

Smart Villages through Information Technology – Need of Emerging India

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Abstract- Human society is developing with rapid momentum and achieved various successes for making its livelihood better. The civilization is witness for various changes related to it's the development through different catalysts like industrial development, green revaluation, science and technology, etc. The present era is augmented on Information and Communication Technology. This technology has proved its potential in various sectors of development in urban and rural landscapes. Urban areas are seems to more inclined to accept and adopt Information and Communication Technology due to advantages of literacy and better infrastructure as compared to rural areas. Due to such suitable situations of urban landscapes good amount of success of this technology is visible in the form of smart cities and better livelihood of residing human beings. But the problems, consequences and opportunities in urban areas are different for effective utilization of Information and Communication Technology for sustainable development of rural masses. The present research article discusses about rural development in developing world for the up-liftment of livelihood of the rural masses and to take a 'look ahead' at scientific developments and technologies that might be influential over the next 10 -20 years. The driving motivation behind the concept on "Smart Village" is that the technology should acts as a catalyst for development, enabling education and local business opportunities, improving health and welfare, enhancing democratic engagement and overall enhancement of rural village dwellers. The "Smart Village" concept aims to realize its goal through providing policymakers with insightful, bottom-up analyses of the challenges of village development.

Keywords: Information Technology, Rural, Smart Village, Sustainable Development

I. INTRODUCTION

When "India lives in its villages" said Mahatma Gandhi, a great freedom fighter and visionary leader of India. A rural area is a geographic area that is located outside cities and towns, while rural areas are also known as 'village' in India. In these villages, agriculture is the chief source of livelihood along with fishing, cottage industries, pottery, etc. According to the Erstwhile Planning Commission of India, a settlement with a maximum population of 15,000 is considered as "Village". Much of India's rural population lives in nucleated villages, which most commonly have a settlement form described as shapeless agglomerate. India being a rural dominated country, the smartness concept is not even thought about the rural areas. All areas which are not categorized as urban area are considered as rural area. Number of rural units or villages in India have increased from 6, 38,588 [1] to 6, 40,867 [2]. According to 2011 census, rural area has population of 68.84%, whereas urban area has population of 31.16% only. It is growing fact that the rural population is suffering more consequences for livelihood as compared to urban areas. The difficulties of livelihood may be forcing rural population to migrate to the urban areas. The government has already recognized this issue and has put serious efforts through various schemes for

enhancing livelihood of rural masses. Presently, rural development mainly focuses on poverty alleviation, better livelihood opportunities, provision of basic amenities and infrastructure facilities through innovative programmes of self employment. The population residing in the rural area also needs the same quality of life as enjoyed by people living in sub urban and urban areas. Better livelihood in rural area may reduce disturbing effects of poverty, unemployment and inadequate infrastructure on urban centers causing slums and consequential social and economic tensions. Hence, rural development is concerned with economic growth and social justice, improvement in the living standard of the rural people by providing adequate and quality social services and minimum basic needs becomes essential. Such rural development not only improve livelihood in rural area, but also may reduce the migration of rural population in urban areas for employment and reduce pressure on urban infrastructure. Such changes are not very uncommon for human beings as human civilization has passed through various phases of development. Some of the milestones, which are witness to this development, are Prehistoric age, Stone Age etc.; the current era of human development is quit ahead and popularly known as "Smart age". Human beings are using smart phones, smart TVs and live in smart homes. The concept of smartness is popular in

respect of human development irrespective of rural or urban area, literate or illiterate in all the countries and India is not exception to it. Like many developing countries, India too is a rural dominated country. Though, the awareness of the smartness concept is well recognized by the planners and policy makers, but not effectively implemented for the rural areas. In recent times, there is an immense interest in the development of Smart Cities [3]. Making a city "smart" is emerging as a strategy to mitigate the problems generated by the urban population growth and rapid urbanization [4]. Globally, the concept of 'Smart City' is a significant initiative that seeks to improve the quality of life of urban citizens. Smart Cities across the country has the potential to be a game-changer in the country's urban landscape and the lives of ordinary citizens. The smart city initiative is having good potential for urban development and India has also recognized this potential and is at the edge to start implementing this concept. This will facilitate better living for about 30% of the population, who live in urban area. But, more than half population will not be benefited from smart city development. Conditions in rural area are very different as compared to urban, so the same model of smart city cannot be implemented for the villages. The efforts of rural development may not work on the same principle as of smart city. Hence, utilization of Information Technology, which has proved its potential for the development, may be used for rural development through a concept of "Smart Village".

The Smart Village concept will be based on the local conditions, infrastructure, available resources in rural area and local demand as well as potential of export of good to urban areas. (Fig. 1) In the Indian context, villages are the heart of the nation. Hence, for the development to percolate to the grass root level, focus must be devoted to the progress of villages and to smarten the rural population using ICT solutions to achieve self sustainability. Imbalanced growth between rural and urban landscapes leads to the challenge of rapid urbanization in already crowded Indian urban masses. One of the main consequences of uncontrolled urbanization is lack of livelihoods, good standard of living and amenities in the villages of India. Smart village concept may play crucial role in maintaining the balance between the development of rural and urban areas and help to reduce migration of rural population in urban areas. Urban population density is increasing in uncontrolled manner, while the numbers of cities are still inadequate to accommodate the migrating population from villages. This needs to be reversed and suitably managed to improve quality of life in Indian cities. The concept of "Smart Village" will also address the multiple challenges such as unplanned urbanization, under-development of villages, migration for economic pursuits, better standard of living etc.



Fig. 1 Core Smart village

II. NEED FOR SMART VILLAGES

The village communities are little republics, having nearly everything that they want within themselves, and almost independent of any foreign relations [5]. In the development process, there will be many changes in the demand and supply of various needs, as rural population will pass through the process of change. At present, one of the major challenges in India is growing population and rapid urbanization. This urban growth to certain extent is unavoidable, as the economic pursuits and aspirations of the population do change and evolve. This needs to be reversed and suitably managed through a balance between rural and urban quality of life. The concept of "Smart Village" will address the multiple challenges faced for sustainable development of rural India. A "Smart Village" will provide long-term social, economic, and environmental welfare activity for village community [6], which will enable and empower enhanced participation in local governance processes, promote entrepreneurship and build more resilient communities. At the same time, a "Smart Village" will ensure proper sanitation facility, good education, better infrastructure, clean drinking water, health facilities, environment protection, resource use efficiency, waste management, renewable energy etc.

There is an urgent need for designing and developing "Smart Village", which are independent in providing the services and employment and yet well connected to the rest of the world. Based on various programs undertaken taken by Central and state governments along with further technological initiatives, the Smart Village can achieve SMART infrastructure, SMART service delivery, SMART technology and innovation, SMART institutions along with optimal mobilization and utilization of available resources, leading to faster and more inclusive growth. A 'Smart Village' will encompass a sustainable and inclusive

development of all sections of the village community, so as they enjoy a high standard of living.

III. TOWARDS DEVELOPMENT OF SMART VILLAGES

It is clear that the situations and challenges in developing urban and rural area are different due to the constraints and opportunities. Many researchers believe that the existing technologies developed for the smart city may be useful for the smart village concept. Researchers [6] reported that the Smart village system can be developed on the lines of smart city model. The components taken in to consideration will vary from region to region for villages, based on the available resources and opportunities. Following are some generalized guidelines for the development of Smart Villages (**Fig. II**):

1. Economic Component: This component will include local administration and economic factors. It will cover governance models, bandwidth, mobility, cloud computing, entrepreneurship etc.
2. Environmental Component: This component will address the issues related to resources and infrastructures available at local level. It may covers cleaner technologies, public and alternative transportation, green spaces, smart growth, climate change etc.
3. Social Component: This component may address issues related to community life, participatory democracy, social innovation, proximity services etc.

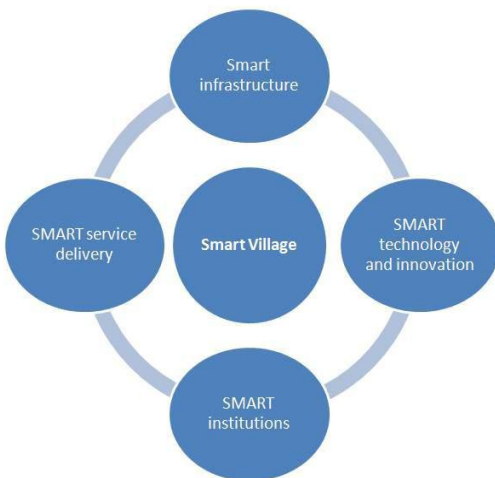


Fig. 2 Components of Smart village

IV. ICT FOR SMART VILLAGE: PROBLEMS VS. POTENTIALS

Information and communications technologies (ICTs) have proved its vast potential for the benefit of mankind in various fields. Information and communications technologies (ICTs) are often used to assure the right to an

education and learning, and have a potential to serve developing needs [7]. The various researchers have recognized the potential of ICTs for rural development and it may play key role for the fast and sustainable development of rural India in coming years. Information technology (IT) can make a difference in a developing country only, if it is designed in close collaboration with its users [8]. Based on the analysis on limitations of traditional rural planning and construction, the village planning needs to be a bottom-up process that focuses on the local community participation [9]. Information and communications technologies (ICT) have a large potential for enhancement of rural life through its applications in various areas of the rural village development. Globally, the effect of IT/ICT technologies has improved life of people living in urban areas. Rural population has remained mostly neglected and least beneficiary of such technological developments resulting in a virtual digital divide between the rural and the urban population [10]. There may be different school of thoughts about the potential and adaptability of ICT technology in rural areas. But, mobile technology too has played an important role in the economic and social empowerment of rural communities in developing areas to fill the digital divide. Still, rural areas often suffer from slow and unreliable network infrastructures. This limits access to content and services that may promote economic development. However, with the use of ICT, capacity development and empowerment at individual and community level can be achieved to ensure the demand, delivery, reach and use of quality services. All such successful implementation of ICT based activities in rural area may prove the strong potential for further implementation of the technology. It will also help in identifying system bottlenecks / gaps, improving data analysis and monitoring, while enhancing appropriate technical and entrepreneurial skills, promoting social norms and behaviors favorable to the realization of village/community development. Introduction of innovations, new ideas and best practices of self-management is the key feature as well as an important strategy for the Smart Village. Knowledge management along with ICT will focus on strengthening both capacities and systems of the community.

V. GEOSPATIAL TECHNOLOGY FOR SMART VILLAGES

ICT is a composite word having combination of many tools and technologies. Detailed discussion on each and every tool and technology is out of scope in this paper. But, one of promising technology like Geoinformatics may be useful for villages, while transforming rural villages towards smart village. Geoinformatics technologies can play a very prominent role in the deployment and implementation of ICT in the "Smart Village" in terms of decision support systems. Available different spatial and non-spatial layers

can be combined and integrated to facilitate analysis and make the best decision [11]. Recent developments in GIS, GPS, remote sensing, web-services and location-based services and technologies can support innovative solutions for management, governance and citizen participation practices compliant with Smart Village objectives. Geo-spatial data and Geographic Information System (GIS) are essential components for building smart villages in a basic way that maps the physical world into virtual environment. GIS-based planning and support systems allow planners and village community to efficiently create and visualize alternative scenarios and determine their possible impacts on future land use patterns and associated population with employment trends [12]. The future of India lies in converting each and every village into smart villages. The concept of smart village will provide the similar kind of facilities to the villages, so that the agrarian community will remain in villages and not migrate to urban areas. Future generations will contribute immensely in development process and enjoy the traditional agriculture activity with the use of modern technology. Following are some potential areas, where Smart Village may create measurable and significant impact:-

- Organized Settlements: The village population is distributed in a staggered manner and they are not well connected to the village roads. These may be re-distributed preserving proper zones for habitation, play ground, agriculture land and areas to develop various infrastructures like bio- fuel generation centre, overhead water tank, etc.
- Smart Agriculture: In order to increase the quality and quantity of agricultural production is using “Sensor” technology to make farms more “intelligent” and more connected through the so-called “Precision agriculture” also known as ‘smart farming’.
- Road Infrastructure: GIS analysis ensures all the houses in rural areas are well connected through rural road.
- Smart water supply: There should be provision for water supply for agricultural, household use and drinking. This may facilitate effective and judicious utilization of the surface and ground water resources.
- Smart sanitization: Smart equipments may be adopted in rural areas to facilitate disease free villages.
- Education: GIS analysis may be carried out to find suitable locations to establish state-of-the art education hubs for the villages. Virtual classroom facility may be provided to use the benefit of available experts at other locations.
- Disaster management (DM): Villagers are easily affected by disasters due to lack of preparedness. DM cells may be set up at the *panchayat* level to address all the disaster related issues. DM cell will connect to the National Disaster Management Authority (NDMA) through the central server for monitoring the future scenarios.

VI. CONCLUSION

Smart Villages are the need of the hour as development is needed for both rural and urban areas for better livelihood and Information technology will offer effective solution. There are successful technologies available, which have been implemented in urban areas. There is tremendous pressure on urban landscapes due to migration of rural people for livelihood. Smart Villages will not only reduce this migration but also irrigate the population flow from urban to rural area. ICT/ IT and GIS are the unbreakable pillars to support the whole process of village development. Smart village concept will have potential to uplift the grass-root level of the country, hence adding feather in the overall development of India. Failure to utilize Information Technology tools for rural development is because of lack of strategy, unfocused planning and above all monitoring and execution of the activities. All these activities need to be addressed based on the varying rural situations. A specially designed suitable framework for rural areas on the grounds of Science, Technology, Engineering, Regulations and Management will play important role to build next generation smart villages. Each village is a unique example and having diverse set of problems and situations. It may be difficult to implement the same model of village development for all the villages. To address this complex problem, Public Private Partnership (PPP) may play key role for developing smart villages. Benefits of the smart village efforts are foreseen to be tremendous. Smart village concept is having high replication potential in other countries of developing world. The concept of smart village may also be extended to small towns and also townships surrounding the big Cities.

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