



IOT AND CONNECTED SERVICES AS THE BACKBONE OF SMART CITIES

A pov on how iot and connected services based cx applications are going to impact smart city solutions

Smart Cities and their Objective

Any Smart City would bear at its core - Improving the quality of life for its Citizens, by transforming the existing infrastructure thereby ensuring we are sustainable and resilient, prepared for the future.

A Smart City utilizes Technology, infrastructure, Data to provide intelligent services to its citizens allowing them to access real-time updates on the Facilities provided within the City. It also helps in improving the quality of living not just with intuitive services but also through fixing issues intelligently through advanced technology and devices.

Smart City solutions offer to save time through intelligently controlled traffic, Energy savings through Smart Buildings which rely on sensors to switch on and off services based on heat maps, Efficient usage of Water resources through Smart Water meters, efficient use of public transport, making available better healthcare services through AI and analyzing mass patient volume, improved citizen security through connected surveillance devices and data.

These are just some of the ways in which Smart city solutions address the challenges due to rapid urbanization, there are still many other possibilities to extend.

Technologies to be considered for Smart Solutions

Smart cities can consider using a combination of the below Disruptor Technologies to improve services

Blockchain -Blockchain has emerged as a disruptive technology, which is able to include decentralized and distributed secure ledgers, recording transactions creating the potential to remove unintended errors by providing transparency as well as accountability. Apart from cryptocurrencies it also contributes to various other sectors.

AI -AI Enabled devices can monitor, track and predict usage patterns, needs, get insights, and solve problems intuitively when trained. It could lead to minimizing downtime, higher productivity, lower maintenance costs and better sustainability. These could evolve to be a game changing technology when leveraged the right way.

Conversational AI -AI chatbots and Voice Assistants, Digital Avatar Assistants have already made their way into our daily life while interacting with Service based organizations. They help imitate human interactions, reduce human effort, waiting time and aid in delivering prompt resolutions at the basic level.

Robotics and Drones -Drones are already being used in various walks of a citizen's life- be it video capturing, surveillance, Insurance assessment, Delivery, etc., to aggregate, analyze and deliver highly accurate and highly detailed data which are key to a successful Smart solution. The data thus collected facilitates applications that improve operations, engage residents and support communities.

Mini robots were used during the peak of Covid to administer to covid affected, isolated patients, they have also been used at disaster locations and rescue operations. the advent of robots may bring in better job opportunities for some and replace human effort in other cases and they are reshaping the everyday life of the common man.

IoT - IoT Devices and networks are the key to making a city smart since they are deployed on the field and provide critical, real time data at all levels from devices such as sensors, smart lighting devices, meters. How they impact the Smart Solutions and how they need to be aided to ensure the sustainability of the Smart City model - will be the subject of our focus in this paper.



IoT and Connected services as the backbone of Smart Solutions

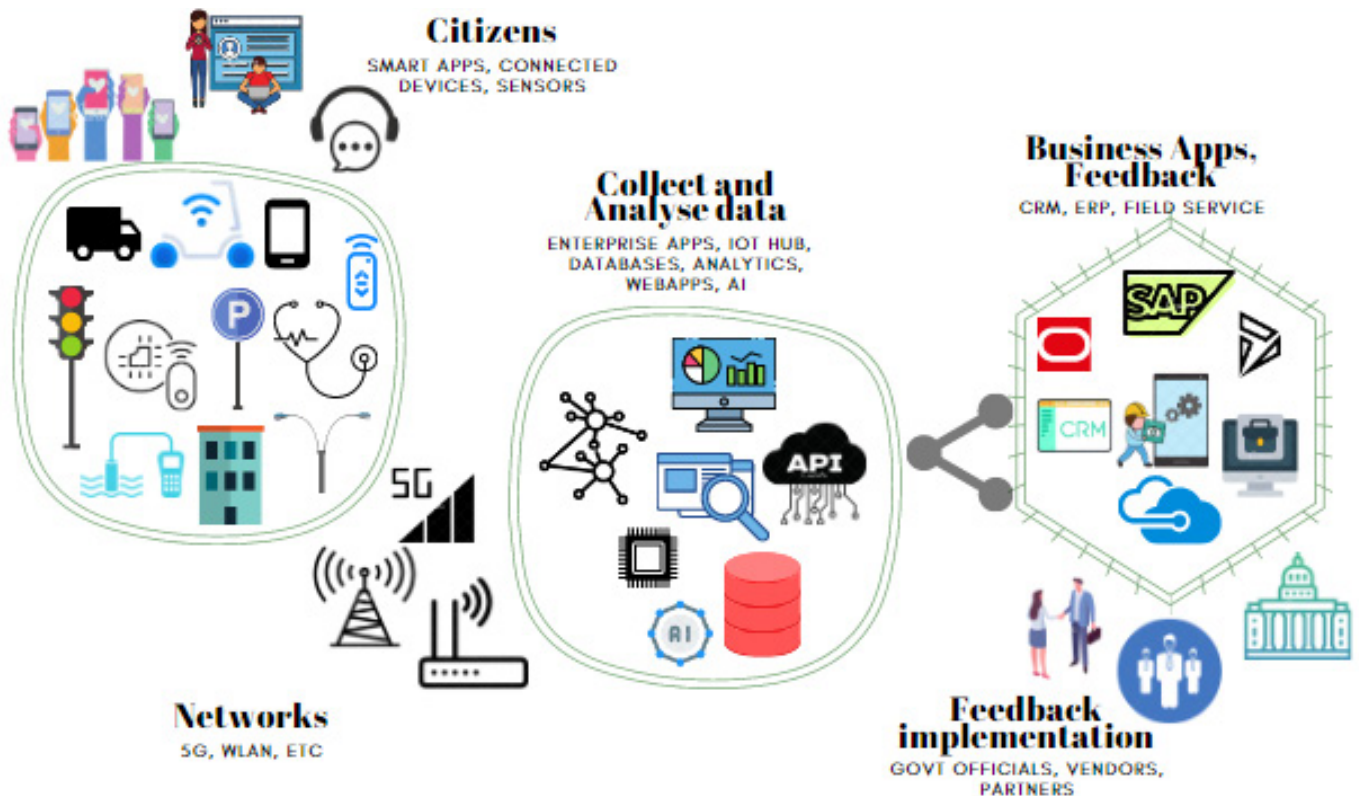
“ It is predicted that by 2025, 41.6 billion devices will be capturing data on how we live, work, move through our cities and operate and maintain the machines on which we depend.

Billions of connected devices instantly translate our physical world into the digital realm by capturing and analyzing data about our surroundings in real time. This vast network of devices – thermostats, speakers, beacons, cameras, sensors and other devices – is known as the internet of things (IoT). ”

**(State of the Connected World 2020 Edition)

In its simplest form, IoT consists of data-collecting sensors that are connected with wireline or wirelessly to the internet, where the data transmitted by the sensors is captured, stored and analyzed digitally, with little or no human intervention. The insights generated can then be used by machines, and by humans, if necessary, to adjust and modify the activity being monitored.

Indicative Architecture



Any basic IoT based infrastructure would involve three main components as shown in the diagram above.

1. Smart apps, devices and sensors – these are the core components of the solution that relay important data, usage patterns, take stock of and measure various parameters to ensure the systems are running smoothly. The data could be based on citizens usage of smart apps or could be picked up by the sensors automatically and relayed to the hub.
2. The Brain – comprising of the APIs, IoTs, AI based analytic engines, backed by the right infrastructure to relay the information such as WLAN, Mobile networks, Broadband network etc through which the information picked up from the sensors are relayed to the hub – where this information is processed, analyzed, and meaningful insights are drawn
3. The Execution – where the meaningful insights drawn from stage 2 are implemented, or actionable decisions are made to address the need/issues detected.

Challenges faced when engaging IoT

- **Security** - Smart cities face many risks as digital and physical infrastructure converge making IoT more vulnerable to attack and harder to defend because of the sheer number of interconnected IoT devices and networks offering hackers millions of points of attack.

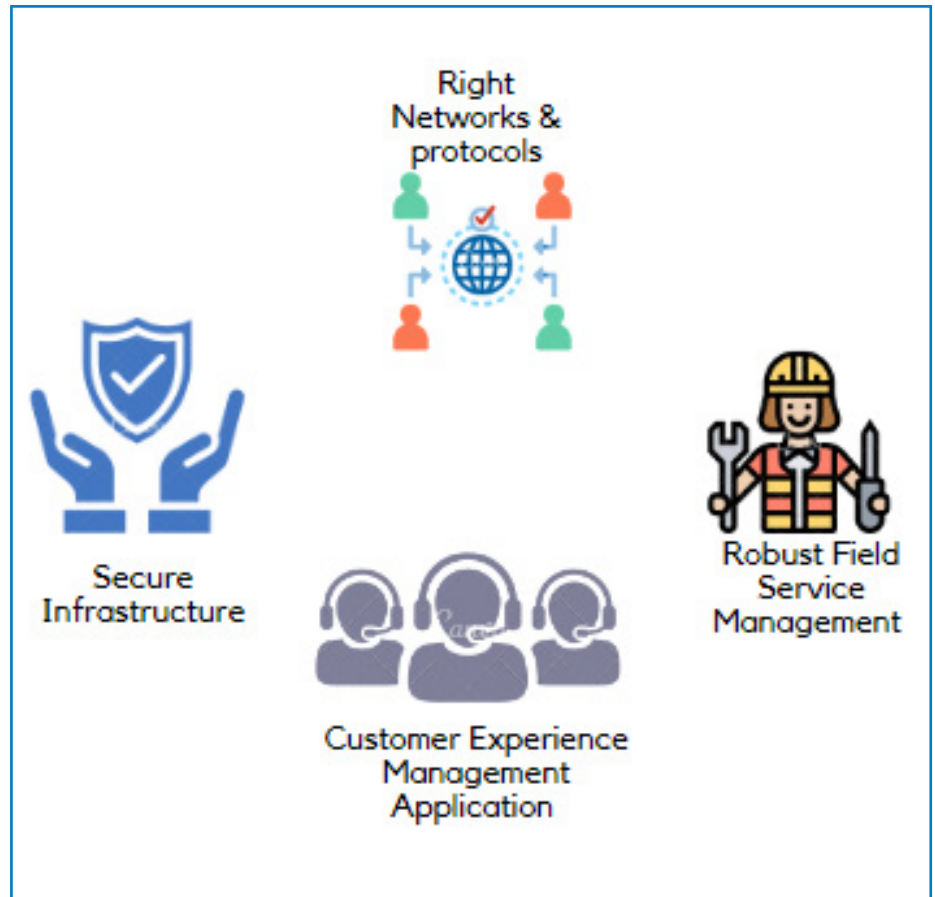
Different IoT devices using different security features, capabilities and levels of protection, making it difficult to follow a uniform security protocol.

- **Interoperability** - Interoperability issues and the lack of global standards are undermining progress and creating barriers for the further development of IoT. When implemented on a large scale - multiple versions of the same device communicating in different protocols and platforms causes issues.

- **Connectivity Network** - Mobile Networks such as 5G, LoRwan, contribute to a better connected network among the IoT devices than other broadband that might lead to weakening of signal strength and thereby render the connected devices ineffective. Due to the ever-increasing volume of sensors and their data, robust connectivity technology is a requirement for success

- **Need for Connected Services for IoT Devices** - While deploying Connected networks is just one half of the effort, the receiving

information, processing/analyzing it, acting on the information sent is the key part of having a connected network on such a large scale.



Addressing these challenges-

- IoT networks need to follow industry specific Security and communication protocols, to be able to have stronger security firewalls across devices and networks
- Using latest networks such as 5G, Lo-RaWAN, using Lo-Ra enabled sensors to enable better quality communication between devices at all times.

- The IoT network needs to be backed up by a versatile Customer Experience Management(CXM) applications that can receive data, derive insights of usage and behavior patterns, can respond to changes in the parameters being monitored by the devices.
- The CXM needs to be backed by able Field Management Application so that, based on the analysis of the real time data, requests, the CX application can

quickly dispatch the nearest available Technician to fix the issue. This way the issues can be detected and fixed by the Application and network even before it is observed by the End Users.

- Finally having strong analytics would help to gather data from the CXM analyze End User usage and behavior patterns, aiding in understanding the citizen needs better and predict and pre-empt needs.

Examples of Smart Solutions

- Data-based crime prevention - Receiving data and analysis of the real time data from connected CCTVs, sensors, from potential crime prone locations, crowded locations, helps the City Crime detection officials to take prompt action and even dispatch personnel whenever they sense a deterioration of the situation.
- Smart Parking and connected vehicles – Having parking slots fitted with sensors, would relay slot status automatically to a central location or to sensor fitted vehicles – so that the driver needn't spend time looking for an empty slot but the car is redirected automatically to the empty slot.
- Smart Traffic Management – Having the traffic signals and the street lights fitted with sensors, helps in analyzing real time data and diverting traffic accordingly, thus saving citizen's time and potential traffic jams
- Smart Transport– Logistic vehicles and warehouses fitted with IoT devices would help in redirecting vehicles on a need basis, vehicles fitted with sensors would enable drivers to prevent crashes, relay real time information on speeding, etc, thus ensuring the safety of drivers.
- Smart Buildings – Buildings fitted with smart devices, help analyze building facilities utilization thereby helping control energy, water, heating services, service personnel used within the Building.
- Smart Lighting & living– Having the street lights connected with sensors, cameras, etc would help in collecting Air quality data, utilize power effectively by self-switching lights. Having smart lights within building can help conserving energy by auto switching off lights when not in use. These can also act as alarms to help people with disabilities raise an alarm when in need, when combined with other devices.
- Smart Healthcare services – By fitting patients with wearable devices, monitoring devices with sensors, enables prompt interaction and access real time information between the paramedics, doctors, and other healthcare staff. It helps to track the patient health and status actively, thereby helping make quick decisions when needed and dispatching, controlling personnel utilization on a need basis

Benefits enjoyed by Citizens through Smart Cities

Transforming urban spaces into Smart cities helps raise up the quality of living for the common citizen, by improving the usage of public resources in an efficient manner. The benefits are listed below

- Conserve Energy through smart grids, smart meters, smart lighting, buildings etc
- Better traffic and Parking management – Smart Parking, Signal lights, smart sensors along roads/lights to track road usage, etc
- Conserve natural resources – Smart water meters, sensors to reduce leaks, minimize usage, etc
- Intelligent Transport& Logistics – Vehicle, Logistics, Warehouse Tracking, better delivery and storage of consumables
- Reduced Crime rates, accidents – Connected cameras, connected vehicles
- Better Healthcare – Wearables, quick turnaround, first response on critical situations
- Reduce overall costs incurred by the City governance by better planning of resources



Factors that go into making a Successful Smart City

1. Human Capital

It involves stakeholders from various dimensions such as the Government authorities, Transport, Healthcare, City corporation, Logistic service providers, Waste processors, Telecom service providers, Energy Providers, Educational institutions, etc., along with the common man to be involved in a collaborative way to be able to achieve the ROI from Smart City investments.

2. Technology

Apart from the human component, the backbone of the Smart city is Technology and its success lies in its ability to leverage the latest technological advances and apply it to retro-fit the existing city infrastructure. Also its ability to upgrade the infrastructure to avail greater advantage of Technology would be an added plus. It would depend heavily on Mobile Apps, IoT devices, AI, high-speed internet networks, integrated sensor networks, to provide services, track personnel, generate insights, provide predictive services, ensure optimal use of public facilities and enhance the quality of services being provided.

Government should also focus on providing high speed broadband, mobile and IoT networks,

3. Finances & Project Implementation

Charting out the right Technical Landscape, roping in the right set of Implementation Partners and Vendors, having them work together towards Common Goal of the Smart City Vision, getting the needed collaboration from all the government stakeholders and facility

providers mentioned earlier, during the implementation, and the Government's ability to park the necessary funds would form the basis for the transition of the Smart City from paper to reality.

In the Implementation of these Projects, The Government would take the role of an Enterprise that is undergoing Digital Transformation and the End Users would be the citizens.

The Government would also need to address the Citizen's needs and Pain points treating them as End Customers, thus leaving no room for slackness in rolling out relevant and advanced services and facilities.

4. Right Branding

Despite all the best efforts, some projects fail to receive the acceptance from the end users either due to a sense of apprehension in moving to a new way of life (could be due to data privacy issues, or being unfamiliar with the usage of the application), or due to poor branding efforts from the Govt.

The Government would need to invest in sensitizing the Users on the ease and relevance of the services being provided and come up with schemes to encourage, incentivize Smart Services Usage.

5. Data

Since there is mass usage, the amount of data generated each day is going to be of huge proportion and they key to improving the services being provided lies in the ability to pull out meaningful insights and channel them into actionable decisions. This would help address the city's practical challenges more effectively.

Solutions should focus on drawing out data from the vast network of public space sensors, draw and connect data trends from a combination of source, and consumer usage patterns, usage traffic.

6. Feedback Loop

The data generated from the apps, devices, and usage patterns of the Smart devices/services should be analyzed by the Government to implement decisions that increase satisfaction, productivity, and transparency related to the services provided by the city.

To address points 5, 6, the Solution should be backed by a strong Customer Experience Management Application that is capable of going beyond the traditional CRM/ERP capabilities and is able to connect data holistically across departments and teams with AI-powered insights to drive better outcomes.

This would ensure that technical glitches, offering the right set of services to the right Users, improving the Quality by offering predictive services, improving Satisfaction by offering to fix issues intelligently even before the User can identify or report it are all addressed within the right frame of time, before it leads to perceptible dissatisfaction among the Users.

7. Security of the Smart Networks

Mass usage and the availability of almost the entire citizen personal database would make it a vulnerable target for cyber-attacks. The connectedness of the networks only increases the risk of attacks on data and destabilizing public systems. Even a possible attempt to hack the data or the networks would badly impact the citizen's confidence in the use of the Smart Solutions.

Enhancing Smart City models through Smart Citizen framework

Other factors that can be considered while designing the Smart solution

- Take into account Citizens Priorities and Data – Each city's needs and pain points are different from other cities. The implementation Partners and the City officials need to prioritize the issues faced by the common citizens to see meaningful ROI on the technology and smart solutions implemented. Rather than go with high cost projects or big bang projects, Our suggestion would be to go step wise, according to the priority of Citizen needs (for ex- Smart Education or Healthcare might be more important than a smart railway system in a given city). This would also help in gauging citizen response and take corrective actions for future projects as necessary, thereby enhancing citizen's satisfaction.
- Segment Citizen data – Rather than rolling out all projects across all segments of the society (which would be costly and difficult to manage too), we recommend that the customers are segmented according to various demographics and needs and need based apps be rolled out in a phased manner- first to the prime segment and then to secondary segments (by doing this, we would also be able to provide an improvised version to the secondary segments, thereby ensuring better acceptance across all sections). This would provide relevant services to the right segment at optimum costs.
- Proactive approach – The full success of Smart solutions cannot be realized by merely rolling out these solutions. These need to be backed by strong analytics and predict needs, demands, to ensure better preparedness and take proactive measures than reactive ones. This would also help the city be prepared in disaster response and management.
- Collaborate – Again Smart solutions cannot achieve full potential unless adopted by the citizens on a wide scale. This helps in increasing the usage database thereby making predictions more accurate. It would also help when suggestions and inputs on these solutions are received on a daily basis through the same smart apps, from the citizens, thereby making the solution more robust and accepted across a wide sector of citizens. Incentivizing usage/feedback, sending crucial data from citizens, can also help in increasing usage from the citizen's end.



Conclusion

While the penetration of IoT devices into the Citizen's daily life has made it an indispensable part in the success of a Smart solution, it also needs to be backed up with applications that can provide effective connected services from the backend. These, coupled with AI, citizen-focused collaborative usage and improvisation of the solution would aid in making the Smart City solution effective.

Besides the pervasiveness of technology today, would help transition even a tier 2 or 3 city into smart city when addressed with the right focus.

About the Author

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Mary has 10 years of experience in the Infosys Microsoft CRM practice and has worked predominantly in the Presales wing of the Practice on the Dynamics Customer Experience Product.

She has a flair for analyzing the Product fitment and drawing up intuitive solutions across domains, based on Dynamics 365 CE. She enjoys shaping the Vanilla CRM and Field Services product to deliver complex business scenarios.

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