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Smart City – The Urban Intelligence of India

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Abstract- ***Smart City means aligning information technologies to citizens' needs in order to enhance their day-to-day lives by increasing efficiency, lowering costs, and engaging more directly with city dwellers. Developing a smart city is the next generation urbanization process for improving the efficiency, reliability, and security of a traditional city. This paper discusses about the economic benefits, cost of implementation and challenges towards a Smart city. It also focuses on its building blocks, history, advantages and disadvantages of Smart cities. A road map to the future city is also suggested, in this paper.***

Keywords— Smart City, Urbanization, Digital Technology, Economic, Social, Environmental, Sustainability, etc

I. INTRODUCTION

In every single day, people are moving towards cities and half of the world's population lives in cities.[1] By 2050, as per the experts, world's urban population will be double. Nowadays, we witnessed that urban regions contribute nearly 60% of GDP (Gross Domestic product) in India, which is estimated to be 75% in the next 15 years. Currently, the urban population in India is 31% of the total population. [2]Consequently it's time for the cities to get cleverer to deal this large scale urbanization and discovering new modes to manage complexity, enhance efficiency, cut down the costs and mend the quality of life in the urban regions. In addition to it, the increased mobility in India, has created vivid challenge between the cities to pull skilled residents, companies and organizations. Contributing this flourishing civilization, cities must achieve economic, social, and environmental sustainability. This will only be made possible by improving a city's efficiency, and this requires the collaboration of infrastructure and services. [1] Though number of smart solutions for cities has risen rapidly, the transformations will require revolutionary changes in the way cities are run today. Thus developing smart cities is not only just a process whereby technology providers offer technical solutions and city authorities provide them. Building up smart cities also requires the development of the right environment for smart solutions to be effectively adopted and used. The development of a smart city requires participation, input, ideas and expertise from a wide range of stakeholders. Public governance is naturally critical, but participation from the private sector and citizens of the community are equally important. It also requires a proper balance of interests to achieve the objectives of both the city and the community at large.[3] Smart cities aren't a science fiction, far-off-in-the-future concept. They're here today, with municipal governments already using technologies that include wireless networks, big data/analytics, mobile applications, Web portals, social media, sensors/tracking products and other tools. [6] Issues such as poverty and environmental disasters can be alleviated with the help of smart cities for advanced communication and warning systems. In medical field, ambulances will communicate with traffic systems in order to find the fastest route to an injured person, in real-time.[7]

II. SO, WHAT IS A SMART CITY?

Various definitions have been put forth for smart cities. Some of them have been highlighted below.[16]

"Smart Cities have been characterized and defined by a number of factors including sustainability, economic development and a high quality of life. These factors can be achieved through infrastructure (physical capital), human capital, social capital and/or Information and Communication Technologies (ICT) infrastructure" – European Commission

"The Smart City is a process, or series of steps, by which cities become more "livable" and resilient and, hence, is able to respond quicker to new challenges. Thus, a Smart City should enable every citizen to engage with all the services on offer, public as well as private, in a way best suited to his or her needs" – Department of Business Innovation & Skills, UK

"A city that monitors and integrates conditions of all of its critical infrastructures – including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings – can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens." - The U.S. Office of Scientific and Technical Information

"Smart City is a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create sustainable greener city, competitive and innovative commerce and an increase in quality oflife with a straightforward administration and maintenance system of city" – Barcelona City(2011)

Whereas from an implementer's perspective, a smart city is one which leverages traditional (for example: water supply) and

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modern (ICT for example) enablers to fuel sustainable economic development, ensuring high quality of life and better management of natural resources.[16] Smart City is a city that uses digital technologies to improve the quality of life and standard of living of its citizens. Smart Cities anticipate and mitigate current and future challenges by using the power of the all-pervasive communication networks, distributed wireless technology, and intelligent business management systems. [12] Smart Cities rely on integrating and analysing massive amounts of data to address day-to-day issues. For example, data can be leveraged to intelligently reroute traffic and reduce accidents, pinpoint crime hotspots and deploy resources accordingly to reduce crime, and to connect citizens. Smart Cities help its citizens in day-to-day activities such as finding a parking spot or new local shop by proactively providing services, notifications and information. Smart Cities make governance more transparent by connecting citizens to their local governments and encouraging direct participation, interaction and collaboration.[15]

The key principles that define a Smart City are as follows:

Information Technology enabled transparent administration and governance.

Efficient management of utilities such as energy, water, solid waste and effluents through use of renewables, conservation and recycling.

Creative and meaningful use of public-private partnerships.

Use of technology for safety and security such as network of video cameras, intelligent patrolling and surveillance and rapid response to emergency calls.

Financial sustainability.

Adequate social infrastructure.

Transit-oriented green environment with design focus on minimum carbon footprint

The following Fig. 1 illustrates the vision of the future Smart city, a city with a pervasive overlay of information and communication technology (ICT) connecting things, organizations, and people. For example, sensors connect cars to transportation management centers that analyze day-to-day traffic flow data and provide what-if scenarios in case of events or accidents.[10] This vision of the future is what Cisco calls the Internet of Everything (IoE). The IoE connects people, data, things, and processes in networks of billions or even trillions of connections. These connections create vast amounts of data, some of it data we've never had access to before. [8]When this data is analyzed and used intelligently, the possibilities seem endless.

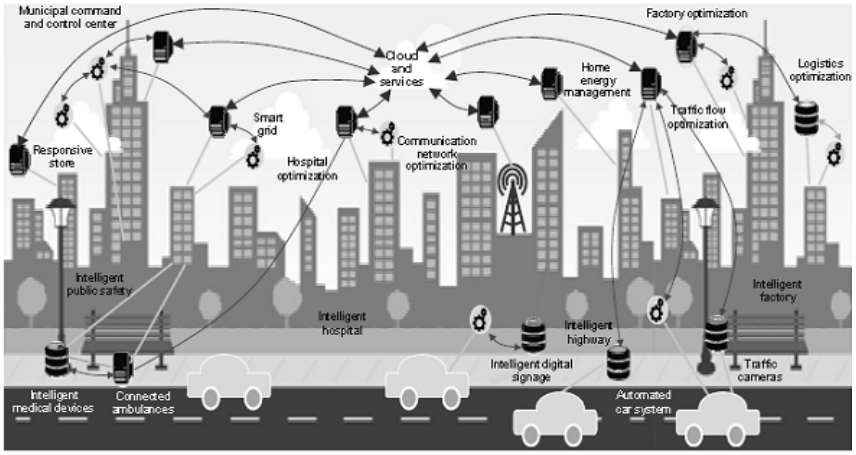


Fig. 1 Vision of future Smart City

III. BUILDING BLOCKS

The key building blocks of Smart Cities are: (Fig. 2)

SMART LIVING: Better access to city facilities and services like housing, utilities, etc and thus improved quality of life

SMART PEOPLE: Better educational levels and skill building, health, lifelong learning and higher participation at community level

SMART MOBILITY: Optimum movement of people, goods and information

SMART ENVIRONMENT: Sustainable development, natural resource utilization, optimal use of water resources and energy, balance between built and green areas

SMART ECONOMY: Economic development, higher employment, more investments

SMART GOVERANCE: Stakeholder involvement in policy making and implementation, leveraging technology to facilitate the

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process, better transparency and accountability

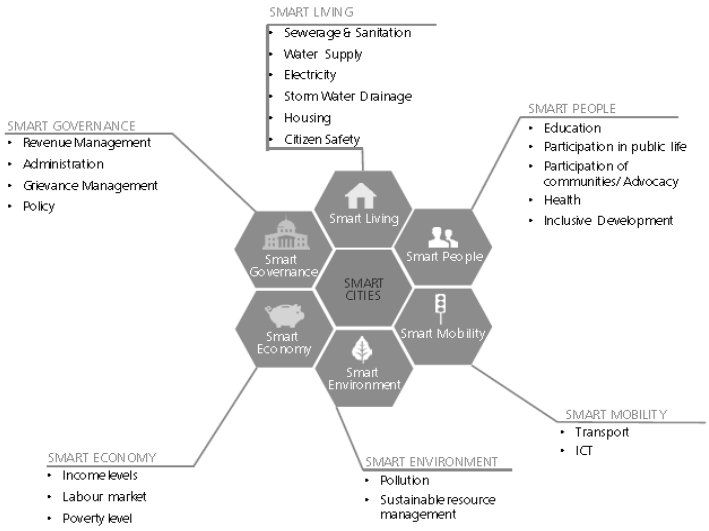


Fig. 2 Building blocks of a Smart City

IV. HISTORY

In 2005, the former US president Bill Clinton, through the Clinton foundation, challenged Cisco to develop technology to make cities more sustainable. [8]As a result of this challenge, Cisco spent twenty five million dollars over a period of five years on a program called Connected Urban Development programme. During this period, Cisco worked on pilot projects with the cities of San Francisco, Amsterdam and Seoul to test the potential of this technology. In 2010, Cisco commercialized the products and services developed through this programme through its Smart and Connected communities division.[9] In 2008, IBM began working on a similar vision to make cities smarter as part of a Smarter Planet initiative. IBM focused on analytical algorithms and data processing technologies to make sense of the oceans of data that is collected on a daily basis.[12] Today, Smart Cities are emerging fast and countries like South Korea, UAE, India and China are investing heavily into its research and formation.

V. ADVANTAGES AND DISADVANTAGES

A. Advantages

Smart City technology will
Help cities streamline their operation,
Reduce resource consumption,
Enable better services to its citizens,
Improve operational efficiency - as cities will be able to track its assets,
Enable efficient asset allocation and situation management,
Reduce greenhouse emissions,
Reduce energy consumption,
Improved waste management, and
Able to better serve its citizens without human intervention.

B. Disadvantages

Smart City will not fix basic urban problems in existing cities such as haphazard growth patterns and poor neighbourhood design.
Smart City cannot overcome issues such as bad building location and sub-standard architecture.
Smart City Technologies rely on constant monitoring and analysis of data for smooth operations. This constant monitoring can have negative ramifications on citizen morale as the technology can be considered an intrusion of privacy. These privacy concerns are legitimate. Data that can be used to find a parking spot can also be used for surveillance.

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VI. ROADMAP TO A SMART CITY

In 1800, 3 percent of the world's population lived in cities. By 2007, more than half of the world's population lived in cities. [3] By 2050, 75 percent of the world population will live cities. As one city mayor said, "The 19th century was a century of empires, and the 20th century was a century of nation-states. The 21st century will be a century of cities." Our cities and planet face serious challenges, including an urgent need to conserve resources as they are consumed by greater urbanization.[7] Cities must develop smarter ways to manage energy, transportation, citizen communication, and other factors to deal with these growing population pressures. Many cities struggle merely to manage the costs of government and to meet rising expectations from citizens to deliver a higher quality of services. Some of the keypoints to the roadmap are as follows:

A. Connect To Citizens And Deliver Better Services

Technology advances have opened up new possibilities and raised expectations about a government's role and how governments should serve communities, including the use of cloud computing as a viable information and communication technology provisioning model and social media to enhance and improve levels of participation and citizen satisfaction.(Refer Figure 2) The appetite for government information is now so great that social tools and open data applications, such as those enabled by the cloud, are often the only viable solutions to provide rich, and personalized experiences, resulting in better served and more engaged citizens.[3] Eg: Microsoft Government Service Delivery and Engagement solutions are designed to combine personal citizen information with cloud-sourced data and services, enabling governments to:

1) *Provide Personalized, Up-To-Date, And Convenient Services*: Provide a single, citizen-friendly point of access to a range of government agencies and the services they offer.

Allow agencies to personalize their services as appropriate to the needs of differing citizen groups and their life stages.

Facilitate direct integration of data with back-office applications to enable end-to-end completion of processes through a single citizen experience.

Put services at the people's fingertips, whenever needed, with online citizen services on websites, contact centers, mobile devices, or on public kiosks.

Build and encourage public and private partnerships, facilitating government modernization and economic recovery through service integration and sharing.

Provide security-enhanced authentication and identity tools to enable personal and sensitive services to be delivered online.

2) *Promote Consultation And Participation*: Use social tools that enable citizens to express their views, politicians to canvas opinions, and government agencies to conduct surveys—all to increase the level of community participation and involvement.

B. Empower City Workers With The Right Tools

The advent of personal computing created a disruptive effect on technology in the workplace. Today, consumerization of IT is having the same effect on government agencies. Gartner coined the phrase "Employee-Centric Government" to describe the challenge of integrating information around a government employee just as we try to do for citizens. This involves not just connecting applications but also connecting knowledge, from data sharing to social connections, as agencies take advantage of technologies that can help foster a culture change toward collective knowledge and expertise through empowerment. Microsoft Government Workplace Modernization[3] solutions aim at improving information workers' productivity through innovative technologies and optimized process management. These solutions enable governments to:

1) *Enhance Collaboration With Function-Rich And Easy-To-Use Tools*: Link familiar productivity tools to intranet publishing and search capabilities, including wikis, digital media, social interaction and community management, and content tagging.

Find and communicate with the right person—anytime, from various locations, on virtually any device with a single user interface for IM, email, presence, voice, video, and application sharing.

Collaborate with granular security and privacy controls, centralized policy settings, and detailed reporting and analysis.

2) *Automate Business Processes By Efficient Design, Deployment, And Operations Of Information Worker–Centric Solutions*: Interoperation of user experiences for line-of-business data access, analysis

Easily deploy flexible and scalable case and workflow management solutions, including tracking and transactional line-of-business systems.

Align IT and business in a unified platform for government records management.

3) *Leverage A Single Platform For Networked Governance*: Seamlessly access mission-critical services and systems with a familiar user experience across PC, phone, and browser.

Get more from contractors and mobile workers with on-premises and cloud-based support for tightly or loosely managed clients

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(e.g., Bring Your Own Device [BYOD]).
Enable agencies to work better together with security-enhanced federated identity across organizational boundaries.

C. Take Advantage Of Business Intelligence Technologies

Many processes and controls in government were designed before contemporary technology was available. Today, technology [3] is often layered on these old processes, making information challenging to locate and an overall picture of policy and service effectiveness difficult to ascertain. To facilitate clearer perspectives on government performance—a desired internal outcome for functional and compliance reasons, as well as a mandate placed on governments by citizens demanding transparency into how their tax dollars are spent—Microsoft Government Insight and Accountability solutions [3] will help governments transform the controls necessary to ensure compliance with laws and regulations, and become more open and transparent. These solutions will enable governments to:

1) *Make More Informed Decisions*: Facilitate information sharing across many systems even in heterogeneous IT environments.

Create sophisticated, online analytic processing solutions, and then share those solutions with other users.
Visualize data about key performance indicators (KPIs) in rich dashboards, data/geography mashups, and interactive maps—such as job creation by city, county, and state—to determine the effects of funding.

2) *Facilitate Transparency And Public Trust*: Deliver greater insight into government activity through the use of emerging standards in government information publishing.

Structure, describe, and govern information assets across organizational and technological boundaries.
Gain visibility and manage workloads across organization boundaries, enhancing decision making, improving alignment with policy, and maximizing resource utilization.
Create visually compelling, interactive dashboards for citizens by combining diagrams, real-time data, and different applications.

3) *Reuse Data To Drive Innovation*: Make data more widely used by sharing internally via Master Data Management and externally via Open Data catalogs, allowing citizens and external agencies to provide innovative applications that build value.

Provide higher transparency and provide greater interoperability using open government principles and standards, such as open source software integration and open standards for portability and consumption.
Enable BI for the masses with the means to easily distribute and maintain controls on government information.
Leverage technology to transform citizen-centric into citizen-driven services.
Publish PSI/Open Data to the cloud to ease the consumption of data for external ISVs and users at a very low cost

4) *Help Ensure The Necessary Controls For Accountability And Compliance Are Available To*: Manage complex regulatory, budgetary, and grant compliance requirements while maximizing the efficient use of taxpayer dollars with technology purposefully built for government entities.

Tie funding to outcomes and measure spending against performance thresholds.
Maintain an easy-to-follow audit trail that demonstrates accountability from beginning to end.
Create consistent processes and quality standards to improve workflows and get advanced reporting metrics for deeper data analysis.
Connect information to enable greater insight, accountability, and compliance.

VII. IN FUTURE

By the year 2020, urban citizens will start demanding intelligent cities with sustainable environment and higher quality of life. New technologies will allow Smart Cities to put citizens first and help deliver the promise of social, environmental and economic sustainability.[15]
By the year 2030, all the major Cities of the world will be on the path to becoming Smart Cities and existing Smart Cities will continue to mature and adopt new technologies such as grid sensors and pneumatic waste disposal while incorporating sustainable architecture and low-carbon energy production.
By the year 2050, Smart Cities could reduce greenhouse gas emissions by up to seventy-five percent through green buildings and use of renewable energy. The eco-friendly high rises in these Smart Cities will be smog eaters with suspended gardens of green algae bioreactors, vertical farms and green bridges, all of which will be efficiently managed by future technology.

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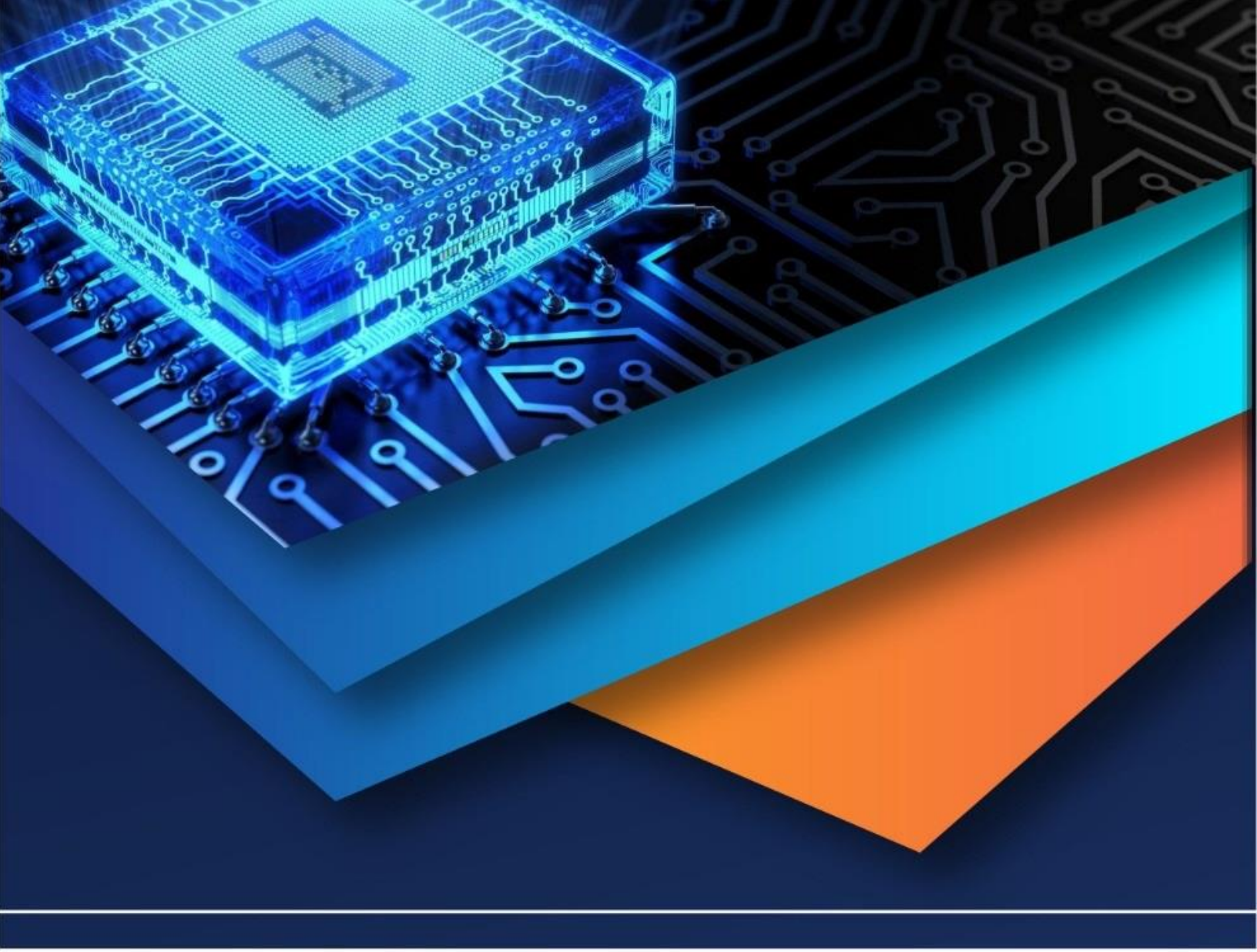
VIII. CONCLUSION

Smart Cities are not a question of "if", but a certainty of "how" and "when". According to ABI research projects, in 2016, cities will spend a extreme amount of forty billion pounds on smart city technologies. [4] Current projections predict an annual spending on Smart City technology at sixteen billion pounds by 2020 with the industry valued at over four hundred billion pounds globally. With so many existing cities around the world and many more new ones in the making, every major IT company is preparing for this future and working on finding their niche in the Smart Cities market.

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