Realizing ‘Smart Cities’ with Technology

A KPIT Perspective
Technologies for a better world
1 Foreword

With 31% of India’s population living in cities and with this percentage to almost double by 2050; the need for cities driving continuous economic growth along with environmental sustainability has never been more evident. Growing urbanization is creating pressing need for policymakers to answer on priority the issues relating to increasing emission levels, inadequate public transportation and infrastructure, and overall resource constraints. Through the ambitious ‘Smart Cities mission’ Government of India is looking to induct newer and integrated technologies to address these challenges, and improve the quality of life of citizens. The key elements selected under the mission are Transportation, Energy, Water management, Environment, Smart Governance, Citizen Participation, Digitization, Public safety, Housing, Education and Healthcare.

The Smart Cities mission therefore is an exciting opportunity for technology providers to collaborate with town planners, Urban Local Bodies (ULBs), and consultants in developing a vision toward achieving the Smart Cities, and enable the Government to maximize its technology investments through various models including public-private partnerships.

Many cities around the globe have successfully transformed into a smart city through technology adoption for a connected experience. While the technology blueprint of such cities could be referred to for guidelines and as indicators, the learnings cannot be applied as-is in the Indian context. From demographics to the current status of infrastructure in Indian cities, there are many differences that make each city very unique. Therefore, in the journey toward becoming a ‘smart’, each city will require an exclusive approach, and hence will prefer partners who have deeper understanding of Indian issues and can provide localized solutions using global best practices.

As a technology provider with a global clientele and footprint, KPIT develops and deploys solutions that are tailored to geographic regulations and specifications. This positions us well to bring in best practices from across the world and localize the solutions for India. Our Technology Solutions and System Integration expertise enable Automotive & Transportation Companies/Operators, manufacturers, Government bodies, Energy & Utility companies, and City authorities, to derive enhanced value from their technology decisions and investments.

Through this whitepaper, we present our perspective on the realm of technology solutions that would be required to enable and empower the ‘Smart Cities Mission’ in India.
2 Technology of relevance for Smart Cities

Several smart cities globally have already implemented point solutions that have demonstrated the fact that existing hardware/software functioning in silos cannot make a Smart city. Truly becoming a Smart City requires seamlessly interconnected systems that can be retrofitted over the existing infrastructure. Such systems need to offer real-time actionable data & analytics for its stakeholders i.e. both the administrators & the citizens in an integrated approach.

It is here that a major confluence of the Smart Cities Mission objectives and our expertise finds a platform. KPIT has tested and proven solutions such as the Intelligent Transportations Systems, City Surveillance & Traffic Management, Hybrid/Electric vehicle retro-fitment technologies, Automatic Meter Reading (AMR), Smart Governance & Citizen participation solutions, Digital campus, Integrated City Command Centre etc., that correspond to the key elements described in the Smart City framework by the Ministry of Urban Development (MoUD). KPIT further brings in the capability to customize the solutions as per a city’s requirement, and integrate these with supporting technologies of Data/Social Analytics, IT Infrastructure Management, IoT, System Integration and Hosting & Cloud Services.
3 Transportation

3.1 Current Challenges
Urbanization is affecting Indian cities in a big way. City population is growing at a much faster pace than infrastructure development, leading to the following problems

- India loses 60,000 Crores annually in traffic congestions\(^1\)
- Only 8% urban population in India uses public transportation for daily commute\(^2\)
- India owns only 1% of world’s vehicle population but contributes to 15% accidents\(^3\)

If infrastructure expansion alone is considered as a means to address the challenges, India would need to invest $1 Trillion in the next 5 years. However, many smart transportation initiatives in India and globally have established that technology can reduce the need for extensive infrastructure expansion. An Integrated Transport Management System (ITMS) approach with a long term vision is needed in achieving smart transportation goals.

3.2 Intelligent Transport Management System (ITMS)
ITMS is a conglomeration of systems that operate in coherence to make transportation safe, convenient and efficient. Within the ITMS framework, multiple systems like passenger information system, smart parking, intelligent transportation and many more work in tandem to drive convenience, safety and efficiency for citizens.

The concept of ITMS fundamentally relies on Smart infrastructure that provides data from systems such as Connected and sustainable multi-modal transport, automatic traffic signals, automated fare collection, vehicle location tracking, automated toll collection etc. Data coming from these base systems and captured by multiple agencies (like transport operators, emergency service operators, traffic/weather data collecting agencies, municipalities etc.) is integrated to reach out to all relevant stakeholders in the city. Data must be allowed to be shared between multiple agencies to take efficient decisions. Regulations play an important role here for standardization of this data interface with the agencies.

In conjunction with standardization, a Platform based approach is instrumented to ensure interoperability and future expansion of systems. Once this integrated data is available from various sources and standardized, smart solutions can be built based on intelligence derived through analytics and automated monitoring for citizen convenience, safety and efficiency.

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\(^2\) Embarq smart transportation city reports
\(^3\) http://www.theguardian.com/world/2015/may/26/india-reduce-road-death-penalties-high-rate-accidents
3.3 KPIT’s Intelligent Transportation Management Solutions

3.3.1 Intelligent Transportation Systems

3.3.1.1 Current Challenges

Current urban bus occupancy in various Indian STUs is <55% and is reducing year on year. This can be attributed to many of the challenges faced by passengers like unavailability of buses on schedule, long waiting time, lack of safety & security measures etc. Decreasing bus ridership is leading to significant economic losses. These losses are further aggravated due to operational inefficiencies.

There is a need for a solution that essentially integrates technology with the public bus transport system. Such a system would streamline the STUs operations as well as make public transportation more convenient for commuters by providing them with data points to plan their travel. KPIT’s ITS addresses the above concerns by enabling innovative technology in buses thereby helping India to achieve world class urban transportation.

3.3.1.2 KPIT’s Solution

KPIT’s solution is an integrated hardware and software wireless system designed to track and monitor Buses. The solution consists of a holistic, on-bus intelligent transportation system (OBITS) fitted on buses and Cloud-based ITS server side applications. The solution enables an on-line / off-line tracking of vehicles and stores, represents and displays vehicle related data which is then transmitted via GPS to the integrated command centre application for monitoring and analysis.


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4 http://embarqindiahub.org/online-publications/11-recent-trends-urban-bus-transport-india
3.3.1.3 **Benefits:**

**For the STUs:** The solution supports STU’s in improving vehicle safety & operational efficiency as explained below.

- **Operations Efficiency:** The ITS systems empowers transport operators to track and monitor the bus operations in real-time. This enables them to take timely decisions supported by analytics resulting in better fleet tracking & schedule management. Overall, the operational efficiency of the STUs thereby improved.  
  *For e.g. If a bus breaks down on the road, operators are alerted and incident management process is initiated immediately resulting in a new vehicle deployed to complete the trip.*

- **Increase in Ridership:** The ITS systems improves travel experience of the commuters due to real-time passenger information availability and enhanced safety measures. This in-turn leads to increased ridership for the STUs.

**End-users –** The solution enhances the overall commuters’ travel experience. This leads to encouraging more & more people to adopt public transportation, thus influencing the mobility demand.

- **Passenger Convenience:** Relevant information is available to passengers for planning their trip. (Accurate Passenger Information System, Smart Phone Integration, Mobile Application for Travel & Route Planning Integrated eTicketing system)  
  *For e.g. Multimodal Passenger Apps*

- **Safety & Security:** Vehicle health parameters and driver behaviour are monitored remotely. The driver can then be communicated appropriately or training needs can be identified to enforce good driving practices. This will ensure safety of vehicle and passengers.

3.3.1.4 **KPIT Credentials:**

1. **4000+ ITS installations** – KPIT is the Largest Transportation Technology company to provide Device + System Integration + Backend IT operations + On Ground Support
2. **19 City and States using KPIT’s UBS-II ITS** – Major users being CSTC (Kolkata), APSRTC (Hyderabad), PTC (Puduchery), NMMT (New Mumbai), TMT (Thane), SMT (Solapur), HRTC (Himachal Pradesh), KSRTC (Kerala), ASTC (Assam), MBMT (Mira-Bayander), KDMT (Goa)
3. **Largest Market player**: KPIT is the largest player for supplying UBS-II ITS systems with more than 90% market share for more than 1 year now.

4. **National Level ITS Architecture & Standardization** – KPIT has contributed in making recommendations and defining the National level ITS architecture & standardization guidelines to institutes like BIS & ASRTU

5. **Service Network**: KPIT provides 3 years of on ground support to STUs that implemented UBS-II ITS across the country

6. **Pan India Emergency response implementation for the National Highways Authority of India (NHAI)** including patrol vans, ambulances and toll trucks.

### 3.3.2 Emergency Response System

#### 3.3.2.1 Current Challenges

Accident Victim Survival rate in Indian cities is around 6% -10% compared to world’s best survival rate of 45% in USA\(^5\). This is due to long response time involved in the current scenario where the present medical & emergency system works on getting calls from patients, victims for help and then sending the Police, Ambulance or the Fire Brigade accordingly. There is a lack of real-time communication with the relevant agencies involved. This highlights the need for an emergency response system implemented in Indian cities. Emergency response plays a critical role in emergencies like accidents, bus breakdowns etc. Faster emergency response ensures higher survival rate and quick congestion resolution to restore normal traffic conditions.

![Emergency Response System](image1)

**700+ Emergency Response Vehicles** including Ambulances, Tow Trucks, and Police Patrol Vans monitored.

**Hon’ble Cabinet Minister Shri. Nitin Gadkari**, Road Transport, Highways and Shipping at KPIT, viewing the demo of Emergency Response System

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\(^5\) [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2822187/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2822187/)
3.3.2.2 **KPIT’s Solution**

KPIT’s solution consists of a system with panic switches and cameras on vehicles. In case of emergencies, information can be transferred to a command center in the form of an alert. Camera images can also be streamed in real-time to the command center in order to gauge the current situation.

The Command center will be able to inform the depot manager about location of the vehicle as well as monitor the location of the closest emergency response vehicles (like Ambulance, Police & Fire Brigade). The command centre operator can also inform the nearest traffic police to facilitate green passage for the deployed emergency response vehicles helping them to reach the emergency spot in the shortest time possible.

3.3.2.3 **Benefits**

**Reduced Emergency Response Time**: On identifying an emergency on road, the nearest emergency vehicle can be deployed to provide road side assistance. Response actions are automatically handled rather than current manual actions, reducing the emergency response time. Faster response leads to quick support reaching to passengers.

**Road Congestion Prevention**: Quick incidence management leads to reduced traffic blockages on roads.

3.3.2.4 **KPIT Credentials**

**Emergency Response on Highways**: KPIT implemented a pan-India project for National Highways Authority of India (NHAI) for Quick Emergency Response on Highways.

3.3.3 **Passenger Information Systems**

3.3.3.1 **Current Challenges**

Many citizens find public transportation inconvenient because of lack of first and last mile connectivity. Planning a trip also becomes difficult due to the lack of real-time information. Providing real-time accurate information to passengers will help in making public transportation the preferred mode of citizen commute thereby improving overall ridership.

3.3.3.2 **KPIT’s Solution**

KPIT’s solution consists of Estimated Time of Arrival (ETA) algorithms that have been developed specifically for the Indian context. The solution is implemented in form of real time bus schedule displayed on LED/LCDs at bus stops/terminals and smart phone applications.
This solution provides passengers real-time bus location and expected time of arrivals and departures, helping them in dynamic decision making related to their travel plans.

### 3.3.3.3 Benefits:

**Passenger Convenience:** This app will ensure complete trip planning for passengers and also family members of passengers who are tracking the travel of their family members. Commuters will be able to have a delightful travel experience as they can plan their journey better with accurate PIS & interactive mobile application. This will in-turn help to increase the number of commuters, thus increasing the revenue generated by STUs.

### 3.3.3.4 KPIT Credentials

**Passenger App for Inter City buses:** KPIT is developing a passenger app for MSRTC for inter-city buses plying between Mumbai and Pune.

### 3.3.4 Traffic Monitoring and Control

#### 3.3.4.1 Current Challenges

India loses INR 60,000 Crore due to traffic congestion, (including fuel wastage), slow speed of freight vehicles and waiting time at toll plazas and checking points, a study on operational efficiencies of freight transportation by roads has claimed. It said vehicles crawl at an average speed of less than 20kmph on some key corridors such as Mumbai-Chennai, Delhi-Chennai and Delhi-Mumbai stretch. Such alarming numbers of economic losses due to traffic congestions pose a big

6 India loses Rs 60,000 crore due to traffic congestion: Study, Times of India
hassle for citizens and municipal authorities. Additionally, because of lack of green corridor planning, traffic departments in cities find it difficult to navigate traffic in emergencies.

3.3.4.2 KPIT’s Solution
This solution brings together a holistic Traffic Monitoring & Control system comprising of Traffic Prediction Algorithms, Vehicle Tracking Application, CCTV Surveillance Management System and a Traffic Management Mobile App for Public. The solution will be using historical as well as real-time traffic volume data for operating traffic signals and sign-boards dynamically. It will also track the traffic violators using Automatic number plate recognition using image processing algorithm.

3.3.4.3 Benefits:
Deployments of the solution will lead to the following benefits:

- **20% reduction in congestions** – By controlling the signal timing based on the traffic volume
- **40% reduction in stops for vehicles** – By providing more green signals to the vehicles to avoid congestion
- **12% reduction in fuel consumption** – By reducing the idle time at intersections waiting for the signal
- **7% reduction in emissions** - By reducing the idle time at intersections waiting for the signal

3.3.4.4 KPIT Credentials
The current solution is one the most widely deployed solution in many countries with reduced need for cabling. The solution has been deployed in 140+ countries and 24000+ intersections

3.3.5 Video Analytics supported Traffic Violation Detection
3.3.5.1 Current Challenges
Traffic congestions are a direct result on not just the number of vehicles, but also on how strictly the traffic rules are abided by. In cases of traffic violations, ensuring transparency of detection of violation and fines collection is essential to enforce traffic rules. Manual intervention is expensive and cannot be round the clock.
3.3.5.2 **KPIT’s Solution**

KPIT’s smart cameras and video analytics solutions provide automatic detection of violations, number plate recognition and other Advanced Driver Assist Systems (ADAS) to ensure law enforcement and safety of citizens.

![Figure 9. KPIT’s cameras and video analytics solutions supporting traffic violation detection](image)

3.3.5.3 **KPIT’s Credentials**

Multiple Patents files in the areas of ADAS & Video Analytics

3.3.6 **Driver Behavior & Vehicle Health Monitoring**

3.3.6.1 **Current Challenges**

India has 55 State Transport Undertakings (STUs) operating in various states which play a major role in providing short as well medium distance passenger mobility. Only 3 out of out of 55 state road transport undertakings (STUs) are making profit\(^7\). The remaining STUs are facing losses due to high operational cost and lack of adequate passenger safety measures.

The **UBS-II specifications have also made it mandatory for bus OEMs to open up over 90 vehicle parameters** related to Vehicle Engine, Transmission, and Safety system for monitoring and analytics. Monitoring of these parameters using KPIT’s remote vehicle health monitoring solution will help STUs bring down their overall maintenance costs and improve operational efficiencies.

Passenger safety is another major concern in public transportation considering the large fleet volume and the number of passengers it carries. The prominence on passenger safety grows manifold if a public transport system is involved in an accident because of the number of passengers the vehicle is carrying. In a recent study by Embarq, 55% of all road accidents are because of driver negligence\(^8\) making it imperative to monitor driver behavior. Resultantly, adequate corrective actions can be taken, in form of alerts, training in case of repeat offence etc. In various instances, it has been seen that driver training has also resulted in 75% improvement in fuel savings in various STUs.

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\(^7\) *Times of India, January 2013*

\(^8\) *EMBARQ India 2014*
3.3.6.2 **KPIT’s Solution**

The solution provides real time information on 200+ key performance parameters of Engine, Transmission & Electrical System to the integrated command centre for remote monitoring & diagnostics. This enables in better Maintenance Schedule Management thus reducing the maintenance costs of the STUs. In addition to this, the solution generates a Driver scorecard helping in reporting case of over speeding, harsh acceleration, harsh braking etc. This scorecard can be used by the management for driver training purposes and driver performance appraisals.

3.3.6.3 **Benefits:**

- **Enhanced Passenger Safety:** By monitoring driver parameters like over speeding, harsh acceleration and deceleration, operators at the command center can take corrective actions to prevent accidents
- **Lowered bus wear and tear:** By ensuring good driving habits, the wear and tear of bus parts like tires, clutch, brake pedals etc. can be reduced. Spare parts contribute to 60% of operational costs for STUs
- **Reduced Bus Breakdowns:** By monitoring bus parameters, it is possible to predict component failure and provide preventive maintenance.

3.3.7 **Electrification of Public Transport (Electric & Hybrid Solutions)**

3.3.7.1 **Current Challenges**

India is ranked 3rd in terms of CO₂ emissions contributing to 5.7% of the world’s emissions\(^9\). Transport emissions contribute more than 50% of the total emissions in India\(^10\). Such trends are having a direct impact on the quality of life and urban productivity. The recent WHO report revealed that apart from Delhi which is the reigning king of polluted cities in the world, there are 12 other cities in India that rank amongst the top 20 polluted cities in the world\(^11\). Such alarming trends make it imperative to **create and implement hybrid solutions that bridge the transition from a fossil fuel era to a world of electric mobility.**

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\(^9\) [CO₂ emissions report](#)
\(^10\) Report released by The Energy and Resource Institute (TERI)
\(^11\) [WHO report](#)
In order to enable this transition, the National Electric Mobility Mission Plan (NEMMP) 2020 aims at promotion of hybrid and electric mobility in India ensuring a vehicle population of about 6-7 million electric/hybrid vehicles in India by the year 2020\textsuperscript{12}. A study by the Indian Institute of Science (IISc) evaluating electric vehicles for urban transport shows that Electric buses generate 27% more revenue and 82% more profits than diesel buses per day. This is because the maintenance and variable costs of an electric bus are lower than its diesel cousin and its energy efficiency is higher.

The scale up plan by NEMMP through a combination of policies will play a significant role in encouraging electric & hybrid solutions, not only for new vehicles but also would cover existing on-road polluting vehicles. Technology solutions comprising of retro-fitment of on-road vehicles with electric and hybrid kit would be a key component in mapping the success criteria for this mission. Also, the solution covering the existing on-road as well as new vehicles will contribute to the green initiative comprehensively. Technologies and standards that are built around Indian needs will allow deep, sustained penetration of electric vehicles in the Indian market.

We at KPIT Technologies are fundamentally committed to making a better world through technology, and have been engaged with India’s National Electric Mobility Mission since its early days. We find ourselves well ahead of the curve with respect to electric mobility in India and already have solutions lined up to help customers leverage FAME India. These include OEM and retrofit hybridization solutions, a wide variety of cars and UVs, all the way up to full-sized buses. We are also in a position to share data that is so critical to the assessment and prioritization of these technologies.

3.3.7.2 KPIT’s Solution

KPIT’s Pure Electric & Electric Hybrid solutions can be retrofitted on multiple types of vehicles like buses, taxis/LCVs to not just reduce emissions, but also help in reducing fuel consumption significantly.

3.3.7.3 Benefits:

- **Improved Profitability for STUs**: Fuel costs account for almost ~35% of the overall operating costs for a Transport Undertaking. With KPIT’s Revolo, the existing on-road buses can be converted to hybrid and electric buses by replacing the bus powertrain, reducing fuel costs.

- **Reduced Emissions**: Electric and Hybrid vehicles are less polluting than petrol or diesel vehicles. Apart from reducing outdoor air pollution—which kills 670,000 people in India every year, according to the Indian Institute of Management, Ahmedabad paper—a clean transport system will aid national carbon-reduction targets.

\textsuperscript{12} Department of heavy industry, National Electric mobility mission plan
• **Better experience:** The passenger will have a much better journey in an electric bus as it is almost noiseless and vibrations free. Features like intelligent transportation system, air condition, Wi-Fi infotainment etc. will also ensure convenience and comfort.

### 3.3.7.4 KPIT Credentials:

- In December 2015, Hon’ble Prime Minister of India flagged-off KPIT’s Smart Electric Bus at the Indian Parliament. Two of these Smart Electric Buses will be used by the Members of Parliament in Delhi for the daily commute to the Parliament.
- KPIT’s electric and hybrid solution for vehicles has been developed indigenously with more than 20+ patents to its credit.
- KPIT’s hybrid electric solution for buses are being piloted with MSRTC (Maharashtra), NMMT (Navi Mumbai) and BMTC (Bangalore).
- 15 buses sanctioned for hybrid electric conversion for MSRTC and ASRTU under FAME India Scheme.
- Significantly cheaper than new hybrid or electric bus. Cost delta of 1.5 Cr – 2 Cr compared to other solutions in the market.
- Funding for KPIT’s electric & hybrid solution available through Union government’s Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME) – India Scheme\(^\text{13}\)

KPIT has won various awards for its impact on fuel efficiency enhancement and emission reduction including the Promising Innovation of the Year Award 2010-11 by NASSCOM, the Wall Street Journal Technology Innovation Award 2011, the Best Implemented Sustainability Innovation of the Year 2011 by Knowledge@Wharton, Maharashtra State IT R&D Innovation Award 2010, the ‘Automotive Idea of the Year’ at The Economic Times Zigwheels Car & Bike Award 2010 and the ‘Technology Innovation of the Year (2015) Award’ from IATIA for ‘conversion technology’ for bus electric hybrid solution.

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\(^\text{13}\) FAME India scheme, Jagranjosh
4 Citizen Connect & Safety

4.1 Current Challenges

As per National Crime Records Bureau of India report on mega cities which includes the top 53 cities with population more than 1 million, the average rate of crime in urban agglomeration centers is 345.9 (Crime Incidence per lakh population). This is 60% higher than the national average crime rate of 215.5 (Crime Incidence per lakh population)\(^\text{14}\). These 53 cities have accounted for 41.1% of the total auto theft cases in the country, 28.0% of total cheating cases and 29.4% of total counterfeiting cases.

Moreover, Mega-cities like Delhi, Mumbai, Bengaluru and Kolkata together account for almost 30% of the total crimes reported from the 53 mega-cities. Lack of Integrated data intelligence from multiple public sources, delay in availability of emergency help during accidents or crimes and lack of city monitoring for public safety are some of the challenges that have made public safety one of the most sensitive agendas for the government. Public safety & security which forms the key pillar for quality of life in cities requires urgent attention in the Smart Cities Mission.\(^\text{15}\)

4.2 The Way Forward

An integrated approach in this domain would be desirable to ensure public safety and response management to the citizens. This integrated approach would require inclusion of open source technology enabling interoperability between different technology standards and solutions. This would enable building safety related solutions that are customizable as well as sustainable of future expansions. Also, there is a need for inclusion of standard operating procedures (SOPs) in the ecosystem, such that together, these elements can establish the capability of seamless communication between multiple agencies. Such seamlessly interconnected agencies will enable efficient city surveillance and incident detection & analysis with centralized command centers by multiple agencies in the ecosystem. This will help in achieving the mission of improved safety & security for better quality of life of the citizens.

4.3 KPIT Solutions

4.3.1 City Surveillance & Integrated Command center

4.3.1.1 KPIT’s Solution

KPIT intends to address safety related challenges through innovative technology solutions for establishing city surveillance. The solution consists of an Integrated Command centre with real-time vehicle monitoring dashboards. Real-time monitoring dashboards provide actionable views into the daily operations of a city and its citizens. This will enable decision makers and involved stakeholders to monitor public areas, analyse patterns, track incidents and suspects thereby enabling quicker response.

\(^{14}\) Economic Times, How to transform public safety in India, July 27 2015

\(^{15}\) WRI report
4.3.1.2 Benefits:
Deploys of the solution would lead to the following benefits:

- **Centralized command center** using seamless multi-source data integration
- **Response module enabling emergency alerts** through integrated multi-agency collaboration
- **Camera based citizen monitoring** algorithm for event detection

4.3.2 Smart Campus; Citizen Connect & Participation

As India gears towards making the 100 smart cities mission a reality, there is an urgent need to prioritize the needs of individual cities and form a development plan for the same. Although there are various model smart cities around the world, India will have to shape its own unique smart cities, considering its strengths and weaknesses. As the need of smart and connected communities in India has been identified as part of the Smart Cities Mission, cities need to implement the technologies providing access to its citizens over an interrelated information/public Wi-Fi network at affordable costs. Such technologies with intelligent networks could enable digitally empowered citizens through the availability of government services in real time, online and on mobile platforms.¹⁶

KPIT solutions addresses the challenges of Lack of digitization and citizen participation through its **Contexual & Location based technologies for efficient city-level governance**. These solutions

¹⁶ Money Control
are custom built point apps to perform tasks based on location and context feeds. They can also be integrate based on use cases to calibrate functionalities.

4.3.3 Benefits:
Deployments of the solution will lead to the following benefits:

- **Location-based campus navigation solutions for digital, connected & smart campuses.**
- **Grievance management system (GMS) using QR code based Scan & Post** smart solutions
- **Location/Context based - Real-time reporting solution to address maintenance** issues for public places
- **Citizen sentiment & feedback solutions** for monitoring citizen sentiment and participation. These real-time insights can empower decision makers and stakeholders with the latest information they need to drive current and future strategies.

4.3.4 Credentials
- 5+ years of experience in E-Governance
- Engagements with 8+ customers across automotive, banking, government institutes
- Dedicated team of engineers working on E-Governance solutions / offerings
- Platform based approach, reduced development time (up to 50%)
5 E-Governance

5.1.1.1 KPIT’s Solution
KPIT’s smart governance solutions and capabilities aim at strengthening Citizen Participation in local governance for efficient administration.

KPIT has readily available solutions such as web portal, m-governance, social analytics, citizen connect apps, grievance management apps and solutions pertaining to city operations. For instance, Social analytics: Social communities are increasingly influencing the citizen’s decision. With KSNAP, local governance bodies can –

- Get social sentiment and reach data
- Optimize awareness of various schemes
- Monitor complaints and comments
- Compare the trends
Figure 17 With KSNA, local governance bodies can get social sentiment with reach data helping them monitor real-time trends & social analytics.

Figure 18 Mobile internet banking app

Hybrid mobility application for NetBanc will enable mobile banking for Bank customers. Mobile application will support Android, iOS and Windows operating systems

Features:
- Accounts Information
- Beneficiary View
- Funds Transfer
- User Profile
- Enquiries
- Requests
- Bill Pay Online
6 Smart Utilities
A key tenet of a smart city and better living is uninterrupted power supply. Integration of energy sources and accurate billing will lead to satisfied end-consumers as well as increased revenue generation for utility companies.

6.1 Current Challenges
India is the fifth largest producer and consumer of electricity in the world with the demand expected to increase from 900 billion kilowatt-hours (kWh) to 1,400 billion kWh by March 2017\textsuperscript{17}. Yet, it continues to remain in a state of perennial energy shortage. One of the major contributors to these shortages is the Aggregate Technical and Commercial (AT&C) losses. For e.g. in 2013, the total AT&C losses were approximately 27% of the total power generation\textsuperscript{18}.

The current challenges can be well addressed through newer and smarter technologies such as ‘Smart Grid’, Smart Building solutions and Advanced Metering Infrastructure (AMI). In order to implement these smart technologies, one of the key components is accurate billing information from energy meters. Currently, these meter readings are procured manually and this method is inefficient, prone to errors. Automatic meter reading solutions provide real-time meter readings to the utility companies, without any human intervention forming the basis of a smart grid.

6.2 Automatic Meter Reading (AMR):
6.2.1 KPIT’s Solution
Energy and Utility companies are moving towards Smart meters and Automatic Meter Reading (AMR) solutions. Major components of our solution are Radio Frequency (RF) Module, Gateway, Data Concentrator Unit (DCU) and Meter Data Management System (MDMS) on Server.

The DCU acquires meter readings from RF enabled smart meters and communicates this information to the server on real-time basis. The MDMS stores the data received from DCU’s to make data available to the billing system as required. Availability of real-time data can help utility companies conduct predictive analysis to manage their energy requirements optimally.

KPIT’s end-to-end solution for enabling AMR infrastructure has the below features:

- Integrate ‘end-to-end’ smart energy solution with hardware and software
- Technologies like low power radio frequency (LPRF) and GPRS technologies enable retrofit solutions for existing meters. This provides a cost-effective solution with a potential to reduce deployment costs by up to 80%.
- Robust technology that ensures consumers’ privacy and data security.

\textsuperscript{17} PTLSolar, 2014
\textsuperscript{18} AT&C loss levels in various discoms remain higher in FY13: ICRA, Economic Times, August 2015
6.2.2 **AMR Benefits:**
Deployments of the solution will lead to the following benefits:

**TO CITIZENS**
- **Accurate billing** information
- Provides the user options to **configure the power usage**
- Provides a **web based user interface** for metering data, and real-time demand visibility
- Generates **customized reports**
- **Improved overall efficiency**, reliability & delivery of services

**TO ADMINISTRATIVE BODIES**
- Helps **minimize losses**
- Facilitates ERP based architecture for central remote diagnostic facilities
- Accurate **detection of tamper/ pilferage** for the meters
- Helps understand the energy **usage patterns**
- Provides configuration of Prepaid meters also with **differential rate management** if required.
- Upgrade software **remotely** to deploy additional functionality as needed

Smart cities mission requires End to end smart utilities solutions with configurable hardware and upgradable software to match the needs of both the citizens and government bodies.

6.2.3 **KPIT Credentials**
Currently running Phase 1 implementation for automated meter reading (AMR) initiative with Maharashtra State Electricity Distribution Company Limited (MSEDCL).
7 About KPIT Technologies

Headquartered in India, KPIT is a Global Technology Company focused on providing Technology Solutions and System Integration expertise to Automotive & Transportation Companies/Operators, Government bodies, Energy & Utility companies and City authorities. With revenues of over INR 3,000 Crores, KPIT has been recognized as one of the fastest growing companies by leading analysts and consulting companies. Providing Engineering & Software expertise to marque global customers over two decades, KPIT has developed robust, Indigenous solutions to make Indian cities cleaner, safer & smarter and operations of city/transport/utility authorities more efficient.

Our strategic thought leadership takes pride of its deep rooted understanding of the Indian context and its socio-economic-technological requirements. KPIT has been an accomplished Global partner with its learnings localized to Indian context, to numerous Indian Central/state level government engagements.

Talking of our mission-‘Technologies for a better world’, KPIT strives to improve the world through the work we do, in partnership with the customers we serve and the suppliers with whom we collaborate.
7.1 Our Alliances, Patents & Research
Leveraging our technology and domain expertise, we partner with customers to co-create transformational value that provides sustainable competitive advantage to their businesses. **KPIT’s 60+ Patents**, majorly in the areas of Hybrid Technology (16), BMS (3), Alternate Fuel technology (2) including others for fields of Embedded, VLSI, Energy are a mark of the spirit of innovation.

Every year, approximately **6% of the company revenues are invested in R&D**, providing cutting edge technology to our customers. The DNA for Innovation, the passion to deliver excellence and strong customer focus are drivers of growth at KPIT that make us clearly stand out against competition. KPIT R&D center called ‘Center for Research in Engineering Sciences and Technology (CREST)’ is approved by Department of Scientific and Industrial Research (DSIR) and Department of Science and Technology (DST) as a recognized R&D center.

Analysts & Industry Bodies have recognized **KPIT amongst the leading Global organizations for our niche capabilities & industry leading efforts**. KPIT has earned a spot on the ‘Best under a Billion list’ in Forbes Asia (July-August 2014 issue). Roland Berger Consultants recognized KPIT as a Leading player in Embedded Electronics and Engineering Services in the ecosystem. Zinnov recognized KPIT as an ‘Established Leader & Niche Provider’ for Engineering Services and ‘Established Leader’ for Automotive.

7.2 Industry Consortiums & Standardization
With a vision to integrate smart technologies in an integrated approach, KPIT has established **relevant partnerships within Industry ecosystem to deliver a holistic solution**.

**Global Alliances and Certifications**

"KPIT is the 1st company in India to achieve SPICE Level 3 (Nov -2004), and amongst the top 2 companies in the world to achieve Auto SPICE Level 5 (Dec-2007)."
We are a recognized member of various Industry consortiums including the Technology Advisory Group on Electric mobility (TAG-EM). We have been acclaimed for its efforts and contribution to TED 28, a committee under BIS for Intelligent Transport Systems (ITS) Standardization.

KPIT is also an active member of FICCI’s Urban Infrastructure & Smart City Committee on Smart Cities. This Committee has key objectives to work with the Government to create an enabling framework for the private sector to partner with Government bodies in developing the Smart Cities. It also acts as an advisory body to the Government about policies and contracts that need to be formulated for various areas in accomplishing the objectives of developing smart cities. It performs a key role in conducting activities that bring states and center together to ideate and review the progress of the states.

KPIT’s Intelligent Transportation System received a special mention at ‘The European IDTechEx Energy Harvesting and IoT Awards’, 2015.

19 TAG is a nodal body formed under joint supervision of Department of Heavy Industry and Department of Science and Technology
8 Summary

KPIT is a Global Technology Company with a deep rooted understanding of the public policy making bodies associated with the Smart Cities mission in India. We have relevant partnerships within Industry ecosystem to deliver holistic solutions. It has key focus on providing Technology Solutions and System Integration expertise to Automotive & Transportation Companies/Operators, Government bodies, Energy & Utility companies and City authorities.

We have made deep investments and are prepared with ready solutions as per elements described in the Smart City framework by the MouD. We find ourselves well ahead of the curve with respect to Transportation and mobility solutions in India. Backed by expertise of domain specialists across diverse service areas, KPIT offers a wide range of systems integration solutions, technology implementation and consulting services aligned to the Smart Cities Mission. Having developed the understanding of complex technologies and framework required, we can help cities analyze, plan and roll out pilots customized in according to City level prioritization of citizens’ requirements.

We can act as the enabler to provide integrated framework & platform based future proof approach required for smart city planning. We have the required expertise to help cities with benchmarking, project nucleation and proposal evaluation. Also, we help define metrics for success measurability and strict adherence policies for Operations & Maintenance (O&M) post implementation.

Keeping up with Global standards of delivery, quality and standardization, we are focused to build technologies that can enable sustainability, smart solutions to become a part of the Smart Cities Mission.