THE USAGE AND ADAPTATION OF IOT IN IMPLEMENTATION OF SMART CITIES CONCEPT

Riyaz Mohammed[1], Xavier Vaz[2] and Sandeep Kumar K[3]

Abstract. Cities nowadays face complex challenges to meet objectives regardingsocio-economic development and quality of life. The concept of "smart cities"is a response to these challenges. This paper explores "smart cities" as environmentsof open and user-driven innovation for experimenting and validatingFuture Internet-enabled services. Based on an analysis of the current landscapeof smart city pilot programs, Future Internet experimentally-driven researchand projects in the domain of Living Labs, common resources regardingresearch and innovation can be identified that can be shared in open innovationenvironments. Effectively sharing these common resources for the purpose ofestablishing urban and regional innovation ecosystems requires sustainablepartnerships and cooperation strategies among the main stakeholders.

Keywords: Smart Cities, Future Internet, Collaboration, Innovation Ecosystems, User Co-Creation, Living Labs, Resource Sharing

I. INTRODUCTION

A smart city is an urban development vision to integrate multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in a secure fashion to manage a city's assets – the city's assets include, but are not limited to, local departments' information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement, and other community services.

The goal of building a smart city is to improve quality of life by using urban informatics and technology to improve the efficiency of services and meet residents' needs. ICT allows city officials to interact directly with the community and the city infrastructure and to monitor what is happening in the city, how the city is evolving, and how to enable a better quality of life. Through the use of sensors integrated with real-time monitoring systems, data are collected from citizens and devices - then processed and analyzed. The information and knowledge gathered are keys to tackling inefficiency. Information and communication Technology (ICT) is used to enhance quality, performance and interactivity of urban services, to reduce costs and resource consumption and to improve contact between citizens and government. Smart city applications are developed with the goal of improving the management of urban flows and allowing for real time responses to challenges.A smart city may therefore be more prepared to respond to

[1] *Department of Computer Science & Bio Informatics AIMIT,St Aloysius College Mangalore, Karnataka, India*
[2] *St Aloysius College, AIMIT, Mangaluru, Karnataka, India*
[3] *St Aloysius College, AIMIT, Mangaluru, Karnataka, India*

challenges than one with a simple 'transactional' relationship with its citizens. Yet, the term itself remains unclear to its specifics and therefore, open to many interpretations and subject.

II.   SMART CITIES IN INDIA: IMPLEMENTATION CHALLENGES

The concept of smart cities seen from the perspective of technologies and components has some specific properties within the wider cyber, digital, smart, intelligent cities literatures. It focuses on the latest advancements in mobile and pervasive computing, wireless networks, middleware and agent technologies as they become embedded into the physical spaces of cities. The emphasis on smart embedded devices represents a distinctive characteristic of smart cities compared to intelligent cities, which create territorial innovation systems combining knowledge-intensive activities, institutions for cooperation and learning, and web-based applications of collective intelligence[1-3].

It is anticipated that smart city solutions, with the help of instrumentation and interconnectionof mobile devices, sensors and actuators allowing real-world urban data to be collected and analysed, will improve the ability to forecast and manage urban flows and push the collective intelligence of cities forward. Smart and intelligent cities have this modernization potential because they are not events in the cyber sphere, but integrated social, physical, institutional, and digital spaces, in which digital components improve the functioning of socio-economic activities, and the management of physical infrastructures of cities, while also enhancing the problemsolving capacities of urban communities. The most urgent challenge of smart city environments is to address the problems and development priorities of cities within a global and innovation-led world[2]. A recent public consultation held by the European Commission on the major urban and regional development challenges in the EU has identified three main priorities for the future cohesion policy after 2013. It appears that competitiveness will remain atthe heart of cohesion policy, in particular, research, innovation, and upgrading of skills to promote the knowledge economy. Active labor market policy is a top priority to sustain employment, strengthen social cohesion and reduce the risk of poverty. Other hot societal issues are sustainable development, reducing greenhouse gases emissions and improving the energy efficiency of urban infrastructure[2-3]. Smart city solutions are expected to deal with these challenges, sustain the innovation economy and wealth of cities, maintain employment and fight against poverty through employment generation, the optimization of energy and water usage and savings, and by offering safer cities. However, to achieve these goals, city authorities have to undertake initiatives and strategies that create the physical-digital environment of smart cities, actualizing useful applications and e-services, and assuring the long-term sustainability of smart cities through viable business models.

In India, the rate of urbanization has really picked up pace over the past few decades, especially in the after 1991. Coupled with economic growth and expanding markets, the urban population in India now stands at around 30% of the overall pie. However, from economic reforms to demographic dividend in the form of a young population, India has many areas of focus. There is also some ground work to be done in order for India to reach beyond its 'developing country' tag and emerge as a technology hub. Upgrading existing cities and creating new ones are prerequisites for economic progress and they must take place in an organized manner.[4-5]

There is a great need for the Indian government to build smarter cities to improve the overall quality of life in a city environment. The definition of a "smart city" varies widely – ranging from the use of discrete new technology applications to a more holistic conception of intelligent, integrated working and user-generated services. A smart city could take between eight to 10 years to build from scratch – and even more time to attract businesses and residents. Such an

initiative requires commitment and persistence on part of the government over a long period of time. The authorities need to be aware of the latest relevant technologies, and the technologies have to be custom and used effectively taking into account the topography, location and natural resources of the area.

Given below are some of the key challenges that governments/businesses in India will face while implementing their smart city strategies:

Replacing Existing City Infrastructure to Make It "Smart City-Ready"
There are a number of latent issues to consider when reviewing a Smart City strategy. The most important is to ascertain the business case that will justify the replacement of existing infrastructure. The integration of formerly isolated systems in order to achieve city-wide efficiencies can be a significant challenge.

Providing Clearances in a Timely Manner
For timely completion of project, all clearances should use online processes and should be cleared in a time bound manner. Freeing the right of way for laying optic fibre networks, water supply lines, sewerage systems, draining systems and other utilities should be given as per the timeline and cost decided by the government.

Financing Smart Cities
The High Power Expert Committee on Investment Estimates in Urban Infrastructure has assessed a Per Capita Investment Cost (PCIC) of $685 for a 20 year period. The total estimate of investment requirements for the smart city comes to $113 billion over 20 years.

Capacity Building Program
Building capacity for 100 smart cities is not an easy task and most of the ambitious projects are delayed due to lack of quality manpower, both at the center as well as states. In terms of funds, only around five percent of the central allocation may be allocated for capacity building programs which focus on training, contextual research, and a rich database.[1-2]

III. OUTLOOK

A smart city uses digital technologies or information and communication technologies (ICT) to enhance quality and performance of urban services, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens. Sectors that have been developing smart city technology include government services transport and traffic management, energy, health care, water and waste. Smart city applications are developed with the goal of improving the management of urban flows and allowing for real time responses to challenges. The smart city development should be self-sustainable.

Best of our knowledge Singapore is one of the most successful stories in thesmart city space because of a very 'smart' idea to make open data sets and information related to the metrics of a city for its citizens. Online collaborative sensor data sets and engagement platforms are online Database services that allow sensor owners to register and connect their devices to feed data into an on-line database for storage and allow developers to connect to the database and build their own applications based on that data.

So after seeing qualities of Singapore, I want to suggest some qualities of these cities should be adapted and we can give following suggestions:

a.   Make more efficient use of physical infrastructure (roads, built environment and other physical assets) through artificial intelligence and data analytics to support a strong and healthy economic, social, cultural development

b.   Development of an existing built area greater than 500 acres so as to achieve the objective of smart cities mission to make it more efficient and livable.

c.   IT&C to municipal services and infrastructure to make them better.

d.   Develop a previously vacant area of more than 250 acres using innovative planning, plan financing and plan implementation tools with provision for affordable housing, especially for the poor.

e.   Waste Management, Energy management, water managements systems should be maintained.

f.   Remove slums by building G+3 apartment buildings and slums located at central locations, can be converted to green zones and/or commercial locations. Preference should be given to those who lose their properties due to development works like road widening.

g.   Provide entire city free Wi-Fi, with advertisement rights to some privatecompanies like Google.

h.   Multi-level parking in areas where there is no or very little parking. Public toilet in various locations, with more weightage of public toilets for women.

i.   Solar systems panels on all parking lot roofs and also all bus stops.

j.   All public locations should have 24x7 cc TV surveillance.

k.   Create awareness amongst the citizens with special emphasis on younger generation including school children to inculcatea culture of making the city sustainable.

l.   Use of Information & Communication technologies (ICT) and Internet of Things (IoT) to improve the delivery of existing services on a continuous basis

m.   Effectivemethods for waste management.

n.   Being blessed with good water resources, identify ways to improve agriculture and promote agro-based industries which will help farmer

IV.   CONCLUSION

In this paper we explored the concept of "smart cities" as environments of open anduser driven innovation for experimenting and validating Future Internet-enabled services.Smart cities are enabled by advanced ICT infrastructure contributed to by currentFuture Internet research and experimentation. Such infrastructure is one of thekey determinants of the welfare of cities. Other determinants of the welfare of citieswill be important as well: the infrastructure for education and innovation, the networksbetween businesses and governments, the existence of demanding citizens andbusinesses to push for innovation and the quality of services.

REFERENCES

[1].   Kroes, N.: European Commissioner for Digital agenda, The critical role of cities in makingthe Digital Agenda a reality. Closing speech to Global Cities Dialogue Spring Summit ofMayors Brussels, 28 May (2010)

[2]   Caragliu, A., Del Bo, C., Nijkamp, P.: Smart cities in Europe. Series Research Memoranda0048. VU University Amsterdam, Faculty of Economics, Business Administration andEconometrics (2009)

[3].   Eurocities: Strategic Policy Paper on Broadband in Cities (2010)

[4].   Eurocities: Cities and Innovation in Europe. Discussion paper (2010)

[5].   Von Hippel, E.: Democratizing Innovation. The MIT Press, Cambridge (2005)