Infrastructure Development In Smart City

Anuradha Manikrao Patil[1], Sagar Gawande[2]

[1]AnantraoPawar College of engineering & reasearch, Pune

[2]HOD, Civil Dept., Anantrao Pawar College of engineering & reasearch, Pune.

Abstract— **Cities are facing unprecedented challenges. The pace of urbanization is increasing exponentially.Every day, urban areas grow by almost 150 000 people, either due to migration or births. Between 2011 and 2050, the world's urban population is projected to rise by 72 % (i.e. from 3.6 billion to 6.3 billion) and the population share in urban areas from 52 % in 2011 to 67 % in 2050. In addition, due to climate change and other environmental pressures, cities are increasingly required to become "smart" and take substantial measures to meet stringent targets imposed by commitments and legal obligations.**

I. INTRODUCTION

The increased mobility of our societies has created intense competition between cities to attract skilled residents, companies and organizations. To promote a thriving culture, cities must achieve economic, social, and environmental sustainability. This will only be made possible by improving a city's efficiency, and this requires the integration of infrastructure and services. While the availability of smart solutions for cities has risen rapidly, the transformations will require radical 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 procure 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.

II.TECHNOLOGY

There is no single trend, solution or specific approach for smart cities. Regional trends illustrate that there are divergent urban growth patterns among major regions with different levels of economic development. Still, significant disparities in the level of urbanization can also be observed across different countries within the same region. Nevertheless, all cities aiming to develop into smart cities have to be built on three sustainability pillars:

☐ **Economic sustainability**

Cities need to provide citizens with the capacity to develop their economic potential, and attract business and capital. With the global financial crisis, the economic sustainability of cities has taken centre stage. The crisis has unearthed considerable weaknesses in the financial models and planning strategies of public authorities in the provision of services and in their infrastructure investments. Their financial sustainability now depends also on new financial models, as well as more efficient and better-integrated services and infrastructures.

☐ **Social sustainability**

A city's attractiveness for people, business and capital is closely related to the quality of life (QoL), business opportunities and security and stability, which are guaranteed by social inclusiveness.

☐ **Environmental sustainability**

Cities face a number of environmental sustainability challenges, generated by the city itself or caused by weather or geological events. To reduce the impact of the city on the environment resource it is important to promote the effi cient and intelligent deployment of technology and to integrate infrastructures. This process can also be developed in such a manner as to increase the resilience of the city to environmental shocks.

These three pillars have one common denominator, namely the need to achieve more and better with less, i.e. efficiency. Efficiency must also be achieved in a manner that brings benefits and opportunities to citizens, making the city more dynamic and participatory.

Smart technology solutions create value.

Rather than being an expense, smart technology integration can create considerable opportunities for added value in any city. Technology integration helps cities to improve effi ciency, enhance their economic potential, reduce costs, open the door to new business and services, and improve the living conditions of its citizens. A key condition for value creation through integration is the compatibility of technologies; which is best achieved through common and consensus-based standards that ensure interoperability. Presently, however, smart city projects concentrate mainly on vertical integration within existing independent infrastructure and services silos, e.g. energy, transport, water or health. A truly "smart" city requires horizontal integration as well as creating a system of systems capable of achieving considerable increases in effi ciency and generating new opportunities for the city and its citizens.

New approaches are necessary to design, implement and fi nance smart city solutions.

Cities are faced with a complex challenge, as the traditional processes of planning, procuring and financing are not adequate for their needs. Smart cities can only exist if fundamental reforms are undertaken.

Stakeholders are key drivers to smart city solutions.

A smart city cannot be imposed by decree, as the city is shaped by a large number of individual decisions and social and technological changes cannot be fully accounted for. With the present advances in telecommunications, information and communication technologies (ICT) and affordable energy effi ciency and energy production tools are changing the relationship between citizens and city services. Citizens are increasingly becoming providers of city services and not only users. A good plan requires the participation, input and ideas from a wide range of stakeholders within the city. This means that city

planning needs to allow for bottom-up processes of modernization. The stakeholders are:

 Political leaders, managers and operators of the local government (city).

 The service operators – public or private: water,electricity, gas, communication, transport, waste, education, etc.

 End users and prosumers: inhabitants and local business representatives.

 Investors: private banks, venture capitalists, pension funds, international banks.

 Solution providers: technology providers, financiers and investors.

Giving to each of these groups a true stake in smart city development is important to achieve the necessary consensus for the changes. Their concerns need to be carefully considered and acknowledged, and ultimately the direction and next steps have to be collectively approved. In the absence of proper consultation, the authorities will sooner or later face considerable additional obstacles to make their vision a reality.

Without integration rising to the level of a system of systems there cannot be smart cities.

The transformation of a city into a smart form presents its stakeholders a wide range of chal lenges, including benefi ts and consequences when such a transformation is undertaken. A promising approach to support city planners, but also standards developing organizations (SDOs), is to model a city as a collection of activity domains in an integrated virtual organization (the city), where various groups of stakeholders (local governments, public and private corporations, academia, healthcare institutions, cultural associations, religious congregations and financial firms) participate in operating and sustaining the city as a whole. Modelling the interrelations allows identifying pain points, gaps and overlaps in standardization and clarifying the technical needs for integration. While the technologies to develop smart cities are mostly already readily available and improving, their deployment is hampered by technical, social and administrative challenges. Horizontal integration of infrastructures through technology is essential to reap the benefi ts of innovation and the potential and necessary efficiency.

Thus, interoperability is essential; without it, city planning is marred by unexpected ineffi ciencies leading to suboptimal outcomes and higher costs. The planning requirements for city authorities are very complex, as there are thousands of organizations and companies working in parallel to bring on the tools, systems and products that offer potentially affordable/sustainable solutions. To ensure that smart integrated systems are put in place in practice, internationally agreed standards that include technical specifi cations and classifications in order to support interoperability (i.e. devices and systems working together) are *sine quanon*. These include technical specifi cations and classifications in order to support interoperability. These are metrics against which benefi ts can be assessed as well as best practice documents that detail controls.

Horizontal as well as vertical integration is key to creating value and interoperability.

Electric grids, gas/heat/water distribution systems, public and private transportation systems, and commercial buildings/hospitals/homes play a key role in shaping a city's liveability and sustainability. To increase their performance and effi ciency, these critical city systems need to be integrated. The successful development of a smart city will require the combining of a bottom-up systems approach with a top-down service development and a data-centric approach. Technology integration includes vertical integration from sensors, to low cost communication, real time analysis and control, and horizontal integration of historically isolated systems up to citizen based services. Combined, this creates a system of systems. Today's smart city projects are mainly focusing on improving the integration of historical verticals, i.e. parts of existing utilities, improving e.g. energy efficiency, or reducing water leakage. The next step is horizontal integration. Data from the different sectors can be combined to better manage the city and reduce risks.

Interoperability is the key to manage systems of systems and to open markets to competitive solutions.

Interoperability is key to manage systems of systems and to open markets to competitive solutions. While we are today experiencing the internet of things (IoT) revolution (driven by the appearance of smart devices, such as wireless sensors, radio-frequency identification (RFID) tags and IP-enabled devices), different producers are generating technologies using their own communication specifi cations and data protocols. Future interoperability can only be guaranteed through the existence of international standards ensuring that components from different suppliers and technologies can interact seamlessly. Continued best practice sharing and development of common standards to ensure that data can flow freely between systems is essential, while maintaining the need to protect confi dentiality and individual privacy. Common terminology and procedures have to be developed in order to also ensure that organizations and businesses can effi ciently communicate and collaborate, which can also be guaranteed through standards.

Sectorial bodies need to increase collaboration.

The large efficiency gains from integration and interoperability can, however, only be realized if city departments and other stakeholders collaborate effectively and agree to share information. Smart services and infrastructures cannot develop without proper collaboration. The lack of exchange of fundamental data on customers, infrastructures and operations is one of the most important barriers highlighted by stakeholders.

There is a need to reform the way standards are developed.

The glue that allows infrastructures to link and operate effi ciently is standards. Standards are necessary to ensure interoperability of technologies and the transfer of best practices. But standards are not yet adapted to the level of technology integration we are requiring. Standard bodies still operate in sectorial parallel silos, developing standards that are not easy to understand by nonspecialists, for example city managers. Standards are facilitators for city planners who need to incorporate them in planning and procurement. There is thus a need to reform the way standards are produced and ensuring that they are adapted to the needs of the city planners and other service operators within the city.

The systems approach will only work if there is a coherent global approach.

There is a need for close collaboration between standard bodies themselves and collaboration with outside organizations, and particularly the city

planners. A precondition for the considerable investment in, and successful deployment of, smart city solutions is a substantial worldwide agreement on the *what* and *how* decided for and with the key stakeholders. Smart cities stakeholders need to recognize that standardization efforts will involve the development, promotion, and deployment of standards series and conformity assessment schemes that enable the implementation of smart city solutions. In addition, the multiplicity of technologies within a city now demands a top-down approach to standardization. This requires new coordination approaches between SDOs in which all the parts of the city are jointly considered by the several technical committees involved by the different organizations. This methodology is essential as systems level standards will enable the implementation and interoperability of smart city solutions.

REFERENCES

[1]   Mr.Nalit Patel, City Urbens.
[2]   Luis M. Correia, Klaus Wünstel, Smart Cities Applications and Requirements, White Paper, 2011-05-20.

.