

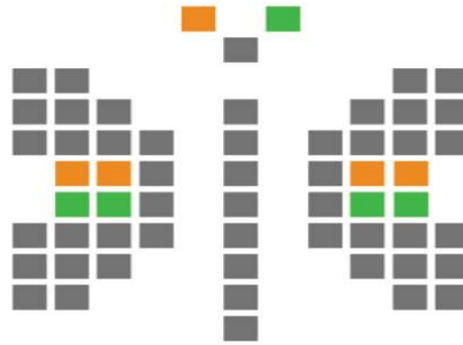


CCS PROJECT (Term IV)

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Smart City
MISSION TRANSFORM-NATION

A study on the usage of ICT for
the Smart City Mission, India

Acknowledgement

We would like to thank Prof Rahul De, Chairperson, Centre for Software & IT Management, Indian Institute of Management Bangalore, for guiding us not just with the content of our report but also for linking us with key stakeholders in the Smart City Mission which enabled us to gain key insights for our study.

We express our special thanks to Mr. Arvind Tiwary, Founder & CEO of SangEnnovate and Chair of IoT forum at TiE (Bangalore Area), Mr. Puneet Kishor, who is an independent consultant in the data management space, and Mr. Ravichandar V, Founder of Feedback Consulting and a key contributor to the Chennai Smart City Special Purpose Vehicle management for providing us with a lot of information which are not easily available in the public domain and also for enlightening us with newer perspectives on the whole Smart City mission of India.

Smart City
MISSION TRANSFORM-NATION

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Introduction:

The Smart Cities Mission is an urban renewal and retrofitting program by the Government of India with a mission to develop 100 cities all over the country making them citizen friendly and sustainable. The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities as per Wikipedia ¹.

Looking at the Request for Proposals of individual cities submitted by various cities to the Ministry of Urban Development², it is found that water, energy, and transportation is a huge problem for smart cities. Most of the proposals dealt with improving issues related to the above sectors. For example, the transportation sector had a multitude of issues such as reducing traffic jams, providing a safe and secure environment for transportation, improving the safety of pedestrians, constructing all amenities essential towards the overall improvement of the transportation scene. Due to the Indian Government's push of the Smart City mission, the efficient redressal of all issues would significantly improve public quality of life, and make the city more sustainable. We have identified two major problems about the transportation sector, which if sufficiently addressed, will be a game changer for the transportation sector.

Of late, Information and Communication Technology (ICT) has been playing a huge role in formulating intelligent solutions. The arrival of Internet of Things (IoT) has only bolstered the usage of ICT and forced the government to seriously consider implementing ICT to achieve better and seamless integration between the various stakeholders of the smart city mission.

Along with ICT comes huge amounts of data, due to the vast number of connected devices today. Smart analytics, storage, and management of the data generated is of prime importance, as there are many potential privacy and security concerns associated with such vast amounts of data.

We will consider in detail the data management process and some of the concerns about data management. Also, we have held interviews with some key stakeholders, the details of which have been included in the Appendix.

¹ https://en.wikipedia.org/wiki/Smart_Cities_Mission

² <http://smartcities.gov.in/upload/uploadfiles/files/ChennaiAnnexures.pdf>

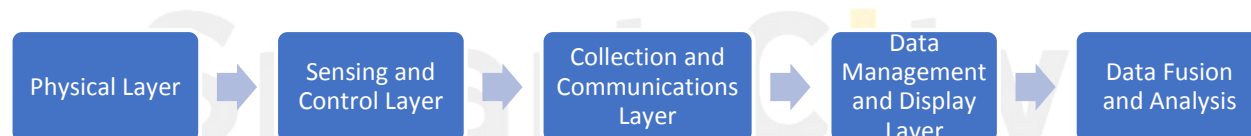
Water Category in Smart Cities:

The first and foremost objective of the smart cities mission in water category is to provide an adequate water supply to its citizens. With the use of ICT to enhance the livability, workability, and sustainability, smart cities have much potential to manage their water systems better.

Out of the 24 features used by the Ministry of Urban Development, to identify the smart cities, three were directly related to water, and another seven were indirectly related to it. This shows the importance of water in the smart city missions.

We can use ICT to create a Smart Water Network, one which helps the city to better anticipate and react to different types of water network issues, from detecting leaks, theft and water quality incidents to conserving energy and tracking domestic water consumption. Key focus areas include smart meter management, leakage identification, preventive maintenance and water quality modeling.

We need to ensure that the administration is kept up to date with real time information on the city water network, and act quickly should a problem arise. The basic crux of the water management scenario can be broken down into five layers as shown below ³.



Physical Layer involves the necessary components for delivering water such as valves, pipes, taps, pumps, etc. The **Sensing and Control Layer** has equipment and sensors that measure water related metrics such as flow, pressure, water quality, and storage levels. This data is transmitted and stored via the “**Collection and Communications Layer**” which includes cable, radio, cellular, and internet networks. The fourth layer, “**Data Management and Display**” aggregate data from the preceding three layers to create an interface with human operators through centralized

³ <https://www.swan-forum.com/resources/a-layered-view/>

processing systems, network visualization tools, and water balance applications. The final layer, “**Data Fusion and Analysis**” is where more sophisticated processing of raw data occurs. This may include, for example, real-time data analytics, hydraulic modeling, network infrastructure monitoring, or automatic pressure and energy optimization systems.

The management of water systems in Chennai is taken care by the **Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)**. It manages the drinking water supply via pipelines, water tankers and so on. It also manages the reservoirs and is responsible for providing round the clock supply of water to Chennai City. Also, it also takes care of the water waste management by treating the sewage and then disposing of it without any threat of pollution to the environment and water quality.

The first initiative in the smart city process is the **availability of 24/7 water supply**. This can be done by laying out the requisite infrastructure of pipelines and maintaining adequate water levels in all reservoirs.

The next step would be **Smart Water Meters** – which can measure the water quantity being used and can give each household/business an estimate of their water usage. Also, it can charge as per the water usage patterns. Along with **water level sensors**, the smart metering system, if implemented can generate huge data, which can be effectively analyzed to propose smart solutions for saving and minimizing water wastage.

Chennai has a water subsidy, which means that the government heavily subsidizes the costs of water supply and usage for households. **A Give Up Water Subsidy campaign**, like the lines of the Give up LPG subsidy can be carried out to generate more awareness among citizens.

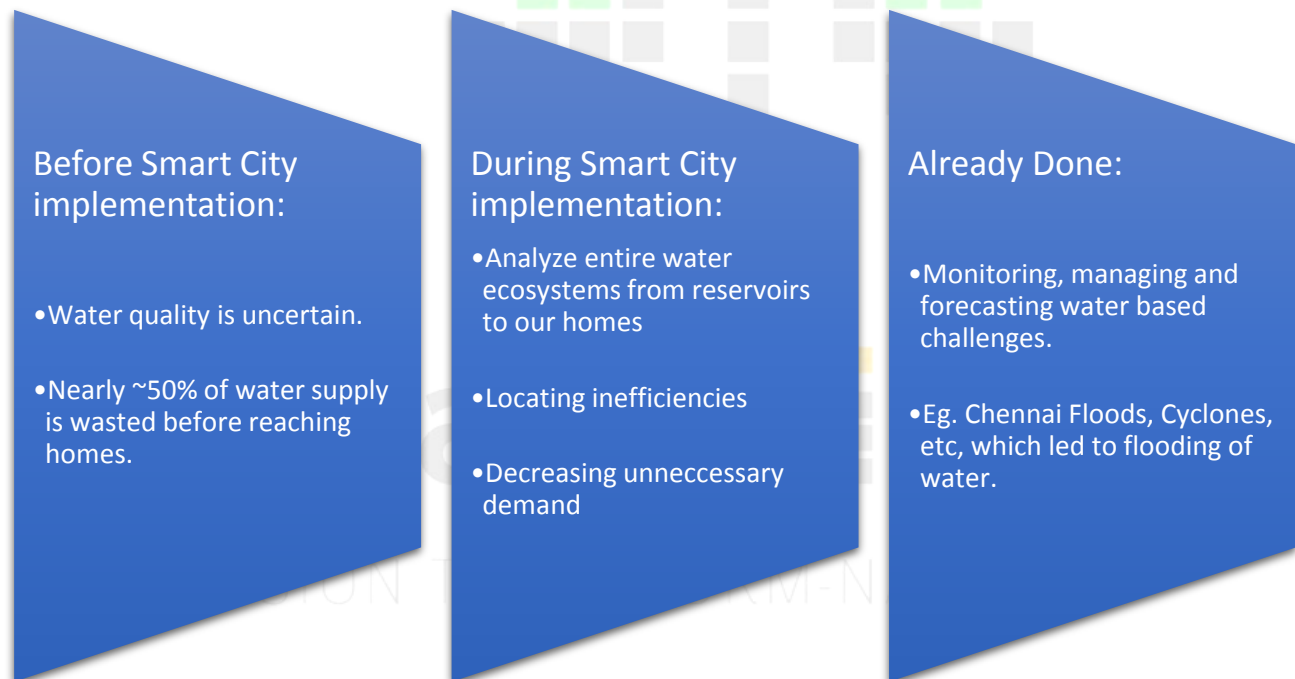
Water accounting at community level must be conducted to find the community level of usage and wastage, and by comparing with the benchmarks, one can easily target specific communities with relevant programs on water savings and waste water management. Also, **Smart Rainwater Harvesting** must be carried out, with smart meters being installed in the pits to measure how much efficient is the water accumulation.

The online system of water connections must be implemented, right from the process of applying for one to the billing stage monthly. This will be a step forward in e-governance and provide the government and the citizens easy and unique access to their water metrics.

Leakage identification and preventive maintenance can be carried out by the government agency after the due analyzing data and metrics provided by the smart water management system. It will be a huge step forward in reducing the % of water wastage at the source, which is around 40% of the total water supply at present.

Water quality monitoring must be carried out by installing water quality measurement sensors at vantage points in the city network of pipelines. Those sensors will send the water quality characteristics to the local engineers who then can act swiftly to resolve problems if any.

The process of improving the smart status of Chennai city regarding water sector:



Apart from water usage and supply management, disposal of sewage must be taken care of. This also needs technological intervention as part of the smart city project. As a beginning step, **waste water recycling** can be carried out by using highly specialized smart waste water treatment

plants. Only after treating the water, only it must be discharged out in the open. It must treat all its sewage to prevent polluting of water and aquifers.

Chennai being a coastal city is very prone to cyclones and flooding. This had caused innumerable damage to the city and its resources. With smart city water management, we can turn over the tide **by using the data points and critical analysis** from the smart water management system to **better plan drainage systems**. Storm water reuse must be taken up proactively as to tide over the drought in the summer season. This can be achieved efficiently with the use of ICT.

To sum up the initiatives for Chennai Smart City,

- We need to encourage the implementation of Smart Metering,
- a system where citizens can access the data and metrics,
- GPRS enabled payment collection system for easy mobility,
- volumetric based billing and online collection system,
- improve leak detection and reduction strategies,
- an automated system where it controls the flow of water and maintains supply round the clock,
- GIS based utility map,
- lay particular emphasis on intelligent rainwater harvesting,
- moreover, lastly, increase coverage of storm-water drain network in the city with the help of ICT tools.

Smart City
MISSION TRANSFORMATION

Energy Category in Smart Cities:

The energy segment is of importance in the smart city mission, as it is responsible for the smooth conduct of many other services, and related sectors. In a smart city, there must be a reliable, **24/7 electricity supply** with no delays in requested hookups. Also, a smart city, according to the guidelines issued by the government, must have at least **10% of its electricity generated by renewables**. A smart city must promote the state of art **energy efficiency practices** in buildings, street lights, and transit systems. We can use ICT to create an intelligent **energy management system** that will be useful in managing and controlling the city energy requirements, supply, and maintenance.

There is an energy grid which is the network of wires providing energy/electricity supply to the entire city. Now, this grid is not entirely perfect, as it misses some coverage as well. By feeding the grid data to the smart city system and by using appropriate tools to visualize the data, we can create a **smart grid**. This allows us to maintain operational efficiency at the lowest possible cost. Also, apart from the present system of installing meters at households, we will need to change them to **smart meters powered by IoT**, and install them at points of source and end, i.e., on the grid and households as well. This can help the management detect energy usage, monitor, and act on abnormal usages. Also, such a system can detect energy thefts as well.

Smart street lighting must be expeditiously done. Streetlights are known for being notoriously inefficient and an energy guzzler. Also, there is a need to replace the lights with energy efficient LED's. By using smart technology solutions, and IoT, we can make the street lights power on by itself according to the light levels outside, i.e., the ambient light levels, instead of relying on the local electricity company switching them on, at a particular time of the day. Also, it can **be solar powered** to save costs.

All overhead cables must be converted to underground based, and also be **RFID tagged** for easy identification and maintenance later on. RFID tags can help locate the underground cables without having to dig up the road. This will save on road and digging costs, and be smart and accurate as well.

In Chennai, an **advanced distribution management system with supervisory control and data acquisition** needs to be set up as part of the smart city initiative. This can be done by following the framework shown below.



Physical Layer would be the network of wires, junction boxes, transmission control lines, and so on. The **sensing and control layer** would consist of smart meters, and IoT connected streetlights/grids which in turn sends data to the **Collection and Communications layer**. The **data management and display layer** collates this information into data, and this data is analyzed and worked upon to give meaningful outcomes in the **Data Fusion and Analysis layer**.

Solar energy initiatives must be set up, by creating awareness, setting up solar farms, where the panels are intelligently controlled **by algorithms** to align themselves to the direction of the Sun, using panels in streetlights, and government offices and so on. The government can provide a subsidy to people willing to set up solar panels at their homes.

The government must look at renewable sources of energy, and harness its potential. **Energy-efficient and green buildings** must be encouraged and popularized.

At Chennai, online and **intelligent billing systems** must be set up. Currently, the process is manual, where the electricity company staff comes monthly to houses to check the meter usage and bill the customers. This leads to corruption and has scope for losses to the electricity company. This can be mitigated by using smart meters, who in turn, by using IoT technologies send the real-time consumption usage stats to the smart energy management system.

The system then is accessible by the consumer, who can check their usage history, billing, submit grievances, and so on. It is hoped that the smart energy management system can also minimize the losses by identifying pain points for the concerned authorities to act upon. **Quality management** also becomes easier due to this.

Transportation Category in Smart Cities:

The increased amount of technology does not mean a smarter city! Smart should be both the citizens and the public administration, which must build a genuine dialogue with people. A smart city is above all inclusive, meaning the ability and opportunity for everyone to be an active citizen. The perceived quality of life is dependent on family relationships and context. That is not included in most schemes, which consider only the quantifiable things.

Accident Prevention/Reduction

Tamil Nadu recorded 69,059 road accidents for the year 2016 which accounted for 14% of total road accidents for the whole nation. It is high time that the state and municipal government authorities deploy smart city solutions to address this issue. Below are some key areas which should be the focus.

Incentives for Smart Vehicles: Carmakers have been mandated to include safety features like airbags, Anti-lock Braking Systems (ABS) & Speed-warning systems before October 2018 which should have a profound effect on road accident fatalities. The Government should introduce incentives for automakers that are including new-safety features in their vehicles.

Vehicle-to-vehicle communication is a field that is being explored by auto majors. If successfully implemented it can improve road safety by leaps and bounds as vehicles can communicate to each other about their whereabouts and can overcome blind spot accidents.

Voice Recognition systems can also be leveraged for preventing accidents. Both Google and Apple have improved their voice recognition systems by a great deal, and since most of such systems are opened for integrating with other software, auto companies can leverage the same.

An incredible use-case could be even a person who does not know to drive, can issue commands to the system at critical juncture which could save human lives.

Road Condition Monitoring: A survey taken in 2014 shows that 85% of roads in Chennai failed to meet the Chennai Corporation Quality Standards. On March 2017, a prominent road in the City, the Anna Salai, caved in due to underground tunneling work.

Technology should be used to keep the rampant corruption in check as well as to detect certain faults on roads. An automated sensing system to capture anomalies on road surfaces was proposed which touches upon below steps

- Real-time road surface information is captured, and discrepancies such as potholes and enlarged speed-breakers are singled out.
- Mobile device applications are developed which will receive information on specific routes requested by road users.
- A GPS receiver mounted on a vehicle combined with an accelerometer to capture acceleration data during motion is collected during the transit of vehicle on specific routes, and the data are sent back to servers.
- A statistical analysis on captured data is done, and threshold violations are noted down and informed to the road users for precautions, and subsequently, road contractors are intimated to fix such issues.

Weather Updates + Connected Devices

- Chennai city roads are one of the worst roads to commute during the rains; it will be of immense help to individual drivers (2/4 wheelers) if they can get frequent weather updates so that they can make informed decisions and use public transport if necessary during patchy weather conditions
- A mile-by-mile weather assessment report and alternate route planning combined with driver advisory info are relayed to commuters in real time
- Live Data is also collected from sensors mounted on vehicles (at least Government vehicles to start with) and are relayed back to a Vehicle Data Translator to verify the authenticity and quality of data received.

Smart Mobility

Intelligent Transportation Systems (ITS) are portrayed as the brain of the smart city where citizens have started to value arriving in workplaces on time and safely of prime importance. Innovative

smart mobility solutions should become the focus for Chennai Corporation. Some use-cases are as follows:

Congestion predicting signaling system

Queue Learning Algorithm combined with congestion prediction and Markov decision process generates an intelligent signaling system which will solve the problem of congestion to a great extent

- Traffic light controllers are updated based on congestion predicted at real time at each road line instead of manual operation or by keeping it at a fixed time duration.
- An optimal signal duration is calculated using both present traffic conditions and by leveraging historical traffic conditions.
- This will deliver free flow of traffic 24*7 without involving costly and faulty human intervention methods.

Parking & Toll Booth Time Optimization

End-to-end parking digital solutions are provided to consumers through a mobile application so that users can save the time of not just for them but also for fellow commuters.

Automated Fare Collection feature integration on existing toll booths can ease the traffic congestion especially during long weekends

TapToPay Transport solutions has implemented the auto fare collection feature by leveraging on contactless payment solutions, and with the increasing penetration levels of contactless debit/credit cards (VISA/MasterCard) in the Indian market, this solution should be something that the State Government should target.

Public Transport Tracking + Occupancy Numbers

- A MyMTC App which has been crowd sourced has been developed to track real-time bus locations which also enables users to track nearest bus stops for the specified bus number
- At bus stops, a digital board has been installed by MTC (Madras Transport Corporation) which shows the arrival time of subsequent buses along with the destination

- The technology should be expanded to include the occupancy numbers of each bus, so that public will adapt to public transport if they are provided a comfortable commute experience
- One of the main reasons as to why public shuns public buses is that they believe all buses are crowded, this technology addition can change public perceptions

Implementation of an integrated smart traffic management system:

Mumbai, Delhi, Bangalore, Chennai – virtually every city in India is affected by traffic jams. As we have all experienced, traffic jams are a huge waste of money, time and energy. A 2015 study by IIT Madras showed that New Delhi, India's capital, loses about \$10 billion or about 60,000 crores annually due to traffic jams, and is estimated to balloon to over 98,000 crores by 2030. At Bangalore, India's IT capital each IT employee loses 470 hours per year due to the chronic traffic. The number of hours spent in peak hour traffic jams in 2017 is more than double as 2012 figures. This is a sad reality, and this is when IoT comes in.

Solving the Problem:

There is a huge scope for an integrated, comprehensive smart traffic management system, where all relevant points of interaction during daily commutes are made smarter with IoT sensors. For example, we have traffic lights, toll plazas, emergency vehicles, CCTV cameras, road sensors, parking place sensors, and lastly, traffic police booths as points of interaction.

By integrating all those with the help of a powerful IoT platform, we can use the immense data thus generated to perform deeper and constructive analytics to make the existing systems smarter than ever. Traffic lights turn green once the accompanying sensory network finds that there's more traffic than usual on the road.

It also automatically gets feedback from the traffic data at previous signals and upcoming signals to make a smart and informed decision. The same can be extended for emergency vehicles – so to provide free right of passage to them to respond faster. Toll plazas can save time by using IoT instead of the RFID tags used currently to enable faster payments and this easing traffic. CCTV

cameras can be used to find cases of speeding, and help in easing traffic by generating data to be fed into the traffic management system. Parking can be made automated with IoT.

There are endless possibilities in which IoT can make a positive impact to the traffic management scenario in Indian cities.

What's it for companies in the IoT – Transportation Sector?

For companies dealing with the IoT – Transportation Sector, this represents a huge marketing opportunity to establish the company's prowess in the IoT sector. With the strong network, the infrastructure is already set. Also, in this case, upon examining the smart city proposals submitted to the government, it was found that traffic management is a huge pain point for the smart city mission, and the government is more than willing to pay for an effective solution. If implemented, it would be for the first time in India with IoT based technologies.

To sum up, setting up an integrated smart traffic management system makes huge sense, as the company can easily capture the huge Indian market owing to its first mover advantage with its strong IoT platform offering.

Implementation of an integrated multimodal transport system:

Chennai has various modes of transport, ranging from cycles, two-wheelers, cars/taxis, local trains, metro, and of course the local buses. The city has well provisioned transport facilities, and scores high as compared to other cities in the transport availability index, which means that people have access to many forms of transport.

However, inspite of this, the transport scenario in the city faces a glaring issue – there is no proper integration of transport facilities, and hence no seamless integration. This leads to longer wait times for people wishing to avail of transport facilities.

For example, a person needs to go to his home from the workplace by two different transport modes – by the local train and then use the bus to his destination. However, there is a long wait time between the local train arrival at the station and the local bus arrival at the bus stop, leading to frustration of the people.

Internet of Things can be used to solve this problem. As we know, IoT devices/sensors can be installed in all public transport vehicles, and thus be used to track the arrival times at various stoppage points using GPS. This data can be fed to a centralized server, and then analyzed to arrive at optimized time schedules for public transport, so that the customer does not have to wait for long at the station/stop.

Many cities around the world have implemented this system and Singapore is a perfect example where everything is closely integrated and thus results in comfortable commutes for its citizens. Chennai is in urgent need of such a system as it would solve the traffic chaos and reduce waiting times immensely, and go in a long way towards making the city smarter.

Map Unity and its work in the Smart City Sector:

Need of the Hour - Single Tech Platform with a city specific focus

Even though the term 'Smart City' encompasses a very broad notion covering multiple domains, there could be innovations at a relatively small scale which could end up making the city smart. MapUnity - A social technology platform for all of India's smart cities is one such innovation which is making the right sounds. It has even tied up with Flipkart Maps which is viewed to give the e-commerce giant an edge in supply chain/logistics.

MapUnity aims to put all city specific information using its TechNagara product where general public are allowed to publish their views. Live Tweets, newsfeeds from Facebook, wikipedia write-ups about city-specific organizations like Municipal Corporation, Metro Rail Organization etc are uploaded on the landing page. Sector specific information spanning Tourism, Safety, Transport etc which are very specific to cities prove to be very useful to local citizens as well as tourists alike. Basically, MapUnity strives to create a constructive platform for channelising public discourse so that Government and private firms alike can design tailor made applications suited for the city and it has tasted initial success with the Bangalore Transport Information System (BTIS). BTIS provides the local citizens with bus routes, transport specific public offices even carpool searches etc which has proven to be beneficial for all key stakeholders like traffic police, local authorities, transport companies as they could respond real-time to city-specific issues and developments.

MapUnity intends to spread this initiative to the entire gamut of 126 cities identified by the Government of India as part of its Smart City Mission.

What makes this initiative stand out can be explained in a two-pronged approach. One - The reach of this platform can be huge and need not be restricted to the elitist which is what many other smart city innovations are focussed upon; Two - Citizens life can be improved only if local Government authorities who know the grass-root level problems are involved and MapUnity intends to do exactly this by including local municipal corporations, city transport systems etc

Startups & Smart Cities - A combo to look out for

The minefield of Smart City mission cannot just be realised with the advent of big technology firms. True, such big firms can be capable of producing cutting-edge technology which can solve bigger problems but the challenge is that most such firms go with a one-size fits all strategy.

This is where startups need to pitch in where in they start focussing on problems prevailing in their locality and slowly start expanding. Considering the plethora of opportunities available in the smart city space, Startups stand a chance to do well if they take a leaf out of MapUnity and deliver solutions keeping in mind the local conditions with the homegrown Government authorities kept in loop.

Governance Category in Smart Cities:

- Smart online municipal services can be set up to introduce a new level of efficiency and transparency
- M-governance by creating mobile apps for better engagement with the citizens.
- GIS maps for city departments performance.
- Integrated operation among various departments by a common data management system.
- Data analysis and insight creation.
- Data Management – risks, ways to manage, dark data and so on.
- Analysis of interviews from key stakeholders in the smart city sector.

Appendix:

Automated Meter Infrastructure and Smart Water Metering

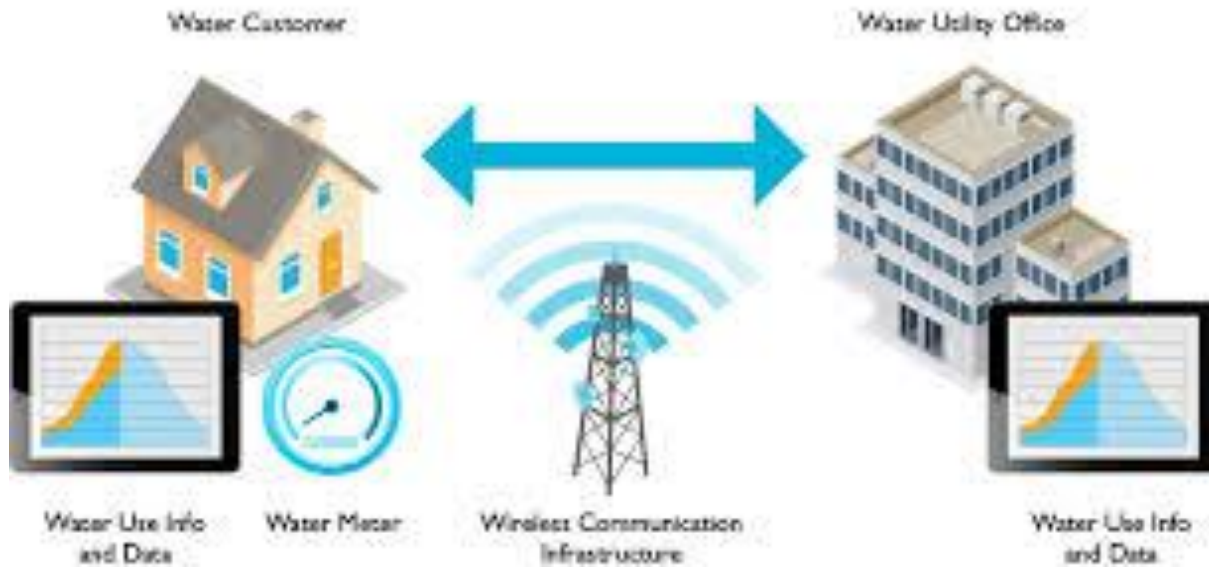


Figure 1: Implementation of Smart Water Metering

<https://www.metering.com/wp-content/uploads/2015/03/smart-meter-infrastructureLG.png>

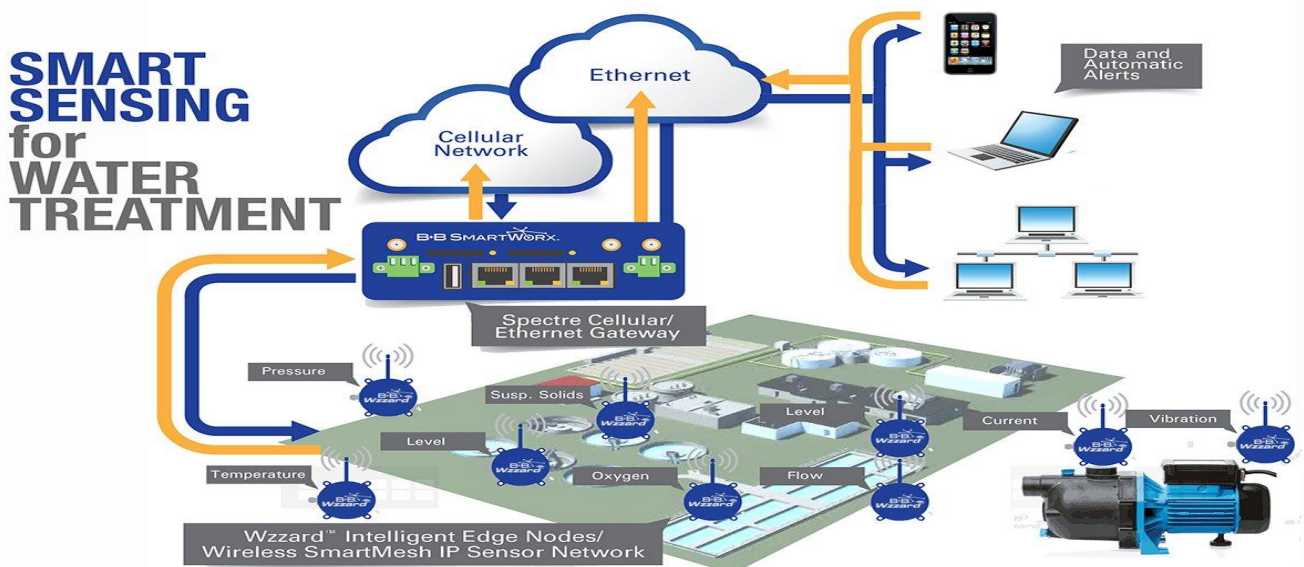


Figure 2: Smart Sensor System for Sewerage Treatment

<http://advantech-bb.com/wp-content/uploads/2015/06/smart-sensing-water-treatment.jpg>

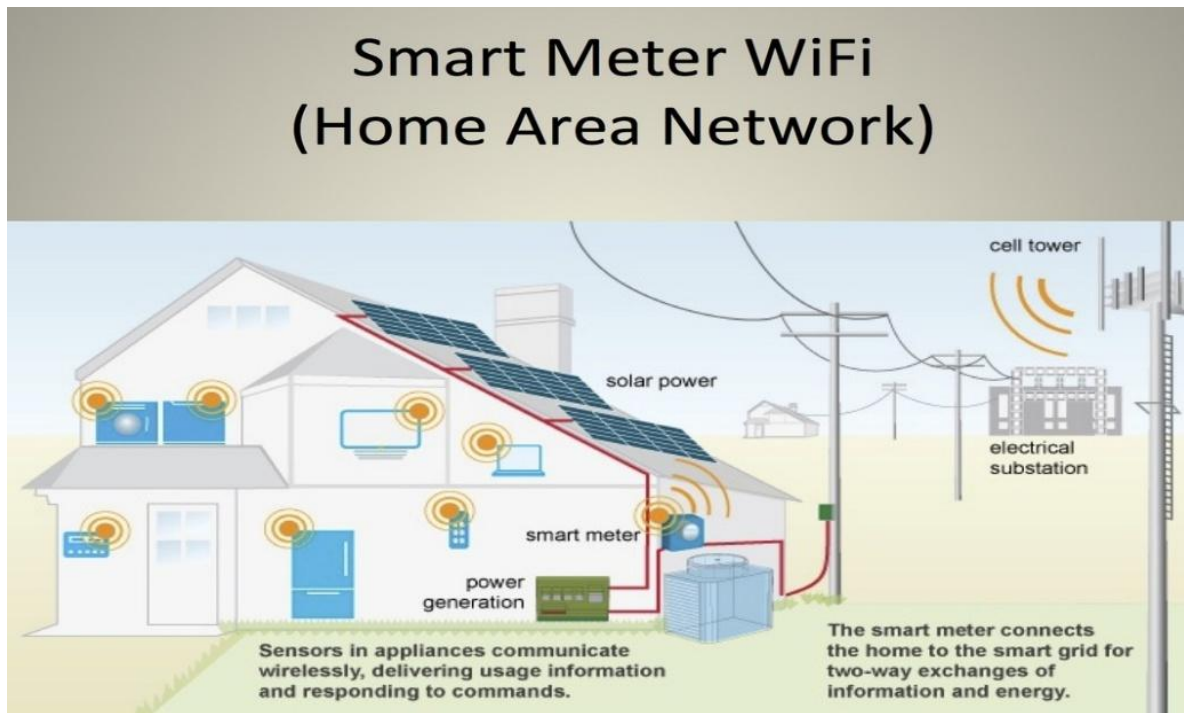


Figure 3: Smart Energy Management System

http://stopocsmartmeters.com/uploads/3/5/1/6/3516580/6373033_orig.jpg

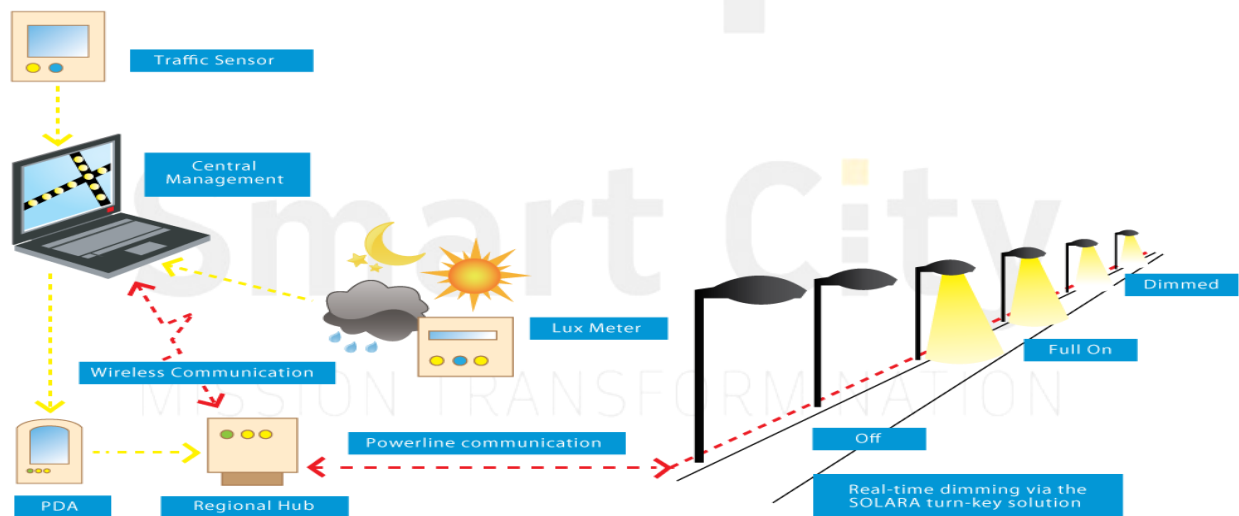


Figure 4: Smart Lighting System

<http://3.bp.blogspot.com/-5sSelmh70hM/VTGadGW5E7I/AAAAAAAAAdaw/8RcqlqfQpw/s1600/street-lights-05-image-1.png>

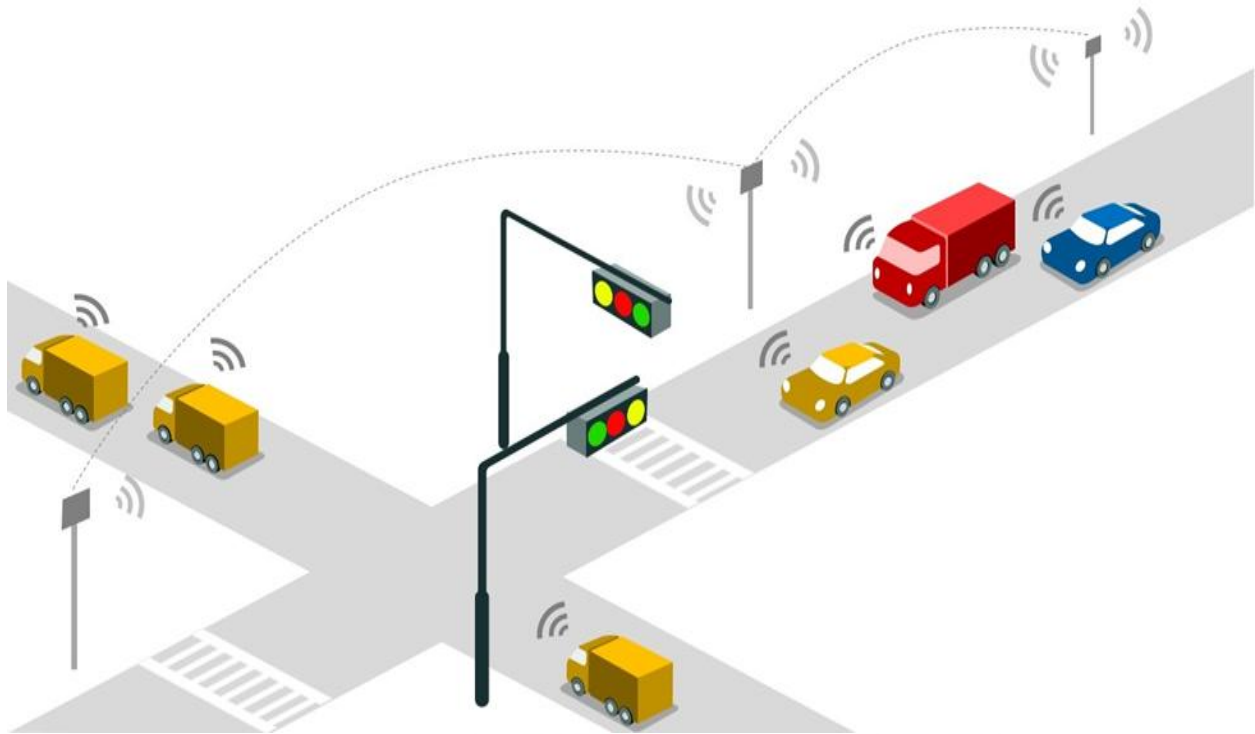


Figure 5: Integrated Traffic Management System

<https://www.linkedin.com/pulse/future-smart-cities-usa-bhagvan-komadi>

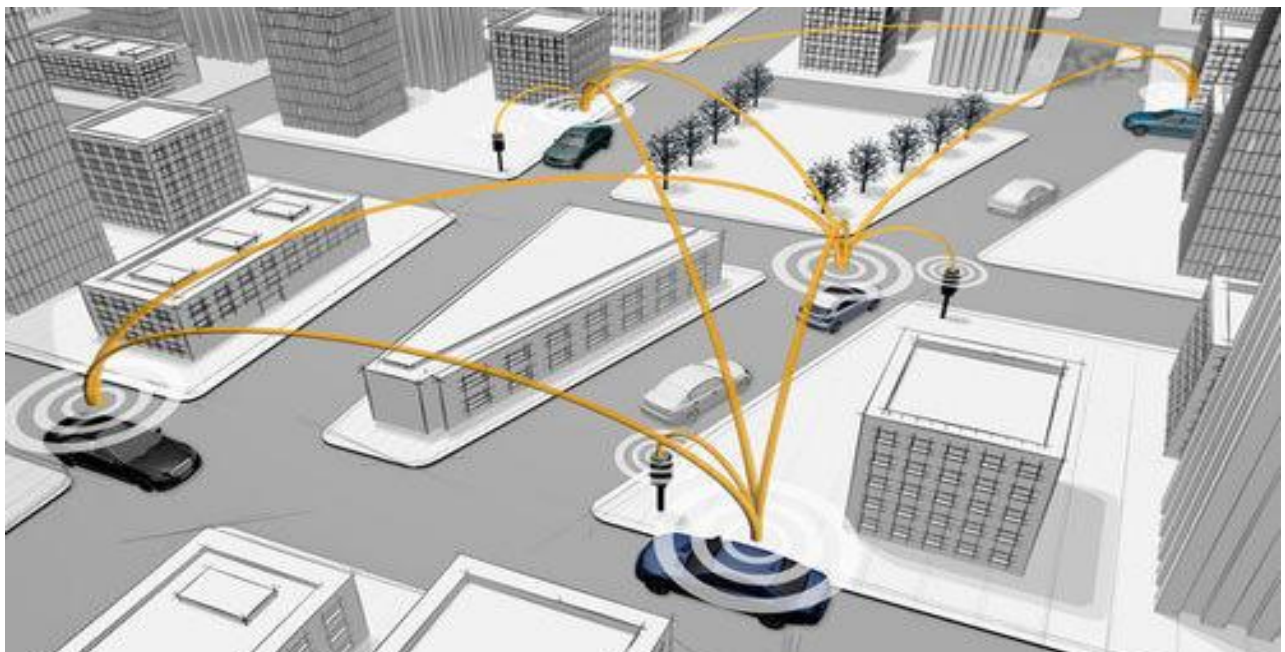


Figure 6: Vehicle to Vehicle Communication - <https://www.topspeed.com/cars/car-news/mercedes-brings-car-to-car-to-object-communication-to-the-us-for-testing-ar133484.html>

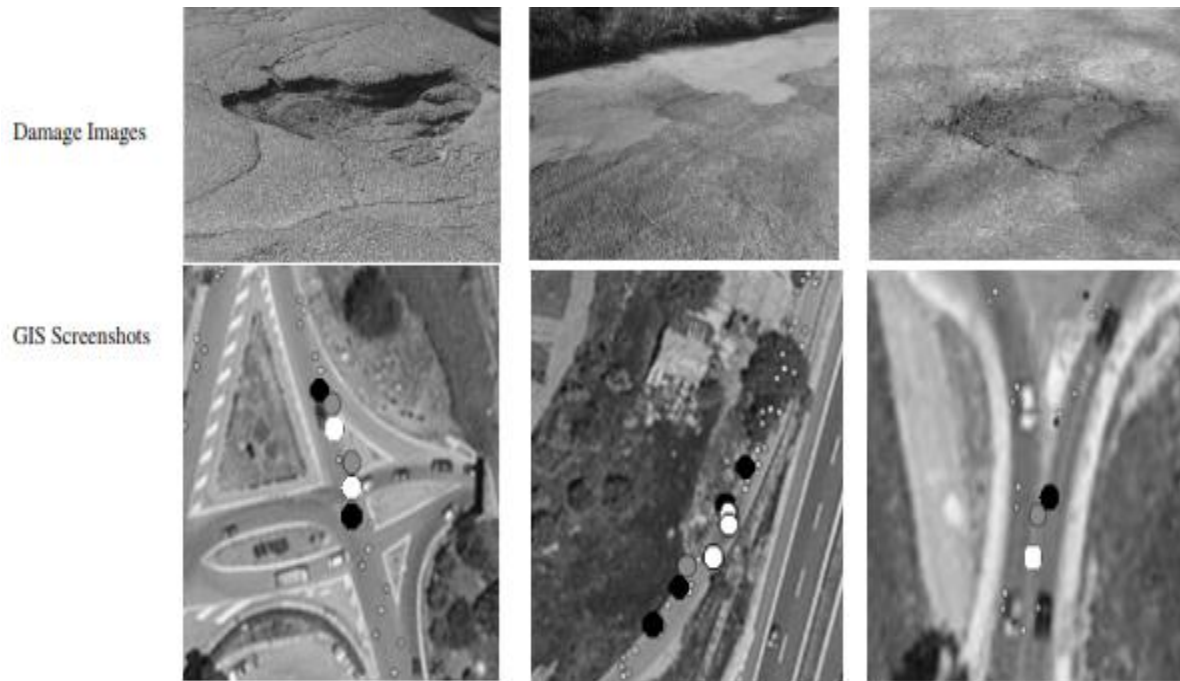


Figure 7: GIS System for better complaint management

<http://www.sciencedirect.com/science/article/pii/S1877042814000585>

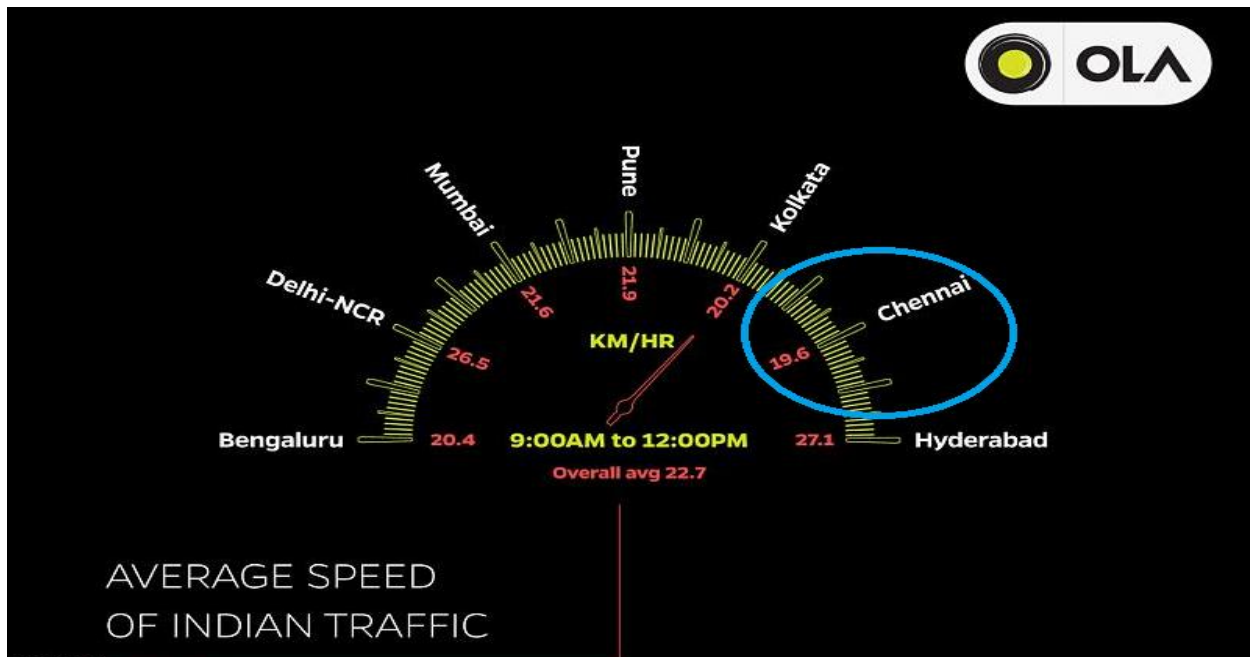


Figure 8: Chennai ranks among to lowest in traffic movement according to an Ola Study

<http://www.team-bhp.com/forum/street-experiences/183123-ola-insights-average-speed-traffic-spots-big-indian-cities.html>



Figure 9: A Sample Smart Parking App

<http://www.getmyparking.com/>

Smart City

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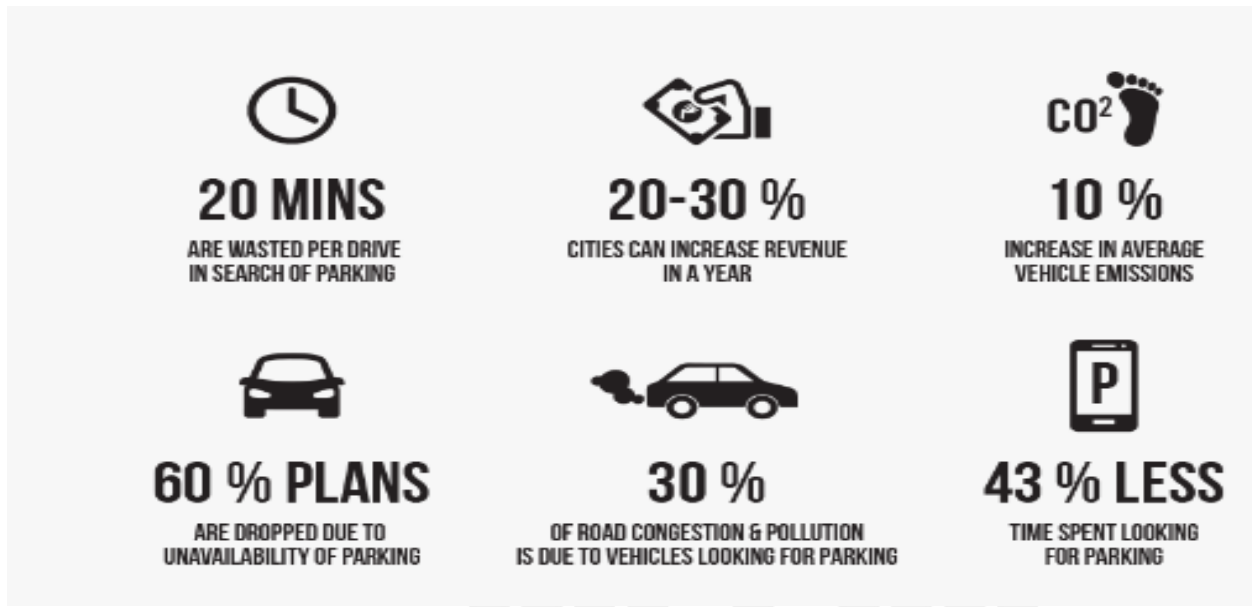


Figure 10: Issues plaguing the transportation sector

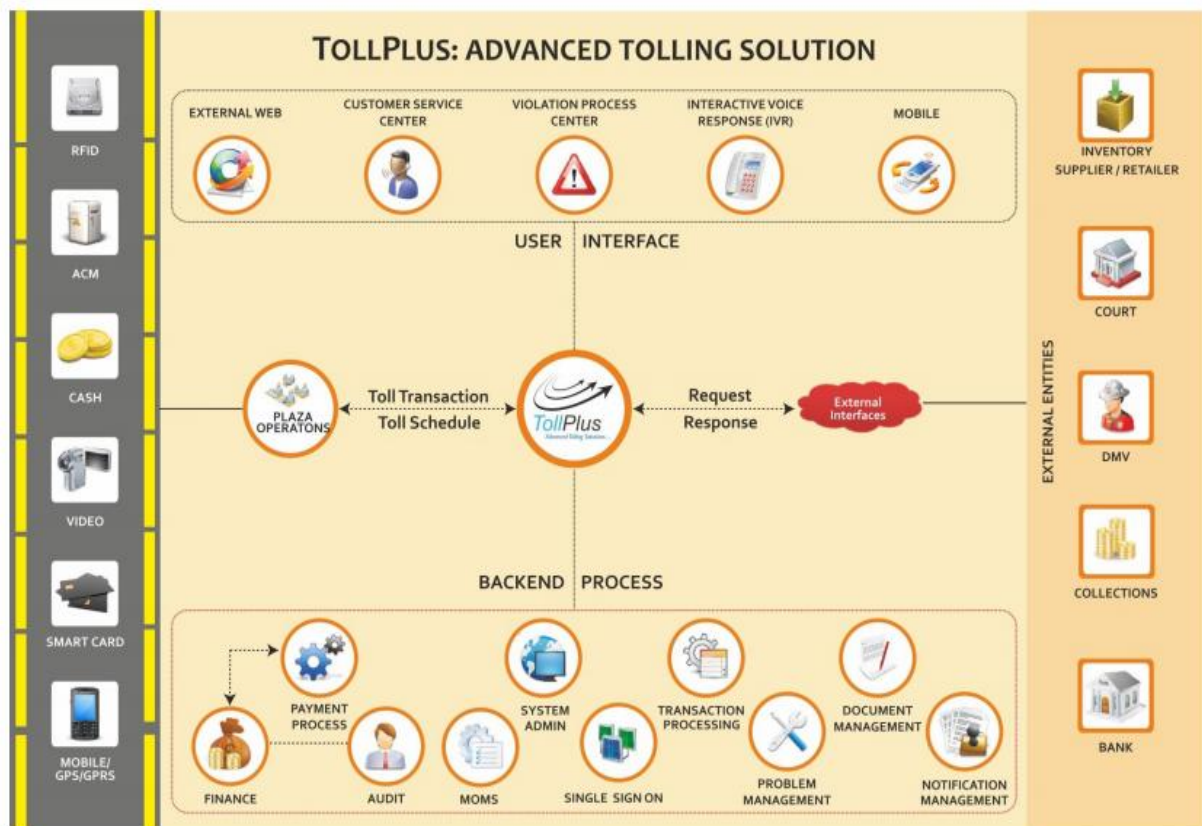


Figure 11: An intelligent Toll Plaza management system with IoT

http://www.tollplus.com/Download/TollPlus_Brochure.pdf

Interview Transcripts:

Interview with Mr. Ravichandar, of BPAC and a key stakeholder in Chennai Smart City Special Purpose Vehicle:

Q: Sir, we are looking at two sub-sections within the Smart Transportation Agenda of a Smart City - Smart Mobility & Integration of the multi-mode transport system with Chennai as a focus city. Your thoughts on the same?

A: On the mobility front, Government has structured in the form of UMTA (Unified Metropolitan Transport Authority) which is looked upon as a reform measure. Govt has come up with a set of guidelines for UMTA and unique to Chennai, workshops have been conducted as well to take forward the idea of UMTA. Comparable cities have also been identified such as Singapore's Land Transit Authority, and there is a similar authority located in London, UK. What the authorities do is that they become the czar of everything that moves in the city and they calibrate between rails, buses, taxis, private vehicles, etc.

They plan what the demand is, what should be the modal share, how to regulate the whole system etc. For example, in Singapore if they find that the metro rail usage is down, they sit down and lower the rates, modify the frequency, etc., to bring it up. However, this is under the assumption of the ideal world.

Q: Will we get to UMTA in India, is the jury is out?

A: We can only give a theoretical construct but let's come down to reality in Chennai where the entire system is dysfunctional. Pallavan is a bus transport company in Chennai, Metro Rail is another thing that is coming up, MRTS is also another mode of transport, RTO is a body which is regulating and licensing all vehicle drivers, and the cab aggregator model is the latest addition for which the policy formation itself is in a very nascent and in not-so-good stage. The challenge is that all these individual silos are managed and governed independently. One more challenge is that authorities encourage private vehicles, but it must be the other way around of encouraging public transport. The agenda for them is moving vehicles and not on moving people while strategic mobility is all about moving people. Institute for Transportation & Development Policy (ITDP) has done a great job in setting down certain guidelines for the same which is something that you guys should look at.

Q: One issue which will crop up in the future is the one surrounding data. With just Aadhaar data alone, Government has been courting so many controversies, now with so many IoT devices coming up shortly, there will be so many open-ended questions surrounding data. What is Government's take on it, Sir?

A: There is no thinking at this stage as the Government wants to be very opaque at this stage. Pallavan Transport in Chennai does not even put out its data in the public domain. Issues like

Data Security, Protocols for sharing, Data Privacy are in a very nascent stage in Govt, and its capacity to think through these issues is also weak.

Q: So Sir, this is where private players and experts such as you need to step in, right?

A: As a matter of fact, yes. For example, my firm has developed a GIS system for Bengaluru where it will keep digital spatial data so that informed decisions can be taken by spatial data. Take the case of Chennai, the CEO of Smart City Chennai Project, Mr.Raj Cherubal, a good friend of mine, is a private expert in this field. So this goes on to show the involvement of non-government players in the whole Smart City Project.

Q: The cost factor in the Smart City initiative is something that is frequently touched upon. Actually how much is enough to achieve at least some progress on the agenda?

A: To fix Bangalore over the next ten years, we need 20000-25000 Crores of capital infusion per year on a comprehensive level. While for smarty city project, the budget is pegged around 200 Crores which is minuscule so at best, the smart city development will be at a demonstration level alone at this stage

Q: Sir, there were some political hurdles which we found as part of your TenderSure initiative in Bengaluru. Your take on tackling such issues in the future?

A: Not just political, even citizens come up with such issues. It is a very big hurdle to cross considering different stakeholders and agendas. The entire work in front of us is a minefield, but such is reality.

Transcript with Mr. Puneet Kishor (condensed):

Q: Sir, your take on few examples on what smart transportation could be and what could be the data concerns surrounding the same?

A: In most cities, real-time arrival/departure of trains or buses through smart phones are already available. A bike-sharing service with bikes all over the city and an app to figure out the nearest bike station is also available in Washington D.C

There are simple classifications which could be made with respect to data security and privacy implications. A simple search of arrival or departure of a bus from a person's device may not be viewed as having privacy implication while on the other hand data related to the frequent traveling destinations of an individual may be viewed as very private. We have recently had a similar scandal with respect to Uber where in there were reports that the firm was tracking the passenger's whereabouts even after the person has been dropped off from the vehicle.

Q: Sir, recently we had a chat with Mr. Ravichandar, a key stakeholder in the Bangalore and Chennai Smart City Special Purpose Vehicles. He had mentioned about a key guideline document with respect to Transportation but there was no mention of data management and its implications in the document. Your take on whether data and its implications should be governed by certain guidelines up-front or not?

A: I think both yes and no. Yes, because it would be very prudent to discuss all data management issues and put forth the best practices in the domain which should be adhered to at all costs.

No, because considering the Indian bureaucracy and the difficulties in the Indian context with respect to data collection, it may be too early for our country considering the infrastructure bottlenecks.

But overall, I think it's never too early to start thinking about data and its implications.

Q: Considering that the entire smart city project is run by immense private player contributions and considering that you're an expert in data management and security, do you see yourself contributing to the Smart City Mission as an external or internal consultant for example?

A: I personally do not have ambitions in contributing to Smart City project at a national level. But if it's going to be focused on one region I might take it up. Because the entire project is highly politicized now and I have my doubts if the aspirations of the entire population are being considered now.

Q: We would like to end our conversation with one last interesting roleplay. We would like you to imagine yourself in the role of a CTO for entire India's Smart City Mission. In the realm of data management, what would your decision be in choosing between trusting the government or outsourcing the entire management of data to a third-party considering the recent Aadhaar scandal in mind as well?

A: Well, I would not trust both the Government or the third-party service provider for that matter.

A quality data audit done by experts in data with proper guidelines in place and, say, a committee of experts in privacy and security will be in place. At the end of the day, it doesn't matter who is taking care of data management but I feel that the Government alone is not competent enough to handle enough and me being a believer in the private market, I will surely engage private players as well.

Some thoughts:

1. There is no canonical definition of smart city though there are generally accepted ideas of what comprises a smart city. Don't just try to see how an Indian smart city plan compares to Singapore or any other developed/planned city. Instead, look at what all is needed to develop an Indian city to the level where one can actually start thinking about making it smart.

2. When thinking of smart cities in India, don't just think of how the notion will apply to the westernized, urbanized, educated middle- and upper-class Indians like yourself. Instead, think of the broader context wherein a vast majority of city Indians live on sidewalks, under bridges, and on the streets. Making a slick parking system doesn't mean anything to me if I don't own a car, not even a bicycle perhaps. Will the Indian smart city be an inclusive smart city or a city smart for only the privileged few?

3. Attitudes toward privacy in India are very different than that in the West. Start with the report linked below and think of privacy in the context of the web, social media and other online presence, as opposed to the notion of personal privacy in the physical space as opposed to the notion of medical or financial privacy. Then you can start thinking about privacy in terms of information required to make a city smart.

4. Think of what can be done toward data gathering, management and use even as cities struggle to even reach the level where they can then start thinking of becoming smarter. For example, in terms of privacy, it doesn't matter who does the work. What matters is that meaningful best practices and standards are laid out in advance so the work can be audited, measured against those benchmarks.

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