

In a developed country, the idea of a smart city entails making existing systems smarter. In a developing country like India, however, the primary focus is on infrastructure development. Information and communication technology (ICT) applications can play a major role in making cities smart and sustainable, and ensuring a better livelihood for their citizens. While there can be a no single solution that works for all smart cities and every city needs to be developed differently, a sustainable smart city should have smart communication, ICT infrastructure, smart mobility, a smart environment, smart living, a smart economy, smart governance and smart citizens.

Some of the promising smart solutions being used in India are as follows.

Smart energy

A smart city should provide 24x7 uninterrupted and affordable power supply to its citizens. The role of ICT in efficient energy management can be analysed in terms of equitable distribution of power, minimising leakages in transmission, timely repair of faulty transmission channels and real-time updates of energy demand that require a suitable energy framework.

The various aspects of smart energy management include the deployment of advanced metering infrastructure (AMI), peak load management systems, power quality management systems and outage management systems, along with the use of microgrids, data acquisition systems, transmission planning for renewables and energy storage mechanisms.

By adopting internet of things (IoT)-based metering infrastructure, utilities can make major strides in reliable power generation and distribution. Smart meters can record electricity consumption in homes or buildings and send this data back to the supplier and consumer at regular intervals. This real-time information allows customers and utilities to make adjustments in consumption patterns during peak hours. Further, with advanced sensor technologies and software analytics, load imbalances in the grid can be easily detected and this data transmitted back to the utilities. This real-time visibility can help utilities check unmonitored consumption, which, in turn, can reduce power leakages and theft.

Several discoms have deployed smart energy solutions. For instance, Assam Power Distribution Company Limited has collaborated with Ericsson India to conduct a smart meter pilot project under which the latter has provided a comprehensive AMI solution for operating 15,000 smart meters, along with systems integration and support services in Guwahati. The solution helps in outage, management, aggregate technical and commercial loss reduction, power quality management and net metering. BSES Delhi has also installed meter data analytics to detect meter tampering and power theft. To this end, it has deployed various techniques and maturity modules. Further, Tata Power Delhi Distribution Limited is planning to install smart meters for its 2 million customers in Delhi in order to ascertain their usage pattern and manage the load. It has partnered with Landis+Gyr, a unit of Toshiba, to build the communication network and install smart meters, which will help the company save 25 MWp power requirement. With the installation of smart meters, consumers will get messages from the local power utility to switch off their air conditioners or any other high-power-consuming appliances to avert power cuts during peak hours.

Smart mobility

Owing to increasing population and rapid urbanisation, there is immense pressure on the city framework that was planned years ago. Currently, heavy traffic jams, increased pollution levels, inefficient transport systems, limited road network and inadequate transport infrastructure are causing a lot of inconvenience to people.

A smart city needs to address all these issues by using smarter mobility systems. The traffic system could use ICT and software applications for different purposes such as optimising traffic fluxes, supporting effective public transport routes, real-time parking management, curbing the environmental impact of transport in the city, and obtaining citizens' opinions, suggestions and grievances about urban mobility.

The key solutions for mobility include smart parking, smart ticketing and real-time journey planners. Smart parking helps improve users' ability to locate the best available street parking based on price and proximity. Smart ticketing provides easier payment options for transport services across different modes. It also benefits transport operators through faster payments and greater integration of payment systems. Further, vehicle tagging/radio frequency identification (RFID) can assist in electronic toll collection. In addition, real-time journey planners can help travellers change their journey routes while driving. It also helps operators to use data to plan future operations. This can also be used as a mechanism to influence traveller

behaviour and distribute travellers across different modes of transport. Moreover, urban planners can use this data to make parking provisions and plan future infrastructure and services based on demand.

The bus rapid transit system (BRTS) was implemented by the Ahmedabad government to provide reliable and secure public transport with the primary objective of reducing travel time. Nearly 155 km of road was created within the BRTS after planners determined the service utilisation by considering socio-economic characteristics, travel demand patterns, road network characteristics, the proposed metro plan and the existing Ahmedabad Municipal Transport Service route network. The scheduling and tracking of buses on all routes is being performed from a central location in the city. Some of the key design elements under the BRTS include global positioning system (GPS)-enabled buses, an integrated control centre for traffic management and the use of driver assist and automation technologies with vehicle prioritisation and passenger information systems for operational efficiency. Meanwhile, Kochi Metro Rail Limited has also launched smart cards with the aim of providing an open-loop card payment system that would enable multimodal transport ticketing. Under this ticketing system, commuters will be able to travel using various modes of transport with a single ticket. Toll fee in the cities of Mumbai and Bengaluru can be now paid through mobile applications. Further, Raipur Smart City Limited is developing a smart parking system under the Smart Cities Mission based on a public-private partnership model. The project involves advanced technologies to help motorists locate and pay for parking.

Smart waste management

ICT solutions can also be used for efficient waste management in smart cities. The accumulation of waste is a major problem that can be resolved by placing sensors at garbage disposal sites, which can help the civic bodies keep track of how much garbage is being disposed of at a particular site. In case the capacity at a particular site is exhausted, the garbage can be immediately shifted to another site.

For instance, Andhra Pradesh launched a fleet of smart garbage collection autos in the city of Vijayawada. These pollution-free autos come with multiple tracking points, which help track where the waste is being collected from, how much waste has been collected, the route taken by the vehicle and the disposal spot. The launch of these autos has eliminated manual tracking and monitoring. Meanwhile, the Pune Municipal Corporation has been using various technologies like a GPS vehicle tracking system, ultra high frequency RFID, and IoT sensors along with innovative mobile and web-based applications to improve waste collection and recycling.

Smart health care

The increasing population and urban lifestyle demand a smart healthcare network to ensure quick and efficient access to healthcare facilities. Cloud computing technology and big data analytics have made huge inroads into the healthcare sector. These technologies help store and analyse the huge volumes of raw and unstructured data generated from various sources including hospital information systems and electronic health records.

Smart health care also involves the use of wearables and mobile devices. The use of such devices is smart, in the sense that they help prevent diseases by detecting symptoms at the right time. These devices work through sensors and collect a patient's data remotely. The data can be stored and analysed by doctors and healthcare professionals for better diagnosis and solutions. The use of smart wearable devices can help in checking blood and glucose levels, body temperature, heartbeat, cardiovascular problems, vision quality and chronic ailments. These devices are a boon particularly for diabetic and heart patients. Products like fitness trackers and bands have gained immense popularity amongst fitness enthusiasts.

In Rajasthan, more than 21,000 anganwadi workers use smartphones as a part of ICT-enabled real-time monitoring (ICT-RTM) of integrated child development services (ICDS). This helps in not only efficient delivery of services but also in monitoring the scheme. The project entails a mobile application ICDS-common application software (ICDS-CAS). The app has also enabled the automation of 11 ICDS registers that were maintained manually earlier. In addition, it has helped in the automatic generation of lists of ICDS beneficiaries and real-time capturing of information. Another advantage of ICT-RTM is that it provides access to information on any of the anganwadi centres to officials at the national, state, district and block levels.

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