cost.
- vii. Giving an identity to the city — based on its main economic activity, such as local cuisine, health, education, arts and craft, culture, sports goods, furniture, hosiery, textile, dairy [9].

## **INTERNET of THINGS**

After the advent of Big Data and Cloud Computing, the need of acquiring of data from remote area and storing them for future aspects have grown up. This has led to a new level of thinking called, Internet of things (IoT).

IoT is a forthcoming thought that brings all the devices collectively. It is growing speedily and is reaching different verticals and industries. Lot of innovation is happening around IoT across different verticals and technologies. It is one of the most talked about technology trends today. There is a broad consensus among technology vendors, analysts and other stakeholders that IoT would have a significant impact on the technology in the years to come.

In India, the IoT ecosystem is mainly driven by Government, Industry and Startups. India is showing a keen interest in making use of IoT. The 'Make in India' initiative started by the Central Government is a major leap towards the IoT. Government has rightly recognized its potential and working towards its usage in having good governance. The government has taken initiative and planned policies to accomplish vision of developing a connected, secure and a smart system based on our country's needs. [8]

Government of India's IoT Announcement: Department of Electronics and Information Technology, has come out with a draft IOT Policy document which focuses on following objectives:

1. To create an IoT industry in India of USD 15 billion by 2020. It has been assumed that India would have a share of 5-6% of global IoT industry.
2. To undertake capacity development (Human & Technology) for IoT specific skill sets for domestic and global markets.
3. To undertake Research & development for all the assisting technologies.
4. To develop IoT products specific to Indian needs in all possible domains. [1]

### **MISSION OF THE GOVERNMENT REGARDING SMART CITIES IN INDIA**

Smart Cities Mission of the Government of India is a courageous, new initiative. It is meant to set examples that can be replicated both within and outside the Smart City, catalyzing the creation of similar Smart Cities in various regions and parts of the country. The core infrastructure elements in a smart city would include:

- i. adequate water supply,
- ii. assured electricity supply,
- iii. sanitation, including solid waste management,
- iv. efficient urban mobility and public transport,
- v. affordable housing, especially for the poor,
- vi. robust IT connectivity and digitalization,
- vii. good governance, especially e-Governance and citizen participation,
- viii. sustainable environment,
- ix. safety and security of citizens, particularly women, children and the elderly, and
- x. health and education.

**Some of the key aspects of a Smart city will be:**

- Smart parking
- Intelligent Transport System
- Smart urban lighting
- Waste management
- Smart city maintenance
- Citizen safety
- Smart Grid
- Smart Energy
- Water Management[2]

**TECHNOLOGIES EVERY SMART CITY SHOULD HAVE**

For an intelligent functioning of a smart city it must have good assembly of technologies. A few are listed below:

- City guiding apps
- Wi-Fi
- Machines that display real-time information dynamically
- Disaster Management System
- 24x7 surveillance
- Device charging stations
- Good amount of sharing methodology for data and other resources
- Good Internet penetrations
- traffic rerouting facility
- Better accountability of data
- An efficient Human Resource Development

**List of cities selected to be made Smart in India :**

Here is the list of smart cities released by the government today:

Port Blair, Vishakhapatnam, Tirupati, Kakinada, Pasighat, Guwahati, Muzaffarpur, Bhagalpur, Biharsharif, Chandigarh, Raipur, Bilaspur, Diu, Silvassa, NDMC, Panaji,

Gandhinagar, Ahmedabad, Surat, Vadodara, Rajkot, Dahod, Karnal, Faridabad, Dharamsala, Ranchi, Mangaluru, Belagavi, Shivamogga, Hubballi-Dharwad, Tumakuru, Davanegere, Kochi, Kavaratti, Bhopal, Indore, Jabalpur, Gwalior, Sagar, Satna, Ujjain, Navi Mumbai, Nasik, Thane, Greater Mumbai, Amaravati, Solapur, Nagpur, Kalyan-Dombivali, Aurangabad, Pune, Imphal, Shillong, Aizawl, Kohima, Bhubaneswar, Rourkela, Oulgaret, Ludhiana, Jalandhar, Amritsar, Jaipur, Udaipur, Kota, Ajmer, Namchi, Tiruchirapalli, Tirunelveli, Dindigul, Thanjavur, Tiruppur, Salem, Vellore, Coimbatore, Madurai, Erode, Thoothukudi, Chennai, Greater Hyderabad, Greater warangal, Agartala, Moradabad, Aligarh, Shaharanpur, Bareilly, Jhansi, Kanpur, Allahabad, Lucknow, Varanasi, Ghaziabad, Agra, Rampur, Dehradun, New Town Kolkata, Bidhannagar, Durgapur, Haldia [source: <http://timesofindia.indiatimes.com/>] [10]

## **CHALLENGES FOR SMART CITY IN INDIA**

Though we are planning for a big leap towards future using IoT but there are many challenges to overcome. They are observed and counted below:

- 1) The biggest challenge lies with the infrastructure. The development of high-tech infrastructure is a herculean task as the current cities are less adaptive. Practically, if we see the Indian cities in current scenario, are very ill equipped with respect to internet. In India the use of internet is expanding but not as fast as is required. The roads, offices, educational institutes, service sectors need to be well organized to be made adapted in the smart city.
- 2) Unplanned cities are available in India. These needs to be reshaped which is not a simple assignment.
- 3) Some of the cities are ancient. Their original identity would become a past in the race of making the city smart. This may add up to more intangible tasks.
- 4) Population in India is vast. Providing technological freedom and maintaining a control over it is itself a bigger aspect of discussion.
- 5) Issues of cyber security and handling crimes related to cyber world would multiply leaps and bounds. Hence proper precautions have to be also taken legally.
- 6) Connectivity in vast regions also considering the geographical challenges is a major hindrance that needs not to be forgotten.

- 7) With advent of new technologies and newer protocols, etc, the older ones needs to be made compatible to them. Upward compatibility has to be thought of in the initial stages itself keeping a window open for the new technologies to be brought in and old ones to be phased out.
- 8) One must also think of the scenario of accounts maintenance of those who will not be alive after being a part of Smart City for decades.
- 9) Balancing the eco system of the city is a major challenge. Adding new technology may hamper the eco system of the entire life chain that is currently dwelling in the city.

The challenges are many but a few are mentioned above. The list still goes on.

### **OBSERVED SOLUTIONS TO THE CHALLENGES TO BE OVERCOME TO BRING IN SMART CITY AS A REALITY**

- 1) The cities that are selected now has lots of unmanaged pockets of spaces that need to be found, acquired from the illegal occupants and planned.
- 2) The people need to be made aware of the use of IoT. Training to be imparted, the techniques should be made available as pilot projects to the mass so that they start adapting to the concepts.
- 3) Management of Wastes in the city needs to be taken as a task of highest priority. Recycling of waste to make reuse of it is the need of current hour.
- 4) Proper utilization of water and better management of pollution is to be seen as one of the next features.
- 5) Data needs to be made available of each and every thing that is present in the City. It requires lots of infrastructure. Each device needs to be attached with sensors. Hence the required electronic devices to be made cheaper so that it suits the pockets of Indian common man.
- 6) Laws to be amended in the Constitution of India, as many legal complications may have to be faced in Smart City. The IT Act, 2000, needs to be made more robust in that case to curb the cybercrimes that may usurp.
- 7) An advisory committee to be set up by the Governing body that will be giving proper advice at regular basis to the proper functioning of the smart cities. Also they will guide to check anything wrong happenings in the system.

- 8) Separate Research and Development need to be encouraged that will help in bringing newer and better quality products and services in society thus helping the functioning of the Smart City System.
- 9) There are many industries that use little of computer or computer related technology. These industries must be brought into the stream of computing.
- 10) Proper logistics to be maintained. Logistics is a major concern as this would become a major source of information in the planning new things. Also to have future predictions this will play a major role.

### **ADVANTAGES OF IOT**

IoT can be explored to its fullest in the project of Smart City. It is said all atoms in the world can be given an ID and can be used to collect data. So, in this respect, IoT plays a major role in making the smart city a reality. IoT has its emerging use in sectors discussed below:

- Agricultural sector
- Water Management
- Pollution Management
- Educational Sector
- Wildlife management
- Transportation sector
- Traffic Management
- Weather Forecasting
- Earthquake predictions
- Telecom Sector
- Military Services
- Health Sector

All these sectors and many more can use the services of IoT. All these areas are part of the Smart City which will be easily benefitted to other aspects also.

### **CONCLUSION**

Building a smart city is a huge task. But making it possible without IoT is an impossible task. Thus, IoT is a major concern of our age to think and implement in all walks of our lives. One

must start imbibing this technology into the current scenario cities. This will help to develop new protocols, new technology, build understandability about smart city amongst the masses, etc. IoT can be explored to its fullest in the project of Smart City. It is said all atoms in the world can be given an ID and can be used to collect data.

Use of Smart solutions will make possible cities to use tools, information and data to improve infrastructure and services. Comprehensive development in this way will improve quality of life, create employment and enhance incomes for all, especially the poor and the disadvantaged, leading to inclusive Cities. A smart City Model is to be constructed. This idea is still in its inception but needs a high level of thought processing and research & development too.

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