Implementation Model for Adopting ITS in Public Transport

Ahmedabad Municipal Corporation

Yatindra Naik
DGM (Tech/Admin)
HOD e Governance
City Profile

- Started in year 1857 as Municipality and
- Established as Municipal Corporation in year 1950.
- Seventh largest city in India.
- Largest city in Gujarat, with the population of over 6 million and 26.61% decadal growth rate.
- Second biggest trade center of Western India
- Commercial Capital & Growth Engine of Gujarat State
- 3rd fastest growing city as per the Forbes magazine.
- Density: 11,948 /sq.km and Literacy Rate: 89.60%
- Population: 5.7 million
- Area: 466 Sq. km
- No. of Zones: 6 Administrative Zones
- No. of Wards: 48
Obligatory services:
- Water Supply
- Drainage Facility
- Light
- Road & Bridges
- Health
- Town planning
- Fire Brigade
- Slaughter house
- Birth-Death Reg.
- Crematorium

Non-obligatory services:
- City Transport (A.M.T.S.)
- Library
- Gymnasium
- Community Hall
- Swimming Pools
- Hospitals
- Stadium-Sport School
- Medical Education
- Zoo-Balvatika
- Parks & Gardens
- Cultural Monuments Care
- Musium
- Animal Hospitals
- C.N.C.D.
- Primary Education

Services rendered by AMC
• SRFDCL SPV
• AMCMET
• AJL
## Summary

<table>
<thead>
<tr>
<th>Particulars</th>
<th>14-15 Actual</th>
<th>15-16 Actual</th>
<th>16-17 Provisional</th>
<th>2017-18 MC Budget</th>
<th>2017-18 Approved Budget</th>
<th>01-04-17 to 31-10-17 Provisional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev. Income</td>
<td>2890.67</td>
<td>3432.01</td>
<td>3405.21</td>
<td>4484.00</td>
<td>4934.00</td>
<td>1880.28</td>
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<tr>
<td>Cap. Income(Net)</td>
<td>1584.84</td>
<td>1460.12</td>
<td>805.55</td>
<td>1617.00</td>
<td>1617.00</td>
<td>741.57</td>
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<tr>
<td><strong>Total Income</strong></td>
<td><strong>4475.51</strong></td>
<td><strong>4892.13</strong></td>
<td><strong>4210.76</strong></td>
<td><strong>6101.00</strong></td>
<td><strong>6551.00</strong></td>
<td><strong>2621.85</strong></td>
</tr>
<tr>
<td>Rev. Expense</td>
<td>2103.30</td>
<td>2315.52</td>
<td>2499.13</td>
<td>2951.00</td>
<td>3241.00</td>
<td>1357.86</td>
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<tr>
<td>Cap. Expense</td>
<td>2081.63</td>
<td>2273.98</td>
<td>2073.16</td>
<td>3150.00</td>
<td>3310.00</td>
<td>1011.52</td>
</tr>
<tr>
<td><strong>Total Expense</strong></td>
<td><strong>4184.93</strong></td>
<td><strong>4589.50</strong></td>
<td><strong>4572.29</strong></td>
<td><strong>6101.00</strong></td>
<td><strong>6551.00</strong></td>
<td><strong>2369.38</strong></td>
</tr>
<tr>
<td>Rev Trans to Cap.</td>
<td>787.35</td>
<td>1116.50</td>
<td>906.10</td>
<td>1533.00</td>
<td>1693.00</td>
<td></td>
</tr>
</tbody>
</table>

Smartcity Ahmedabad (2017-21)  
Rs. 2492 Cr
Smartcity Ahmedabad Development Ltd.

SPV formed on 28th March 2016

- Equity Structure: 50% GoG (100 Cr) – 50% AMC (100 Cr)

- Chairman: Mukesh Kumar IAS Municipal Commissioner, Ahmedabad
- CEO: Rakesh Shankar IAS, Deputy Municipal Commissioner
- CFO: Arjav Shah, Deputy Municipal Commissioner (finance)
- GoI Appointed Director: R Srinivas (senior town planner)
- GoG Appointed Director: Milind Torwane IAS (Mission Director)
- Funds Outlay: 2492 Cr (GOI -500cr GOG/AMC-900cr PPP 900cr)
- PMC Appointed: TCE and PwC
Ahmedabad Smart City Projects

Retrofitting Wadaj
- Intermodal hub
- Utility Network (Water, sewerage, drainage, roads, street lighting, etc.)
- External Utility Network
- Wastewater Treatment Plant

Smart Features
- Solar Energy
- Waste Segregation
- Smart Metering
- OFC Network
- Wi-Fi Hotspots
- NMT Tracks
- Intelligent Traffic Management
- Smart Parking
- Energy Efficient Street Lighting
- Surveillance Cameras
- Rain Water Harvesting

Redevelopment Wadaj
- Residential & Allied Development

Smart Transit
- Integrated Transit Management Platform
- Common Card Payment System

ICT
- Command & Control Centre
- OFC Network connectivity
- City Surveillance
- Integrated services platform

Rain Water Harvesting

Smart City Ahmedabad
JANMARG – BRTS and AMTS

• BRTS Length - 97 Km
• Bus Shelter – 158 Nos.
• 1,40,000 Passenger Daily.
• Rs. 19 lac Income per day
• 205 BRT Buses
• 2251 Bus Trip daily

• AMTS Length – 3808 Km
• Bus Shelter – 3500 Nos.
• 6,00,000 Passenger Daily.
• Rs. 30 lac Income per day
• 850 BRT Buses
• 198 Route
Ahmedabad is fast adding vehicles!

- Ahmedabad’s population grew at 58% (decadal growth), whereas number of vehicles are growing rapidly
- Number of vehicles in the city are 31.5 lakhs (2014) against the population of 61 lakhs
- Daily 1 million passenger commute through public transport such as BRTS and AMTS
- BRTS carries ~1.50lk passengers with operational fleet of 250 buses and 154 bus stations
- AMTS carries ~6.50lk passengers with operational fleet of 850 buses

- The decadal growth of vehicles is highest in Ahmedabad compared to other Indian cities
- Peak traffic average speed is 9-17 Kmph (BRT peak speed being 25-30 Kmph)

*Because of growing no of vehicles concept of ITMS-AFCS came up.*

*Source: Ahmedabad CDP, Ahmedabad SCP*
**Outcomes**

- Better collaboration
- Faster response
- Standardized process for emergencies
- Pre-emptive governance

**PROJECT NEEDS**

- Enable Integrated Operations
  - Multiple inputs from all the stakeholders involved facilitate a holistic perspective

- Informed Decision Making
  - Collaborative decision is required for quicker response

- Real time Data Analysis
  - Maximum situational awareness is required for efficient decision making

- Being Proactive than Reactive
  - Required to ensure pre-emptive governance

**Control centres operations & Incident Management System**

Managing real time control centre operations and managing all the incidents on real time basis

**Vehicle Planning & Scheduling System**

Planning and Scheduling vehicle according to the high footfalls and peak timing helps to benefit the public. Optimized fleet management for higher availability

**BRTS Command and Control Centre**

**Vehicle Planning & Scheduling System**

**CCTV Monitoring**

**Incident Management System**

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**Need for ITMS- AFCS**
What is ITMS-AFCS

Intelligent transportation management system (ITMS) - is an end-to-end Vehicle to Infrastructure ecosystem, designed to address the challenges of modern day transportation and management of vehicles. It also aimed to enable gathering of transit data from the real-time operations and then providing timely feedback to traffic managers and commuters. It provides tools for real time monitoring of Fleet of Public Transport Buses.

Automated Fare Collection System (AFCS) aims to automate its fare collection mechanism and technology within the transport ecosystem (BRTS & AMTS) to enhance the operational capability of public transport. Thus an open loop card, JANMITRA card is proposed for transit and availing various Municipal services.
Objectives of ITMS-AFCS System

- Real time access to Transit Information
- Reduced cash and lower cash handling cost
- Secure and Safe Experience
- Integration with banking infrastructure
- Enhanced availability and accessibility
- Use of open loop based electronic payments platform
- Service excellence and reliability
- Unify payment experience
- Integrated Travel user experience
- Simplified fare policy
- Integrated planning and operations
- Providing citizens a Common platform for payments
Integrated Transit Platform (with Common Card Payment System)

**INTEGRATED TRANSIT PLATFORM**

**City Goal** – Access to Public Transport within 400 m of each household

**Components**
- Vehicle location systems on BRTS / Metro / GSRTC / AMTS
- Journey Planner & Booking on App
- CCTV Access to Traffic, Parking lots on App
- Public Information System at Stations
- Real Time Tracking of Vehicles on App
- Real Time Parking Availability

**COMMON CARD PAYMENT SYSTEM**

- **Seamless Mobility Card (Common Card)** for utilization at various public places
- **Applications Envisaged**
  - Transportation Systems
  - Parking System
  - Recreational Areas
  - Municipal Bills
  - Utility Payments
  - Retail & Others
Components of ITMS-AFCS

- Business Intelligence (BI)
- Automatic Vehicle Location system (AVLS)
- Automatic Fare collection system (AFCS)
- Passenger Information System (PIS)
- Vehicle Planning and scheduling system (VPSD)
- Incident Management
- Enterprise Management System
- Depot Management System
- Fare collection Devices
**Components of ITMS-AFCS**

**Business Intelligence (BI)** - BI tools builds reports from operation data which enables AMC to take decisions for better operational efficiency.

**Automatic Vehicle Location system (AVLS)** - AVLS primarily uses GPS based location tracking devices mounted on the vehicle as primary source of data for tracking purposes.

**Automatic Fare collection system (AFCS)** - AFCS aims to automate its fare collection mechanism and technology within the transport ecosystem (BRTS & AMTS).

**Passenger Information System (PIS)** - PIS displays accurate and timely transit information.

**Vehicle Planning and scheduling system (VPSD)** - Scheduling/dispatch software which is used for designing and modifying transit routes.

**Incident Management** - Incident management is a planned effort to use all resources available to reduce the impact of incidents and improve the safety of all involved.
<table>
<thead>
<tr>
<th>S. No</th>
<th>Pan City Project Title</th>
<th>Cost of Project (INR Cr)</th>
<th>Implementation Partners</th>
<th>Implementation Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intelligent Transit Management System</td>
<td>187</td>
<td>nCode and NEC (Japan)</td>
<td>It is an ICT project. Requirement gathering Completed and SRS finalized with the vendor and user departments. Pilot demonstration completed and approved. Request Orders issued for Hardware, Software and Networking Equipment's for BRT. Request Order for AMTS (City Buses) issued. Hardware Installation for DC and DR Site and Networking components at all BRT Station Completed. Camera, UPS, POS and other station hardware installation under progress. L3 Application Development completed for AFC Devices. Mobilization Advance payment released to the vendor. Request order for AFCS component for AMTS has been issued. Delivery of the hardware is done and installation is in progress.</td>
</tr>
<tr>
<td>2</td>
<td>City Card Payment System</td>
<td>87</td>
<td>ICICI Bank</td>
<td>It is an ICT project. Requirement gathering, documentation and pilot project have been done. GOT NPCI. Approval Pilot for Non-Transit part program conducted. Started collecting Professional and Property tax payments at civic centers across the cities. 200+ service delivery points deployed in the city. L2 kernel development for AFC Gate Validator. Completed and certified by NPCI/FIEM. PCI DSS for payment system security audit is completed. Bulk card production has completed.</td>
</tr>
</tbody>
</table>
Vision for Common City Payment System

- **Common City Payment System (CCPS)** - interoperable payment infrastructure within AMC through smart cards and mobile phones.

- Single Payment Instrument in the form of Fare media issued by Bank and accepted across different services
  - City buses/ BRTS
  - Parking facilities
  - Recreational Services
  - Municipal Payments,
  - Utility Payments,
  - Retail

- Helps prevent long queues at ticketing station and aid transport integration.

- Green travel initiative.

Ahmedabad is one of the first few cities in India to offer Open Loop based City Payment Gateway aiding integration of people, business and government on single platform. A big leap towards realizing smart city initiative.
Bank’s Roles and Responsibilities

- **Card management**
  - Procurement of Smart cards.
  - Card issuance and Card personalization
  - Card security.
  - Implementation of Card Host System.
  - Marketing and Distribution of Smart Cards by setting up 1000 recharge, card issuance and Bills payment points in Ahmedabad City.
  - Mobile Recharge/ Payment wallet.

- **Clearing House Solution.**

- **Implementation of CCPS in Kankaria, City Civic Centers, SRFDCL.**

- **Cash Collection from 1000 delivery points and depositing the same to AMC Merchants in T+2 days.**

- **Transaction Settlement on T+2 days.**

- **Setting up a Call Center**

- **Bank to provide API and interfacing protocols for CCHS and Card Host Management to AFC Vendor.**

AFC Vendor’s Roles and Responsibilities

- **AFC System for Transit**
  - BRTS,
  - AMTS (City Bus Services),

- **Hardware and Software for Transit :**
  - AFC Software
  - POS
  - ETMs
  - Validators.
  - Station Servers at BRT Stations.
  - Enterprise Management System
  - Business Intelligence System

- **Setting up of Control Center**

- **Integration with Bank’s CCHS and Card Host**

- **O&M of Hardware and Software.**
Project Status

- Certifications as required by NPCI and RBI and PCI-DSS are completed.
- Municipal tax payments at 275 Service deliver points (SDPs) and AMC civic centers is started.
- Card issuance to public and use of card on transit and non-transit (Municipal taxes, retails, e-commerce etc) is started.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Activity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Card issuance</td>
<td>Total new card issuance - 1155</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total card replacement - 3223</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total cards issued (new and replaced) - 4378</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total balance transfer for replaced cards – 196020 Rs.</td>
</tr>
<tr>
<td>2</td>
<td>Total Card transactions</td>
<td>Total card transactions from 16th October till date.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-transit : Total txns. - 200, Total Amount – 21367 Rs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transit : Total txns. - 4366, Total Amount – 65271 Rs.</td>
</tr>
<tr>
<td>3</td>
<td>Daily cash transactions</td>
<td>For 2\textsuperscript{nd} November, 2017 - Total transactions - 39915, Total amount – 529008 Rs.</td>
</tr>
</tbody>
</table>
Challenges Faced vs Mitigation

Design & Operational

Understanding of Geography of Transit System (BRTS & AMTS)

Integration of various AFCS components with Card Host System

Defining the testing strategy in such a complex project with more than 15 sub-systems and 5000 end points.

Integration of 157 Station & 230 Buses of BRTS along with 837 buses & 2900 Stations of AMTS.

A need of integration with Card Host System is majorly depends on Reconciliation process with Open loop card and has been achieved almost 100%.

Considering BRTS, 5000 Odd Devices to be rolled out under this project. The testing strategy has been defined in a way that the end result is comprises of successful functional testing, load testing and throughput in a limited time period.

Special War Room

Monitoring at weekly Chairman Level and Twice CEO Level
Challenges Faced vs Mitigation

Implementation Challenges

Ahmedabad ITMS-AFCS Project is a Brown field project in which all new Implementation has been ensured without hampering ongoing operation.

Establishing Communication protocol between all the subsystems to generate data in synchronized manner for prompt decision making in real time.

For the very first time in the country, understanding and obtaining payment certifications mandatory to implement the project.

Phase wise Implementation has successfully carried out in provided window of time frame (Post operation hours 11:AM to 5:PM) by ensuring smooth user experience.

In record time span, we have achieved all deliverables of Certification with the help of NPCI team.

15 different OEMs to integrate with each other for maintaining and capturing data uniformly.

Almost 100000 Manhours
ITMS - Bus stations - Before
ITMS - Bus stations - Now

- Fare Gate-542
- PIS - 279
- Station Camera-303
- ETM - 231
- PTZ Camera-303
- POS- 157
ITMS - Buses – Before
ITMS - Buses - Now

CCTV - 460
In Bus PIS - 719
GPS Module - 842
Front PIS - 719
ETM - 1346
Side PIS - 719
ITMS - Command and control center - Before
Intelligent Vehicle Scheduling

Route Mapping for identification of overlaps

Run time analysis during operational hours of a route
Vehicle Utilization Analysis
Passenger Waiting Time Analysis

From 00:00 at 00:00
Lower ordinate
Upper ordinate

Hathijan Gam Approach (2055)
Hatkeshwar Depot (1037)
Hatkeshwar Depot (2037)
Hatkeshwar Mahadev (1036)
Hatkeshwar Mahadev (2036)

Time between 2 vehicle stops (Minutes)

Nb. of vehicles that stop: 40  Average: 26 min 40 s
ITMS - Command and control center Now
Thank You!