Abstract

Cities are truly the engines of growth today that needs a holistic approach. To meet the overarching aspirations of growing urban population and sustain a virtuous cycle of growth and development. According to Census 2011, Cities accommodate nearly 31% of India's current population and contribute 63% of GDP. Urban areas are expected 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 are important in improving the quality of life and attracting people and investment. It becomes inevitable for the development of Smart Cities. However, the Smart Cities Mission calls for appropriate local spatial development plans. This paper highlights the present and upcoming challenges related to implementation of Smart Cities projects. The author has suggested possible solutions to overcome such challenges which may help in successful and sustainable operation of Smart Cities Mission of Governance in India to achieve sustainable development and quality of life for people.

Key Words: ICT, Quality of Life, Smart Cities, Sustainable development, Technology Solutions.

Emergence of the concept of Smart Cities

The first question is, what is meant by a 'smart city' and why 'smart city'. A century ago, fewer than 20 cities around the world had populations more than 1 million people. Today, that number has swelled to 450 and will continue to grow for the foreseeable future. As cities grow in both numbers and population, they are taking their place on the world's center stage, with more economic, political and technological power than ever before. Economically, they are becoming the hubs of a globally integrated, services-based society. Politically, they are amid a realignment of power – with greater influence, but also greater responsibility. From a technology standpoint, advances are underway that can provide them with better understanding and control of their operations and development.

Smart infrastructure, people and utility services convert a city into a Smart City. Smart Infrastructure using ICT will provide bunch of tools and services, open various options for the citizen to use resources for their daily needs without compromising ecological balance. Operationally, cities are based on six core systems composed of 1) People, 2) Business, 3) Transport, 4) Communication, 5) Water and 6) Energy.
A city’s people system includes public safety, health and education and is central to whether it delivers a good quality of life for its citizens. A city’s business system refers to the environment that businesses face in terms of policy and regulation. Cities offer people and business the ability to move things around through their transport systems and to share ideas and information through their communication systems. Cities also offer two core utilities necessary for all economic and social activity – water and energy. These systems are interconnect in a synergistic fashion that, ideally, promotes optimum performance and efficiency.

While providing the potential for significant positive transformation, each system faces significant sustainability challenges. For example, cities face considerable healthcare issues, such as infant mortality and the worldwide HIV pandemic. For businesses, cities must balance regulatory requirements with the need to decrease costly administrative overhead. Inefficient transportation systems continue to drive up costs. Increasing communications and connectivity demands challenge the ability of cities to meet the needs of its citizens and businesses. Water resources face challenges with poor quality, leakage/waste and theft. And current energy systems are often insecure and inefficient to fulfill public needs. As cities face these substantial and interrelated challenges, it becomes clear that the status quo – business as usual – is no longer a viable option. Cities must use their new power of technology to become smarter. They must act now, using new technologies to transform their core systems to optimize the use of limited resources. New technologies provide a much greater scope for instrumentation, interconnection and intelligence of a city’s coresystems. Around the world, leading cities are putting in place smarter systems. However, it’s a significant fact that becoming a “smart city” is a journey and not an overnight transformation.[1]
The conceptualisation of Smart City varies from city to city and country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city residents. A smart city would have a different connotation in India than, say, Europe and Australia. Even in India, there is no one way of defining a smart city.

Smart Cities in India

In the approach of the "100 Smart Cities Mission" launched by Prime Minister Narendra Modi on 25 June 2015, a total of ₹98,000 crore has been approved by the Indian Cabinet for the development of 100 smart cities and the rejuvenation of 500 others. The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities. 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 focus 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. It is meant to set examples that can be replicated both within and outside the Smart City, catalysing the creation of similar Smart Cities in various regions and parts of the country. [2]

The core infrastructure elements in a smart city would include:

1) adequate water supply,
2) assured electricity supply,
3) sanitation, including solid waste management,
4) efficient urban mobility and public transport,
5) affordable housing, especially for the poor,
6) robust IT connectivity and digitalization,
7) good governance, especially e-Governance and citizen participation,
8) sustainable environment,
9) safety and security of citizens, particularly women, children and the elderly, and
10) health and education. [3]

Smart Cities Mission envisions developing an area within 100 cities in the country as model areas based on an area development plan. Area based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving liveability of the whole City. New areas (greenfield) will be developed around cities in order to accommodate the expanding population in urban areas. Application of Smart Solutions will enable cities to use technology, 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.

Cities are selected based on the Smart Cities challenge, where cities will compete in a countrywide competition to obtain the benefits from this mission. As of January 2018, 99 cities have been selected to be upgraded as part of the Smart Cities Mission after they defeated other cities in the challenge.

It is a five-year program, where all the Indian states and Union territories are participating, except West Bengal by nominating at least one city for the Smart Cities challenge. Those states that measure up to the guidelines and nominate cities could get funding of Rs 100 crore per year per city for the next five years. The funding is a golden chance for states to rejuvenate their urban areas.
Financial aid will be given by the central and state governments between 2017-2022 to the cities, and the mission will start showing results from 2022 onwards.

The first batch of 20 cities was selected. Known as 20 Lighthouse Cities in the first round of the All India City Challenge competition, they will be provided with central assistance of ₹200 crore each during this financial year followed by ₹100 crore per year during the next three years. The remaining money should come from the states, urban bodies and the consortium they form with corporate entities. Also, 10 percent of budget allocation will be given to states/union territories as incentives based on achievement of reforms during the previous year. [4]

**Smart City Features**

Some typical features of comprehensive development in Smart Cities are as follows,
1. Promoting mixed land use in area-based developments—planning for ‘unplanned areas’ containing a range of compatible activities and land uses close to one another in order to make land use more efficient. The States will enable some flexibility in land use and building bye-laws to adapt to change;
2. Housing and inclusiveness - expand housing opportunities for all;
3. Creating walkable localities – reduce congestion, air pollution and resource depletion, boost local economy, promote interactions and ensure security. The road network is created or refurbished not only for vehicles and public transport, but also for pedestrians and cyclists, and necessary administrative services are offered within walking or cycling distance;
4. Preserving 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 generally promote eco-balance;
5. Promoting a variety of transport options - Transit Oriented Development (TOD), public transport and last mile para-transport connectivity;
6. Making governance citizen-friendly and cost effective - increasingly rely on online services to bring about accountability and transparency, especially using mobiles to reduce cost of services and providing services without having to go to municipal offices. Forming e-groups to listen to people and obtain feedback and use online monitoring of programs and activities with the aid of cyber tour of worksites;
7. 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, etc;
8. Applying Smart Solutions to infrastructure and services in area-based development in order to make them better. For example, making Areas less vulnerable to disasters, using fewer resources, and providing cheaper services.[6]
9. Easy access to public services/facilities to all city dwellers using ICT like, mobile applications, nearest City Civic Centers.

**Challenges**

Smart Cities Mission has its own challenges to face. Here are the top 10:

1. **Retrofitting existing legacy city infrastructure to make it smart:** There are many issues to consider when reviewing a smart city strategy. The most important is to identify the existing city’s weak areas that need utmost consideration, e.g. 100-per-cent distribution of electricity,
water supply and sanitation. The integration of legacy systems with the latest one can be a significant challenge to achieve citywide efficiencies.

2. **Financing smart cities:** Financing is said to be one of the biggest challenges when it comes to the smart city challenge. The High-Power Expert Committee (HPEC) on Investment Estimates in Urban Infrastructure has assessed a per-capita investment cost (PCIC) of Rs 43,386 for a 20-year period. Using an average figure of 1 million people in each of the 100 smart cities, the total estimate of investment requirements for the smart city comes to Rs 7 lakh crore over 20 years (with an annual escalation of 10 per cent). This translates into an annual requirement of Rs 35,000 crore. One needs to see how these projects will be financed as the majority of project need would move through complete private investment or through PPPs (public-private partnership).

The total investment approved under the smart city plans of 99 cities has gone up to ₹1, 91,155 crore. Now, that’s whopping. With the presence of state-sponsored companies also the project seems to have no good start. The government is recently taking steps to finance these projects by making changes in the budget and we hope the problem is addressed to soon.

3. **Availability of master plan or city development plan:** Most of our cities don’t have master plans or a city development plan, which is the key to smart city planning and implementation and encapsulates all a city needs to improve and provide better opportunities to its citizens.

4. **Financial sustainability of ULBs:** Most ULBs are not financially self-sustainable and tariff levels fixed by the ULBs for providing services often do not mirror the cost of supplying the same. Even if additional investments are recovered in a phased manner, inadequate cost recovery will lead to continued financial losses.

5. **Technical constraints of ULBs:** Most ULBs have limited technical capacity to ensure timely and cost-effective implementation and subsequent operations and maintenance owing to limited recruitment over a number of years along with inability of the ULBs to attract best of talent at market competitive compensation rates.

6. **Providing clearances in a timely manner:** For timely completion of the project, all clearances should use online processes and be cleared in a time-bound manner. A regulatory body should be set up for all utility services so that a level playing field is made available to the private sector and tariffs are set in a manner that balances financial sustainability with quality.

7. **Dealing with a multivendor environment:** Another major challenge in the Indian smart city space is that software infrastructure in cities contains components supplied by different vendors. Hence, the ability to handle complex combinations of smart city solutions developed by multiple technology vendors becomes very significant.

8. **Capacity building programme:** Building capacity for 100 smart cities is not an easy task and most ambitious projects are delayed owing to lack of quality manpower, both at the centre and state levels. In terms of funds, only around 5 per cent of the central allocation may be allocated for capacity building programs that focus on training, contextual research, knowledge exchange and a rich database. Investments in capacity building programs have a multiplier effect as they help in time-bound completion of projects and in designing programs, developing faculty, building databases as well as designing tool kits and decision
support systems. As all these have a lag time, capacity building needs to be strengthened right at the beginning.

9. **Reliability of utility services**: For any smart city in the world, the focus is on reliability of utility services, whether it is electricity, water, telephone or broadband services. Smart cities should have universal access to electricity 24×7; this is not possible with the existing supply and distribution system. Cities need to shift towards renewable sources and focus on green buildings and green transport to reduce the need for electricity.

10. **Technology**: The development of smart city confronts several challenges from the technological perspective. Preserving privacy of citizens and end users is a big concern since most of the frameworks require collecting data from the citizens. Challenges related to Big Data (storage, management, fusion, consistency, trustworthiness) in a smart city context become significant. On-device and embedded intelligence to support light-weight artificial intelligence on IoT and resource-constrained devices that build the smart city infrastructure.[6]

**How such challenges can be faced?**

1. **Infrastructure**: To have retrofitting of legacy structures, special packages should be given to people living in older areas to renovate their structure/facilities as per smart standards i.e. water drainage management, green building etc., to have more access to renewable energy and to save electricity. Town Planning scheme need to re-design as per ground level slop to facilitate drainage and rain water harvesting.

2. **Capacity Building**: Training needs to be given to employees on latest/ongoing technology so that they can understand and operate various features to get the maximum/desired outcomes. ULBs can mandate for vendors/contractors to provide training to govt employees or operators on running/competed projects. It will help in operation and maintenance of projects and provide sustainability.

   ULBs can either recruit skilled manpower who are trained with smart cities requirements or to impart training to existing manpower involved in smart cities projects/initiatives. Training should be design to cover manpower from bottom to top and as per their area of work, e.g. project management, coordination, regulation, compliance focused to smart cities. Training should be focused on outcome rather than only conceptual. A third-party consultant from international smart cities can be appointed as an independent advisor and evaluator.

3. **Handing Multi-Vendor Management**: There should be process of Handover-Takeover of project documents on completion of the projects. Standard Operating Procedures need to create and hand over to operation staff which will bring standardization and continuity of the procedure without having dependency on vendor/person. Vendor management should be based on defined SLA with punitive action/financial penalty for non-adherence.

4. **People participation and Awareness**: Any new public initiative requires people/citizen participation from planning to execution, operation and maintenance to further development stages to achieve sense of belongingness of people and success. A concept of democratization. Promotional campaigns need to be done using mobile app, banners, short movie/video, printed boards in public places on provided public utilities/services to spread...
awareness among people so that they adopt the change and start using it. Constant communication with the people/citizens will be the key factor in acceptance and success of any Smart city project.

A survey needs to roll out to end users/public to get their inputs on public services accessibility and experience in Smart Cities. Public voice/opinion should be taken into consideration to provide rating to the smart city on public utilities.

Conclusion

People, Processes, and Technology (PPT) are the three principles of the success of a smart city initiative. Cities must study their citizens and communities, know the processes, business drivers, create policies, and objectives to meet the citizens' needs. Then, technology can be implemented to meet the citizens' need, in order to improve the quality of life and create real economic opportunities. This requires a holistic customized approach that accounts for city cultures, long-term city planning, and local regulations.

Reference Books and Articles