Transformation of Urban Development in to Smart Cities: The Challenges

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Abstract: *Making a city "Smart" is a new urban development phenomena emerging as a strategy to solve the problems generated by the rapid urbanization. There is no clear answer as to what a smart city is. Yet little academic research in western countries has discussed the phenomenon. Literature on smart cities, present Indian Urban Scenario, existing urban development laws play a key role in transforming urban development in to Smart Cities. This paper identifies a framework to understand the concept of smart cities in Indian context and the challenges country may faced while introducing the concept & suggested model for better output. In this regard component like E-governance, Smart people, Smart environment, needs extensive study and research as to how they form the basis to examine how local governments are envisioning smart city initiatives in India and what can be the possible challenges during implementation of each critical factor.*
Keyword: Smart city, E-Governance, Sustainable, Smart citizen,

I. Introduction

More than half of the World's population lives in urban areas [1,2].
India is also not the bar to this phenomenon since 31% population lives in urban area.

This shift from a primarily rural to urban population is projected to continue for the next couple of decades. Such enormous and complex congregations of people inevitably tend to become unhealthy and disordered places [3]

Cities all over the world exhibit complex dynamics. As cities grow, planners devise complex systems to deal with food supplies on an international scale, water supplies over long distances and local waste disposal, urban traffic management systems and so on; and the quality of all such urban inputs defines the quality of life of urban dwellers.

Such Cities, megacities generate new kinds of problems, difficulty in waste management, scarcity of resources, air pollution, human health concerns, traffic congestions, and inadequate, deteriorating and aging infrastructures are among the more basic technical, physical, and material problems.

Violation of existing development control rules, poor Implementation of master plan and regional plan, thereby haphazard growth of town, is routine sub urban problem to metropolitan cities, corporation towns & towns having 'A', 'B' & 'C' class municipal town of India.[4]

Another set of problems are more social and organizational in nature rather than technical, physical or material. Problems of these types are associated with multiple and diverse stakeholders, high levels of interdependence, competing objectives and values, and social and political complexity. In this sense, city problems become wicked and tangled [5]

Within the context of such urbanization for ensuring livable condition needs a deeper understanding of the process. Which ultimate resolve the urgency around these challenges is triggering many cities around the world to find smarter ways to manage such problem. These smarter ways are labeled as smart city. In other way sustainable & livable city can be conceptualized as "smart cities".

Although there is an increase in frequency of use of the word "smart city", there is still not a clear and consistent understanding of the concept among practitioners and academia. Only a limited number of studies investigated and began to systematically consider questions related to this new urban phenomenon. This paper attempts to study literature available on smart cities and to identify issues which may act as bar to achieve the bench marks for smart cities with special reference to developing country like India and to suggest some strategic guidelines in the form of model to transform existing urban development into Smart city or to create new smart city.

II. Literature Review

By 2050, more than 6 billion people will live in urban areas. This development calls for 'smart' approaches to ensure that cities are optimized for economic activity, energy consumption, environmental impact and 'the good life'.
In the concept of the 'smart city' main focus seems to be on the role of ICT infrastructure.

As a consumer one expect quality of services from public services similar to private services, however the concept of a Smart City goes way beyond the transactional relationships between citizen and service provider. Furthermore, citizens need employment and "Smart Cities" are often attractive locations to live, work and visit.

But the concept is not static: there is no absolute definition of a smart city, no end point, but rather a process, or series of steps, by which cities become more "liveable" and resilient and, hence, 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. It brings together hard infrastructure, social capital including local skills and community institutions, and (digital) technologies to fuel sustainable economic development and provide an attractive environment for all.

As discussed above, the concept of a smart city itself is still emerging, and the work of defining and conceptualizing it is still in progress [6,7]

The concept is used all over the world with different nomenclatures, context and meanings. A range of conceptual variants generated by replacing the word smart with adjectives such as digital or intelligent are readily used and reused. Some are recognizing the use of smart city as an urban labeling phenomenon [7].

Noting that the label smart city is a concept and is used in ways that are not always consistent. Several working definitions have been put forward and adopted in both practical and academic use.

2.1 Various Definitions of a Smart City
1. A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens. [8]
2. A city that monitors and integrates conditions of all of its critical infrastructures, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens.[9]
3. A city "connecting the physical, the IT, the social, and the business infrastructure to leverage the collective intelligence of the city" [10]
4. A city striving to make itself "smarter" (more efficient, sustainable, equitable, and livable) [11]
5. A city "combining ICT and Web 2.0 technology with other organizational, design and planning efforts to dematerialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability." [12]
6. "The use of Smart Computing technologies to make the critical infrastructure components and services of a city—(which include city administration, education, healthcare, public safety, real estate, transportation, and utilities)–more in intelligent, interconnected, and efficient" [13]
7. Smart computing refers to a new generation of integrated hardware, software, and network technologies that provide IT systems and real-time awareness of the real World and advanced analytics and actions that optimize business processes [13].
8. The Natural Resources Defense Council [14] defines smarter in the urban context as more efficient, sustainable, equitable, and livable.
9. Dirks and Keeling [15] consider a smart city as the organic integration of systems. The interrelationship between a smart city's core systems is taken into account to make the system of systems smarter.
10. No system operates in isolation. In this sense, Kanter and Litow [16] consider a smarter city as an organic whole—a network and a linked system. The new intelligence of cities, then, resides in the increasingly effective combination of digital telecommunication networks (the nerves), embedded intelligence (the brains), sensors and tags (the sensory organs), and software (the knowledge and cognitive competence.

For many Indian municipalities, smartness means 'e-governance+', or anything a little bit more than e-governance services.

Thus Smart cities are quite a fuzzy concept & we can summarize the definition of smart city as,

The "transformation of existing urban development and its infrastructure by utilizing and harnessing information technology to improve economic and political efficiency and enable social, cultural and sustainable urban development with high quality of life, with a sustainable management of natural resources, through people, public participatory governance.

Whether developing new cities from scratch or rebuilding existing cities, the challenge is to ensure that the city becomes more livable, economically successful, and environmentally responsible. A research project carried out by European Smart Cities.(http://www.smart-cities.eu/) defines a 'Smart City' as a city that performs well in six dimensions shown in Table 1[17]

Table. 1

Sr.No.	Dimension	Expectation for smart city
1	Smart governance	Political strategies and perspectives, transparency and community participation in decision making.
2	Smart people	Diversity, creativity and participation in public life.
3	Smart living	Cultural facilities, housing quality, health and safety issues.
4	Smart environment	Sustainable resource management, pollution prevention, environmental protection.
5	Smart mobility	Strong ICT infrastructure and sustainable transport systems.
6	Smart economy	High productivity, entrepreneurship and ability to transform

Thus in developing country like India one has to identify as to how following thing can be achieved.
• Sustainable development
• Involvement and role of Public in development process.
• Harnessing IT to its fullest extents in governance of city.

Important considerations in this regards are to study,
• Customer psychology
• Development capability
• Training of Government officials
• Premising new Technology
• Harnessing Global opportunities.

III. Indian Scenario

India is second most populas country in the world with 1.21 billion populations. By the end of 2050 the same will increase to 1.6. India also witnesses a substantial increase in the average size of urban areas. This has been made possible by a simultaneous upward shift in the urban technological frontier, so that a city could accommodate more inhabitants. Urban population is currently around 31 % of the total population. Contributing 60% of India GDP, it is also expected if urban scenario continues in the same speed, India will contribute about 75% national GDP by 2030. Lot of development in information technology took place. However, India fails in harnessing the role of IT in good governance while developing cities. Very little efforts have been done to devise a strategy for achieving urban growth in **"Smart"** sense for its metropolitan, municipal towns.

3.1 Case Study

Author has carried out detailed study on development plans and development control rules for "B" & "C" class municipal councils of Yavatmal district of State of Maharashtra. The very interesting observations are cited out with reference to governance, public participation, Economics & use of advance tools in the process of planning and implementation of development plans elsewhere in this article. The observations so pointed out are co-related with the expectations set for the development of smart cities. Though the focus of the study was to see the implementation of prepared development plans and provisions made in plans to make the "B" & "C" class Indian cities sustainable and livable, author has also referred the status of metropolitan cities like Delhi, Nagpur & Chennai master plan and relevant literature on development plan of "A", "B" & "C" class municipal councils.

Very few researches in this direction have been done. Even India fail in harnessing the latest development in technology in planning our urbanization strategy. Cities in the developed world are formulating technology master plans and then using these plans to develop citywide command and control network that monitors and optimizes the delivery of services like power, water, traffic and health care. However, in developing countries like India the cities are planned by preparing master plans/development plans/cities plans without any such reference of advance technology. It does not mean that, Indian cities have not taken advantage of technology.

Indian cities are using advance technology within departments to solve problems. Such as traffic control, using sensors to monitor water leaks, tracking garbage trucks through global positioning systems to ensure they dump their waste at designated landfills, energy management in buildings and complexes.

Master plan, development plans are prepared & sanctioned by government are mostly politically influenced documents. Very large span in terms of time period observed to be elapsed in planning and sanctioning the plan. This is due to one of the factor of not harnessing advance technique during planning [4].

Low level of research, poor organization setup, poor public participation, high cost of creating infrastructure, conflicting goals of officials and politicians and out dated urban laws are some of the issue author has identified in the case study which may became barriers in achieving 'Smart Cities' benchmark in India.
Table No 2 shows the Indian urban scenario on various dimensions based on above study.

Table. 2

Sr.No.	Dimension	Expectation for smart city	Indian urban scenario
1	Smart governance	Political strategies and perspectives, transparency and community participation in decision making.	Due to lack of sufficient and qualified manpower urban authorities failed in good governance. Community/ public participation is found very poor in planning & implementations stage.
2	Smart people	Diversity, creativity and participation in public life.	Is very Poor
3	Smart living	Cultural facilities, housing quality, health and safety issues.	Cultural facilities not up to standard, shortage of housing is observed health facilities are found poor and no where safety issues are discussed in the process.
4	Smart environment	Sustainable resource management, pollution, prevention, environmental protection.	All though Good Attempt are made in framing pollution prevention and environmental protection laws but implementation is poor. Little efforts are done in sustainable resource management.
5	Smart mobility	Strong ICT infrastructure and sustainable transport systems.	Poor in harnessing I.T.in all sectors of planning
6	Smart economy	High productivity, entrepreneurship and ability to transform.	Laws are not found suitable to promote entrepreneurship thereby very low productivity.

Indian Government has set bench marks for the Smart cities to be development in India. These bench marks are with reference to transport, spatial planning, Sanitation, water supply, e-connectivity, electricity, health, education and fire safety. All though the bench marks set are high, how successful will the smart cities be in achieving these bench marks is questionable. The bench marks are shown in Table 3

Table 3: Smart cities Bench marks [18]

| Parameter	Bench marks
Transport	Travel time of 30 minutes in small and medium size cities & 45 minutes in metropolitan areas. 2 meter wide footpaths and bicycle tracks. Mass transport within 800m of all residences in areas with a certain density. Over 175 persons/ha of built area. Access to para-transit within 300m walking distance.
Spatial planning	Population density of 175 persons/ha along transit corridors. 95% of residences should have shops, parks, primary schools and recreational areas within 400 metres walking distance. 95% residences should have access to workplaces and public and institutional services via public transport, bicycle or walking.
Sanitation	100% households should have access to toilets; 100% households should be connected to the waste water network. 100% efficiency in the collection and treatment of waste water.
Solid waste	100% households to be covered by daily door-step collection system. At least 20% of all residential units to be occupied by economically weaker sections in transit oriented development (TOD) zones 800m from transit stations. At least 30 residential and 30% commercial or institutional space in every TOD zone within 800m of transit stations.
Water Supply	24x7 supply of water; 100% households with direct water supply connections. 135 liters per capita supply. 100% metered water connections; 100% efficiency in collection of water charges.
Telecom	100% Wi-Fi coverage at 100 Mbps; 100% households to have telephones, including mobile.
Electricity	Electricity for 100% household; 24x7 supply 100% metering of electricity supply; 100% recovery of cost. Tariff slabs that work towards minimizing waste.
Health	Telemedicine facilities for 100% residents; 30 minutes emergency response time; 1 dispensary for every 15,000 residents; bed strength specified for different categories of hospitals, including 200 specialty hospital beds per lakh population, 1 diagnostic centre for every 50,000 residents.
Education	School and college requirements specified on a per population basis, including 1 integrated school (class I to XII) per lakh population; 1 school for the physically challenged for every 45,000 residents; 1 school for the mentally challenged per 10 lakh population. 1 college per 1.25 population ; 1 university;1 technical education centre per 10 lakh population; 1 engineering college per 10 lakh population; 1 medical college per 10 lakh population.

IV.   The Challenges before the government:-

1. Under the prevailing urban development, can we develop city which will provide equal opportunities for investment, employment and quality life at a very competitive rate?
2. There is no clear answer to what a smart city means. Indian Government has to define the same in Indian context .Can it be relate to urbanization itself is debatable.
3. Bench mark define by Government of India in its ministry note as shown in table 3 is very high . Is it possible when our transportation sector is very weak .Hardly 15 % of the Development plan roads within urban towns are implemented without any road side infrastructure? There are still so many agriculture based towns which are not connected by any means of transportation. At such towns and villages even water supply is also not provided as per standard.
4. Non availability of toilets and its connectivity to the west water network is a big issue of the existing urban development, water supply supplying @ 135 ltr. Per capita & collecting water charges to 100% is also a big

issue before the urban authorities since non employment of technical and supporting staff. Even more than 30% of population is deprived from pure drinking water.

5. Shortage of qualified human resource for telecom, electricity, health and education is a big challenge before the government/ urban authorities.

6. How the city be identified for development of "Smart City", it self will be a big challenge under the present urban development's scenario.

7. Considering the cities track record of implementation of various government schemes, government has taken a decision to implement the scheme on self finance basis. How for the self finance schemes be practicable. What will happen to the constitutional administrative organization setup?

8. Government of India is inviting foreign country's participation in the process of development of Smart cities of India. Can foreign involvement justify and will maintain social aspect of Indian cities for which they are famous.

9. How for P.P.P. model shall be successful in developing smart cities is also a challenge in the Indian context.

10. As for as difficulties in operational procedures are concern, author is very much doubtful @ preparation of (CRF). Citizen reference framework through professional agencies. As per draft concept note on smart city scheme published on 14.10.2014 by government of India, before C.D.P. (City development plan) CRF shall be developed only after CRF.SCDP be prepared along with ESP (Environmental sustainability plan). However, while doing so no where it is mention @how C.D.P. shall be linked with Regional Plan (R.P.) whether R.P. is necessary or not to be linked is big issue. Is government amending policies and provisions of state regional and town planning act accordingly.

11. How far making building bye laws more citizens friendly will transform our cities to smart cities.

12. How government will make land available for public purpose more liberal.

V. Recommendation:

 The challenges are big however, where there is will there is a way.

For Planning & implementing of Smart cities and to get better output a model is suggested to either transform old city in to Smart city or entirely a new Smart city. :

Model for Development of Smart City
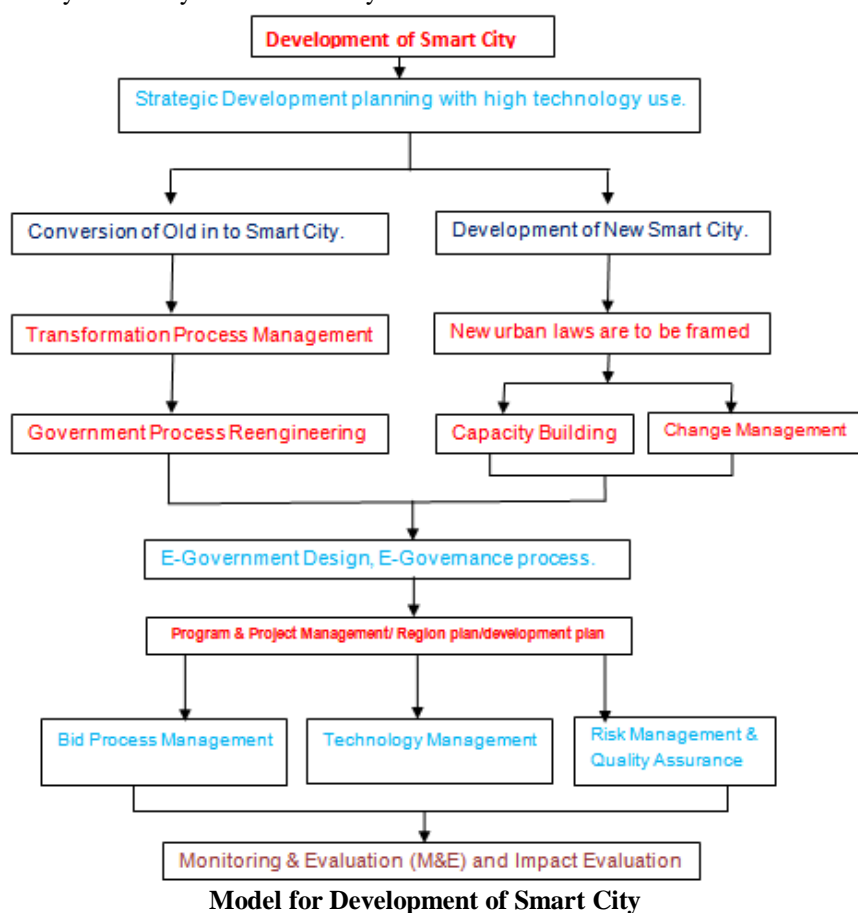
For transforming cities in to smart city or a development of new smart city a very strategic development with maximum use of advance and high technology is pre requisite for any developing country. Strategically old city can be converted in to smart city. Similarly government can also develop entirely new smart city. Off course it is difficult to convert old city to smart city as compared to development of new smart city. For old city, **transformation management process** has required to be evolved and shall be given more emphasis, on the other hand for new smart city development all the existing development laws has to be revived and a latest urban development laws are required to be framed. It is recommended to have new development laws which must covered modern lay-out norms, provision of more FSI, compulsory Wifi networking, underground drainage, underground water supply, sanitary and electric cabling. Width of road within development should not be less than 24 mtr. The minimum plot size should not be less than 500 sq.mt. with minimum front width of 20 mtr. Space for urban landscape, uniformity in set back rule, road front margin, compulsory tree plantation of standard uniform species with strict implementation norms. E-governance and high technology use shall be mandatory for corporation, councils are equally important to get better result. It means capacity building and change management is essential to transform in to smart city.

The concept of Smart Cities is gaining increasingly high importance as a means of making available all the services and applications enabled by ICT to citizens, companies and authorities that are part of a city's system. It aims to increase citizens' quality of life and improve the efficiency and quality of the services provided by governing entities and businesses. This perspective requires an integrated vision of a city and of its infrastructures, in all its components, and extends beyond the mere "digitalization" of information and communication: it has to incorporate a number of dimensions that are not related to technology, e.g., the social and political ones

Linking Technical with political vision & improve urban services. :-

While almost all cities (and municipalities and regions) want to be 'smart', there is no accepted definition of what this means in practice – be it in technological, developmental, or administrative terms. A Smart City is more than a digital city. A Smart City is one that is able to link physical capital with social one, and to develop better services and infrastructures. It shall be able to bring together technology, information, and political vision, in to a coherent programme of urban and service improvements.

It is a mistake to think that making smarter cities requires just more investment in IT (Information Technologies) – what cities need to be able to do is to use IT as a means to deliver local (and national and EU levels) aims and objectives. The most important issue confounding efforts to make cities smarter is not the development of appropriate technologies per se, but to tackle the difficulties in changing organizations and existing ways of working to use these new technologies to deliver smarter cities.

E-Government

The development of efficient and effective e-government is a prerequisite for the development of Smart Cities. E-government applications and technologies must be able to address the fundamental questions of how cities work, how they are organized, and how they can be made to work in more intelligent ways for citizens and businesses. These differences in administrative and technological maturity will shape and constrain the ability of individual cities to become 'smarter'. Training programme for officials, awareness programme for citizens, availability and accessibility to public document are some of the initiative government has to implement.

Sound business model & need based laws:

The development of Smart Cities requires a pragmatic approach to technological development and deployment that is based on open standards and interoperability, which is vendor neutral and focused on the needs of cities, citizens, and businesses. Technologies need to be deployable, and supported by sound business models and establishment of industry based on availability of raw material.

Extraction of information from Man machine - machine

Smart networks and infrastructures need to be developed in order to exchange information from person to person, from people to machines, from machines to people, or from machines to machines. Only by developing robust, shared solutions can one develop cities that are smart, and which are able to increase innovation, improve the quality of life, and raise standards of living.

Data Bank:

The development of open data and data sharing is also a requirement for the development of e-government in Smart Cities. Public data needs to be made open and accessible; through the establishment and use of a repository of definitions and taxonomies that makes data consistent throughout country. This will

provide a standardized foundation for developers to use and re-use government content – including address and location service information, data, maps, transport information, timetables, etc.

To implement the process proper bid management, technology management, risk management and quality management has to be evolved and due care has to be taken. Monitoring evaluation and impact evaluation has to be carried out time to time is the essence to get better output and a sustainable development, thereby transformation of urban development into smart city.

VI. Conclusion

To insure better living environment within the context of rapid urban population growth a new phenomena of smart city appeared. Government of India has rightly planed to develop our cities in smarter ways is really a good intention in spite of so many challenges ahead in the process of development. Government has to enact new urban laws for better development and their strict enforcement to get positive results. To get positive result citizens of the country shall have to be smart and government has to implement scheme, training programme to make aware about to become smart citizens. Roles and the responsibility of the officers implementing the ideas shall be made aware about pros and cons for their ineffective working.

For cities in the 0.2 to 1.0 million population ranges shall be made mandatory to proceed for smart city, because success can be achieved by principal of part to whole development. Migration to major cities can also be restricted if smart cities are development at lower level.

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