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An Analysis of Trends, Developments and Transparent Issues in the making of Indian Smart Cities

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Abstract

During the past few years, interest has grown in the creation and application of methods, structures for smart city evaluation. This reflects the increasing awareness of the value of systems for better planning and architecture of efficient and stable communities. A city is a vast and permanent human community that offers many resources and opportunities for its people. The rapid urbanization and growth have put a lot of pressure on local services and service delivery. The research discusses many potential resources that can make a city smart across growing city dimensions and also discusses the initiatives of the Indian government towards a Smart city. This paper is a survey of a variety of papers, covering the actual case study from a more comprehensive framework, such as e-mobility, which covers the smart city subject from.

Keywords: Smart City, IoT, Ecosystem Model, Capability Layers

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1. Introduction

What a smart city is all about. The response is that the idea of an intelligent city is not generally accepted. Various people say different things. The conceptualization of Smart City therefore depends on how much development, readiness to change and changes, the resources and expectations of people differ from town to city and city to country.

Defining a smart city [1]: A smart-city has developed infrastructure to capture, process, and analyse real-time data in order to better the lives of its citizens. The study indicates that every smart city initiative needs strong guidelines on new technologies and data, a functioning administrative structure, and some form of community engagement. Brooks Rainwater, co-author, and founder of NLC City Solutions and Research Centre [4] said, Technological innovation is closely related to urban growth. Although "Trends in intelligent city development" shows no one-size-fits approach to the implementation of intelligent city systems, it makes three recommendations which must form the core of each plan: The most successful smart or intelligent city initiatives are those with clear goals that solve public issues that are unique to every city. Cities will turn at collaborations with colleges, non-profit groups, and the business sector [4].

Figure 1. Smart City Vision

Figure 1 reveals the smart city vision. Smart-city is an integrated system of intelligent treatment, smart technology, smart environment, smart workplace and smart citizens of course [3]. Partnerships provide cities with many advantages, including access to finance and external expertise. Cities will strive to follow best practices and smart city growth systems.

City officials will take into account and develop technical principles and structures for smart-city growth [7].

Within a smart city the main network components would include:

- Suitable Water Supply, health and education
- Providing guaranteed power and Sanitation and the disposal of solid waste,
- Efficient public transport and urban mobility;
- Low-cost housing, particularly for the elderly,
- Robust IT and digitalization integration,

1.1. Govt. Initiatives

An SCM underlined in figure 2 below has been initiated by the Govt.of India through the MoHUA-Ministry of Housing and Urban Affairs. The SCM of the Government of India supports cities that provide the citizens with a healthy and secure environment for their core amenities and good quality of life, and the introduction of Smart' technology. These Smart Policies cover e-governance ICT programs, online government facilities, and relatively reduced prices to improve key service efficiency [11].

The aim of the Smart Cities Project is to encourage communities with modern services and inhabitants with a better standard of life, a healthy and prosperous climate, and the implementation of smart technologies. The purpose and target is to look at limited areas, construct a model that can be used as a lighthouse in other developing cities [12], and to develop a replicable model of sustainable development. The smart city program of the State is a bold, innovative initiative. It is intended to build templates that can be replicated in and out of Smart City, catalyzing the creation of parallel Smart Cities across the world's various cities and regions.

Source: india.gov.in

Figure 2. Smart Cities Mission

The goal of the Smart Cities Mission [10] is, therefore, to accelerate economic growth and enhance people's quality of life by promoting urban development and technology creation, in particular technology that contributes to smart outcomes. Area-based planning would turn existing areas including slums, into better-developed neighbourhoods, although enhancing the profitability of the City as a whole [14]. Modern areas beyond cities will be built to meet the increasing development of metropolitan areas. In order to improve technology and facilities, the Smart Technologies architecture will enable cities to leverage software, knowledge and data. This will improve the quality of life, generate employment and develop prosperity for everyone, particularly the poor, and vulnerable, contributing to sustainable cities [8].

1.2. Case Study Analysis

Bhubaneswar e-mobility plan: Bhubaneswar, by major public transit network investments and last mile connectivity modes, the goal is to trigger a 20% change to public transport by 2021. According to the bus modernisation programme, 38.7kmspriority Transit Corridors would need 148 new electric passenger buses to carry 192,000 passengers daily. First-last-mile within its ABD connectivity, the City proposes the deployment of 500 e-rickshaws, the associated infrastructure and charging stations from 2021.Ventures will serve as a catalyst to help Bhubaneswar achieve its target goal of 30% of vehicles powered by electric vehicles in town by 2030 [9].

Via participatory policy-making, good governance, and free access to IT, Bhubaneswar is a:

- City based on public transportation that facilitates involved, integrated, and affordable mobility choices

- Vivid community with numerous housing, educational and leisure facilities while improving its history, culture and cultural cultures
- Children's friendly town with open, secure, inclusive and vibrant public areas
- Eco-city that resides in harmony with nature to sustain a stable, clean, green and balanced climate
- The regional economic centre, through the presence and empowerment of their governments, local businesses and informal workers, is attracting knowledge-based businesses and sustainable tourism development.

The e-vehicle policy [13] outlines key measures through Governments of States / Cities as follows: -

- Determination of the correct area / routes for electrical rickshaw service within the city
- Define the regulatory requirements for electric rickshaws in Odisha to ensure maximum coverage
- Finalization of draft Electric Rickshaws Legislation
- Determination of electric vehicle tariff to be paid
- Odisha Electricity Regulatory Commission approval of tariff
- To identify sustainable operating models for infrastructure charging
- Define the requisite amendments to the building laws
- Establishment of an Air Ambient Fund structure
- Describing Auto-rickshaw buyback system structure

2. Role of IoT in Connected cities

The Internet of Things (IoT) supports cities connecting disparate public services, infrastructure and networks. Such intelligent cities produce quantitative data in real time to more efficiently monitor initiatives and resources and to assess their effects instantly [13].

Platooning trucks transport freight easily from port to destination. Smart distribution systems warn operators as freight is transferred between locations. When the time comes to retain or replace public transport and community service cars connect with their home entity. Self-driving vehicles carry users to and from the area, offer transport and delivery to others. Apps work with intelligent parking meters to warn drivers about the availability of parking. The sensors measurement the volume of waste in public receptacles so that sanitation workers can optimize productivity on their way. Solar panels will be tracked to see how much electricity they produce and if maintenance is required. LED lamps are sensitive to the environment and periodically notify the Public Works Department when the bulbs need to be adjusted. Sensors track fire-prone situations in urban parks and forested areas. Sensors are now able to identify flames in buildings and trigger an alarm call to the fire service. Power plants can be tracked in order to track health and local police can be aware of the pollution rates. Cities depend on and promote e-commerce to be competitive in the economy of 21st century [16]. Drones can be used for law enforcement and firefighting as remote outposts for maintenance inspections and for environmental protection. Areas not open to public access cannot be monitored to keep illegal workers out. Commercial applications include precision production, aerial imaging and parcel distribution in the near-coming future. Cities should create smartphones and wearable devices and allow residents an integral member of the internet network that interacts with the community [17]. Table 1 says what internet stuff means for towns?

Table 1. IoT-Internet of Things Mean for Cities.

Transport	Utilities	Services
Smart Logistics	Waste Mgmt.	Fire Detection
Vehicle Fleet	Solar Panels	Radiation Levels
Self-Driving Cars	Lighting	E-Commerce
Parking	Water And Wastewater	Surveillance Cameras/Drones

The latest trend is to smart cities. Citizens around the world are working to make communities more prepared with electricity, security, education and transportation technologies. Cities are creative centres, social beehives, hotbeds of invention and perhaps the most interesting cities to explore in the country. Cities are growing; the United Nations predicts that by 2035[17], [18], 67 percent of world's people will live in the urban regions, according to National Geographic. Smart cities utilize ICT to be smarter and more effective in resource use, resulting in expense and electricity reductions, increased infrastructure efficiency and quality of life, and decreased environmental impact – both promoting creativity and the low-carbon economy. Table 2 lists some of the world's inventive stakeholders [15].

Table 2. Global Smart cities and their Inventions

Name of City	Equipped Technology
Vienna	Smart Energy Vision
Toronto	Low-Carbon Economy Solutions
New York	Optimize Business Process Solutions
London	Congestion Tax
Tokyo	Smart Grid
Barcelona	Low-Carbon Solutions.

Table 3. Smart cities in India and their latest Inventions

Name of City	Equipped Technology
Indore	KAHN Riverfront development
Surat	Smart City Centre
Visakhapatnam	All Abilities Children Park
Coimbatore	Smart Street Bench
Delhi	NDMC open Space development
Bhubaneswar	E-Mobility Plan

For reader's convenience knowing, this article included many acronyms. Table 4 shows all the acronyms included [14].

Table 4. List of Acronyms

Abbreviation	Description
SCM	Smart Cities Mission
IoT	Internet of Things
SCA	Smart City Agent
CAP	Consistency availability partition resist
SCC	Smart City Challenge

3. Background Study

H Kumar et.al [1] propose a multi-dimensional hierarchy of services and critical infrastructural growth. Furthermore, it will enable politicians, local planners, government officials and infrastructure providers to identify and gain more insight from potential creative solutions for sustainable community development in the Smart City Transition Process. In the concrete framework to describe urban development, five main fields (planning and public design, ICT services and smart solutions) are discussed. The current SCTF is supported by research and experience in many intelligent cities around the world to highlight its usefulness. Furthermore, an elegant and systemic simulation for the city transformation process demonstrates the interrelationship between the ideas collected.

J Laufs et.al [2] have assembled a list of security initiatives for intelligent communities and have recommended different improvements to the strategic status quo on the ground. Finally, we suggest three specific groups to categorize security measures in smart cities: those initiatives utilizing modern sensors with existing actuators, those trying to turn old devices smart, and those implementing completely different features. Those topics are then addressed in depth and the significance for the general field of public protection and governance of a set of initiatives is assessed.

A Sharifi et.al [3] discussed general knowledge on aspects such as geographic scope, research size, demographic target and production process. This also describes structure, thematic focus zones, and repeated indicators in systems, and includes detailed detail on the various techniques and methods used to assess city smartness. Results show that different approaches were taken, but some commonalities also exist. Index is the system-wide model of the most common themes: environment, people, politics, climate, accessibility, living, and records. This typology research can be used for many purposes; it can act as a reference frame for those who use appropriate schemes to analyse the efficiency of smart cities, can be used as a framework for more strategic review of evaluation schemes, and can also direct the development of better educated schemes.

PA Johnson et.al [4] conceptualized how the modern smart city incorporates people not only as a community, but as a series of micro-transactions integrated in the city's real-time climate. A smart city system monitors this transactional resident and translates it across other networks into intelligent community decision-making. We have developed four different interaction modes to address this shift from traditional methods of communicating with people and the metropolitan environment to micro-transactions: sort (intentional contribution), tweet (intermediate third parties), tap (interaction accepted or requested) and switch (ambient motion driven transaction). Such four approaches are used to address core concerns on how the citizens in the emerging era of the smart cities interact with the government and how these interactions form people's political relationships and build different power outlets in the private sector.

M Lom et.al [5] created a new concept, Smart City Agent. The SCA is the main building block for smart city modelling. However, this paper's approach emphasizes the interconnection of various systems within a town. Its strength is better data exchange and heterogeneous agents. This knowledge management strategy is the missing link in the increasing demand for partial smart city technologies, allowing applications to be replicated in dynamic environments like a city. The appropriateness of the value of the proposed alternative as seen on an electric car charging usage case. Results show the approach to dynamic behaviour modelling.

S Edge et.al [6] aimed throughout the face of spatial and social change, brought out common viewpoints and insights throughout downtown Kitchener, Ontario, Canada, an intensely clever city on the development track. They adopt an Innovative Analytic Procedure (CAP) method and offer a collection of complex vignettes focusing on the experiences of these stakeholder groups centred on data collected from a neighbourhood dialogue involving representatives of city government, technology and start-up sectors, community service organizations and public leaders. The vignettes highlight various assumptions about the role of technology in enhancing quality of life and demonstrate incapacity to turn shared and equal goals into practice on the ground. We contend that CAP is an important tool for addressing and

enhancing the inclusiveness and openness of conversations and debates in smart cities.

4. Impact on real state

New house-building figures are main economic indicators. Which means they'll give you heads-up on the housing market 's prospects. The figure 3 below shows the number of new private-owned housing units launched in 2009-2020[15].

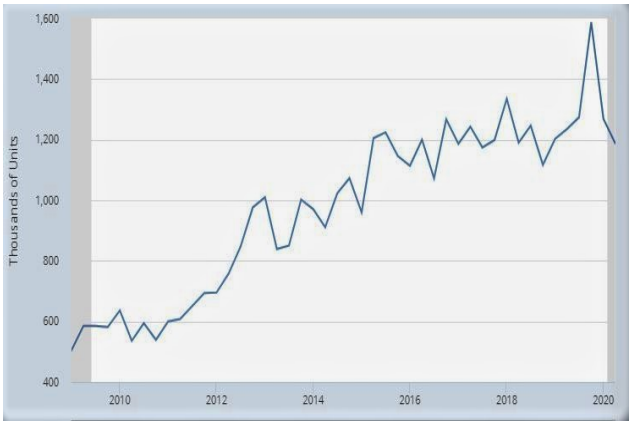

Figure 3. New Privately Owned Housing Units

Impacts predicted are:

- Improved data collection of data should allow stakeholders to better understand a property or location, its environment and inhabitants.
- In the coming years, stronger demand is expected for smart buildings [16], which use digital processes to manage a range of operations such as monitoring and controlling resources, climate, protection and other main features.
- Advances in technology are disrupting the conventional structures of businesses choosing where to conduct business; purchasing or leasing an office; building it to their specifications; and designing equipment for their employees to perform their work.
- In Smart Cities, data centres are required to play a leading position as the hubs for massive data acquisition, storage, retrieval and archiving.

There are following categories of property types [20]:

- Residential land covers new and resale properties. The most popular is single-family housing.
- Features shopping centres and strip malls, hospital and residential facilities, hotels and offices.
- Commercial real estate covers factories and land and warehouses.
- Land includes vacant land, farmland and ranches.

5. Challenges for Smart City solutions

Recognizing that cities are the drivers of development and attracting a million people per minute from rural areas, the government launched the SCC-Smart City Challenge [17], handing over targeted urbanization to the states. The aim of the SCM-Smart Cities Mission strategy is to encourage communities that have key services and have people with quality of life, a safe and healthy climate, and 'smart' solutions. Key challenges and their description is enlisted in Table 5 [15].

Table 5. Key Challenges of Smart Cities

Challenge	Description
Infrastructure	Utilization of sensor technology
Security and Hackers	Cyber-terror threats
Privacy Concerns	Invasion of privacy
Educating Community	Awareness in Citizens
Being Socially Inclusive	Smart transit programs

Smart Cities are utilizing sensor networks to obtain and analyse knowledge to increase the quality of life for people. Sensors gather data from rush-hour statistics to crime rates and air quality in general.

Installing and operating these devices calls for complex and costly systems. How are they going to get that power? Does hard-wearing, solar or battery operation require this? And, for power loss, maybe a combination of all three? Large urban areas are now threatened by upgrading decades-old networks such as electric wires, steam pipes, and rail tubes, as well as high-speed broadband. Broadband wireless coverage is growing, but connectivity is limited in major cities.

Recent debate about cyber-terror risks to fragile, aging power grids has a little more anxiety and cynicism about technology and defence.

Smart Cities spend more time and money in infrastructure, while technology firms build apps with creative built-in systems to defend against ransomware and cybercrime. With block-chain being the focus of the computing industry, many developers are finding ways to integrate these cryptographic technologies into current security-enhancing applications.

Any big city wants a compromise between quality of life and privacy breach. While everybody has to achieve a more comfortable, happier and safe atmosphere, nobody likes to know like any family member is actively watching them [18].

Cameras mounted on any street corner can help to discourage violence, but they may also generate distrust and fear among law-abiding people. Another important factor is the sum of data collected daily by all occupants with smart sensors.

To effectively maintain and grow an informed society, it takes intellectual persons who are interested in the usage of new technology to utilizing them actively. For a current city-wide technological program, the development phase must include informing residents in the public regarding its advantages [19].

Real-time updates are an innovative concept for a busy society with smart transportation services providing riders. So what if one half of the city 's populace does not afford mass transport or Uber? What about the elderly residents, without having mobile devices or apps?

This is crucial because Smart City development needs empathy for all groups of society, not just the wealthy and technically developed ones. Innovation should often contribute for getting communities together instead of dividing them on the basis of income or jobs.

6. Nation-building initiatives in India

The nation-building initiative aimed at turning India into a regional centre for design and manufacture.
Following are the list of some initiatives shown in figure 4:

- Make in India
- India.gov.in national portal of India
- Incredible India
- Smart net (urbanization Solution)

Figure 4. List of Nation Building inititives

6.1. Project's Schemes by Govt.

Government has initiated various beneficiary programs shown in figure 5 for the benefit of people and, of course, country under the umbrella of national initiatives.

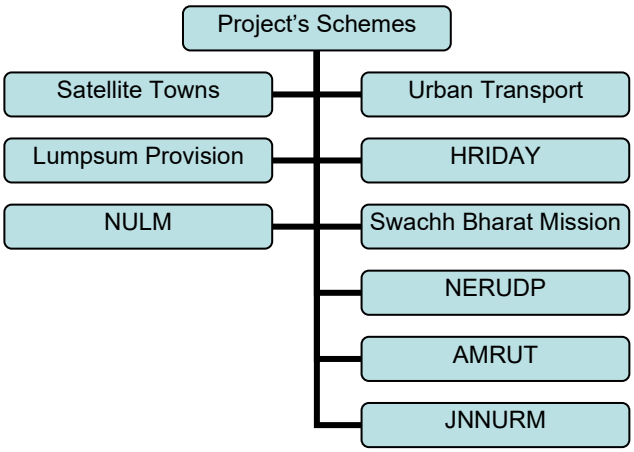

Figure 5. List of Beneficiary Programs/Schemes

On behalf of West Bengal Housing and Construction Infrastructure Corporation Ltd (WBHIDCO Ltd), Bengal Urban New Town's City Development Plan (CDP), designed and submitted by Infrastructure Development Limited (BUIDL) –Kolkata, to be listed under the satellite town planning scheme for urban infrastructure about seven Mega towns. New Town, part of the Rajarhat-Gopalpur area, is a rapidly developing satellite town in metropolitan Kolkata Place (KMA), which has the capacity for construction of infrastructure. Therefore, the town is expected to be able to absorb additional population growth and help lighten burden on City of Kolkata [21].

7. Ecosystem Framework – A Model

A Smart City is a city with six characteristics, based on the "simple" blend of self-decisive, autonomous and informed people [20].

Figure Two demonstrates our smart city architecture structure. An environment composed of individuals, organisations, enterprises, regulations, laws and processes interconnected to achieve the desired effects in Figure One is a lively and prosperous community. This community is flexible, sensitive and still important for everyone living, working and visiting the area. An intelligent city incorporates technologies to speed up, activate and turn this ecosystem [21].

In the intelligent city environment there are four types of value producers. We create and absorb value for one of the results mentioned in Figure7

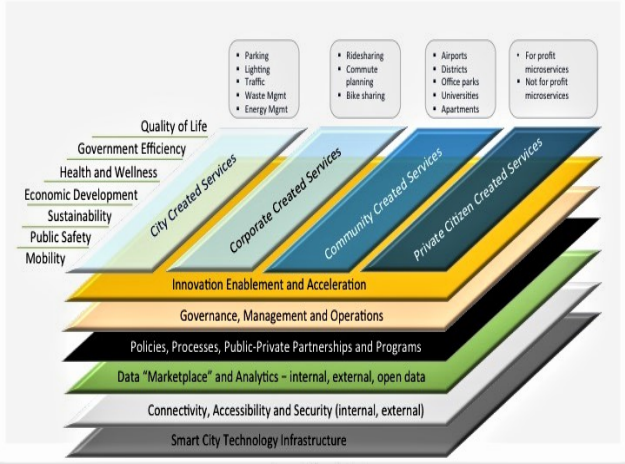

Figure 6. The smart city ecosystem framework.

If you think of a wise city, you immediately think of civic and quasi-governmental infrastructure such as smart car parking, smart water supply, intelligent lighting etc. In reality, three others – corporations and associations, neighbourhoods and people – co-exist in the intelligent community.

Figure 7. The smart city ecosystem framework.

Businesses and organisations should create programs that leverage knowledge to produce outcomes for their stakeholders. Some examples of "smart" companies include Uber and Lyft for personal mobility and Next-door for knowledge sharing [22].

Communities are wise, albeit rather clustered cities. Many examples include schools, office parks, terminals, freight facilities, multinational units (MDUs) or residential projects, housing developments / districts, commercial districts, and even individual "smart" houses, which may be smart neighbourhoods. We need intelligent resources that can be precisely customized to their stakeholders.

Intelligent infrastructure suppliers in smart cities are either tenants or regular individuals. A citizen living near a dangerous crossroads can point a camera to the intersection and broadcast information to traffic planners and the police live. To order to track ozone and pollen rates at certain times of year, homeowners put air quality monitoring sensors on their property and provide this information to certain community members. Residents can opt to temporarily or permanently render such intelligent services free of charge or dependent on fees.

A smart city is an ecosystem consisting of several capability layers listed in Table 6. Whilst technology is an important facilitator, it is just one of the fundamental technologies that any intelligent community requires. No one is more important than the other. In the clever city, every skill plays a different role. These capabilities must be integrated and coordinated to fulfil their mission.

Table 6. List of capability Layers

Name of Layer	Description
Value layer	Visible layer for city residents & Others
Innovation layer.	Variety of innovation programs
Governance & Operations Layer	Upgrade their existing infrastructure
Policy & Financing Layer	Partners are required to build, operate
Information and data Layer	Open data initiatives
Security layer.	Seamless layer of trusted connections.
Infrastructure layer.	Support a new class of value creators

The following steps are important:

Understand the architecture and adapt it to the sense of a special field of the smart city ecosystem. Include this idea in the development and execution of the intelligent urban visions, policies and strategies.

Defining current capabilities and vulnerabilities on many dimensions in the sense of intelligent municipalities. Understand what the four ways of sense consumers require.

Evaluate Smart City projects and strategies on existing and evolving environments. This approach helps to decide what the projects need and what is required to complete the projects.

Prioritize and develop expertise at different habitat levels. A smart city needs new talents and knowledge. Improvements in capabilities by strategic partnerships and agreements with service suppliers, where possible.

8. Conclusion

Technology has made many potential lifestyles dreams a reality The smart city is just one of the technological solutions. The concept of smart cities is extended in other parts of the world including the U.S., Mexico, Finland, South Korea, Sweden, and others. Such cities should make a quality of life leap. Smart cities are designed to fit the contemporary city's needs and potential. The "smart" city, intelligent world, knowledge community, smart communication, and wireless media are among the nomenclatures used. Although the real estate sector is making significant strides in Smart Buildings' growth and innovation, it is important that they obtain a comprehensive understanding of how these innovations match and integrate with the wider Smart City environment. In particular, stakeholders in the real estate sector will need to consider new data sources and how to build on them to support land asset creation, construction, and management.

9. Future Work

Smart City projects are projected to expand in the future, revolutionizing areas such as health care, healthcare, and policing, while also promoting the encrypting development [24] and progress of engaged people who will adopt and use technological technologies and services like Smart People. Future study can have utilized different deep learning frameworks for progressive databases [25]. This study will continue using factors such as: power efficiency, service quality, data transmission speed, range, sensor size, data storage, data transmission reliability, delivery cost, network type and processor to review these published papers on sensor and routing protocols.

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