आज़ादी का अमृत महोत्सव

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS

स्वच्छ भारत
एक कदम स्वच्छता की ओर

NEED OF DATA-DRIVEN TRANSFORMATIONS FOR INDIAN BUS SYSTEMS

14th Urban Mobility India Conference 2021

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BACKGROUND

German Federal Ministry for Economic Cooperation and Development (BMZ) funded SMART-SUT (GIZ) project supporting its three partner cities, Trivandrum (Kerala), Bhubaneswar (Odisha) and Coimbatore (Tamil Nadu) for Data Driven Transformations in City bus System

Implementation of Data Intelligence Dashboard for CRUT

Capital Region Urban Transport

Route Rationalization Study for enhancing city bus efficiency & RR Data tool

Kerala State Transport Corporation

Route Rationalization Study for city buses & Data tool for electric bus route selection

Tamil Nadu State Transport Corporation

Key Learnings

Key Recommendations & Strategies

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Release of Technical Paper on Data Management solutions

ROLE OF DATA IN TRANSFORMING BUS SERVICES - INDIA

DEMAND

- Public transport is mainstay of affordable and safe mobility
- Ridership & mode-share of buses has declined in most cities in past years
- Maintaining service quality- key to retain ridership & attract more users
- Users need more demand responsive services

SUPPLY

- PTA's have limited resources to scale up, particularly post-Covid-19
- Cities to maximize available fleet & reliable demand-responsive services
- Reforming current static schedules, manual & intuition-based planning.
- Data-driven practices helps PTA's taking informed choices to serve users & maximise resources

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DATA AVAILABILITY AND KEY GAPS

Static & Real-time data with PTA's:

- **Intelligent Transport Systems**
  - GPS based AVLS systems
  - ETM's recording route, time, O&D trip-wise
- **Management Information Systems**
  - Reports for performance efficiency management

ITS & MIS digitized some core functions like revenue collection & performance management.
Digitalization hasn't translated much to efficiency improvements

Key gaps in implementation & application of these technologies

- Data availability, inaccuracy, inconsistent & missing data elements. Lack of user-focussed performance monitoring,
- Data management – use of different data formats within different service providers
- Lack of in-house data analytics & application capacities

DATA AVAILABILITY AND ACCURACY IMPROVEMENT OPPORTUNITIES

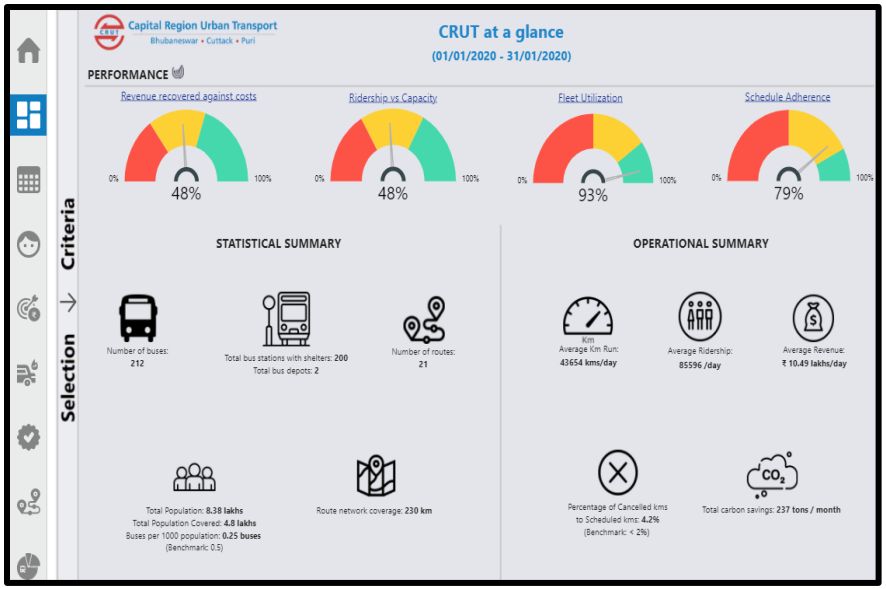
- **Operations database**
  - Route network maps & service schedules in machine readable formats
  - inconsistent data standards and data formats for operations data
- **Base ITS database**
  - Bus stop and route database in ITS backend has inaccurate info.
  - ITS systems to identify metrics for data latency & accuracy
  - Data inaccuracies like wrong route & stops in GPS & ETM data

- **Tickets and fares**
  - Stage-wise fares still in-vogue in many cities (Need stop-wise fare)
  - Lack of direct tickets for transfer between routes despite ETMs
  - Concessional pass users' travel patterns not captured in data
  - Lack of gender info. in ticketing data leads to inadequate planning
- **Data synchronisation and standardisation**
  - GPS & ETM data treated separately. Sync. Imp. for supply-demand dynamics
  - Data formats vary across ITS vendors. Standardised formats required

GIZ SUPPORTED INITIATIVES TO PARTNER CITIES:

BUSINESS INTELLIGENCE (BI) DASHBOARDS- CRUT, BHUBANESHWAR

- Dashboard helps CRUT in operational decisions & short to medium term planning
- Key Performance Indicators (KPIs) developed using GPS and ETM data
- Fleet productivity, service quality, ridership & financial KPIs generated
- KPIs cover bus stop, trip, route & depot level indicators
- Hourly, daily, weekly and monthly KPIs generated, which will be updated for latest data



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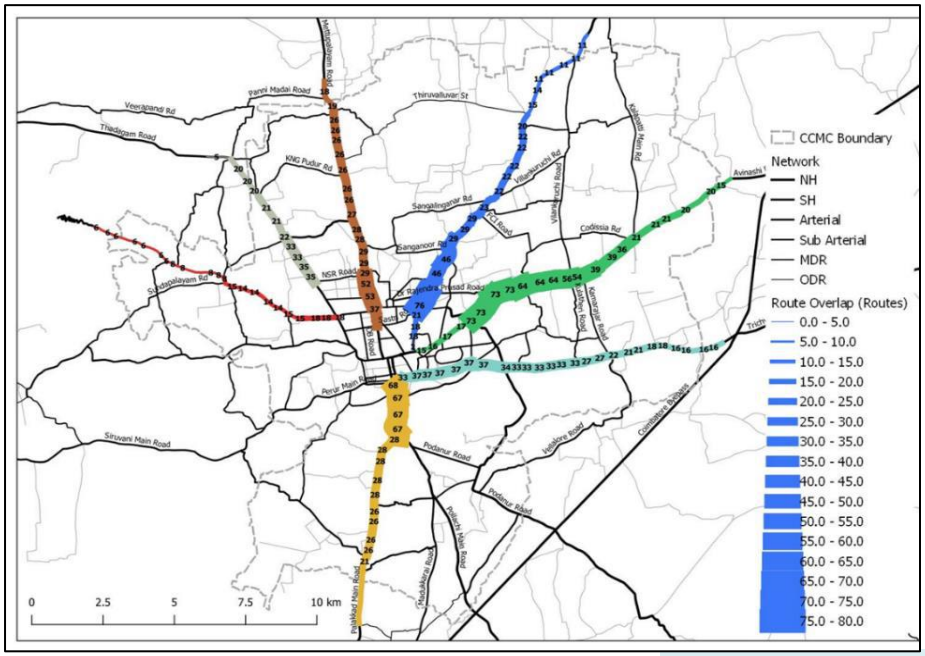
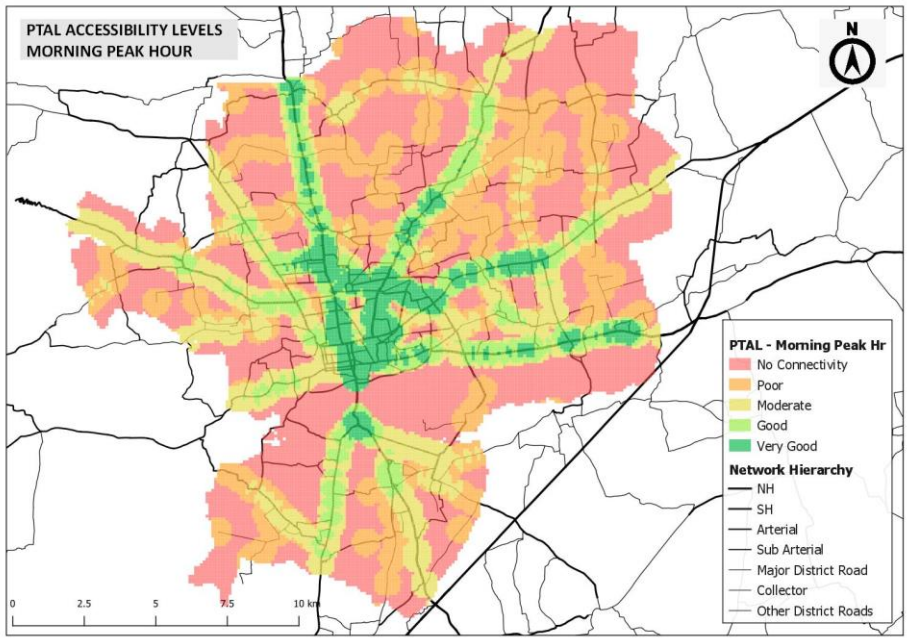
BUS ROUTE RATIONALISATION FOR COIMBATORE

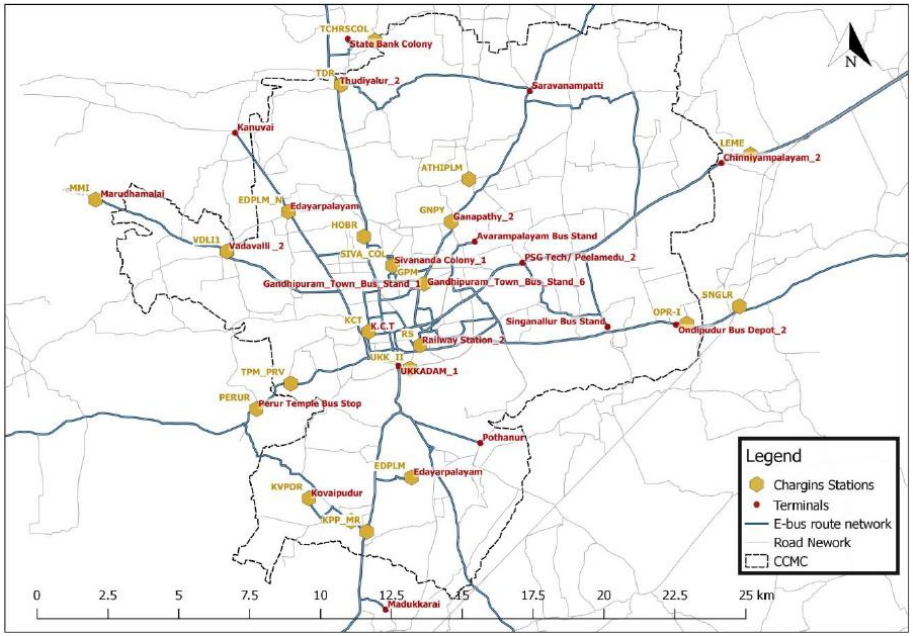
- Review of current network and its accessibility of bus services provided by TNSTC
- Identification of corridors with overlapping services and areas with inadequate services
- Trunk, primary and secondary routes identified based on daily ridership and revenue
- Route specific curtailments, extensions and new routes

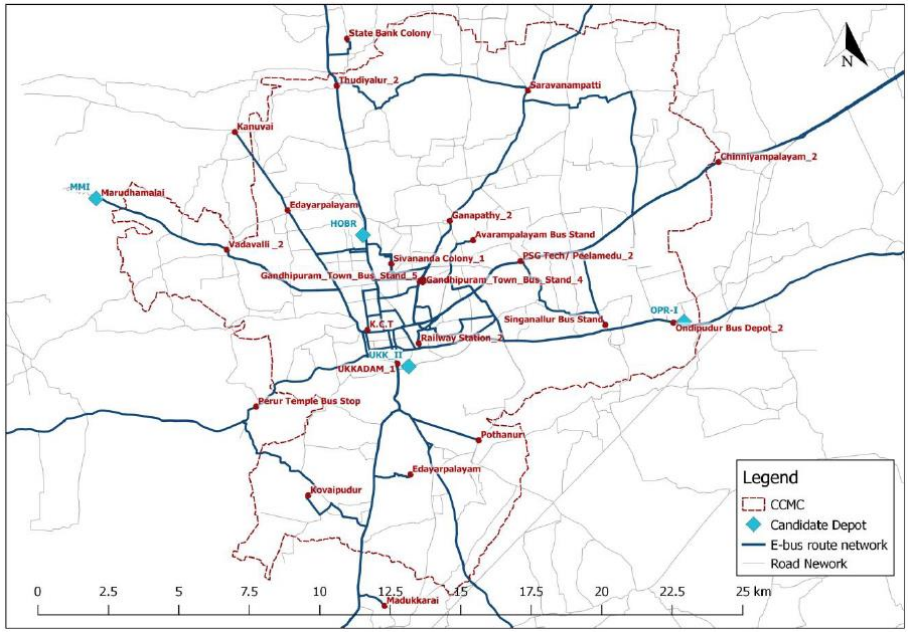




E-BUS ROUTE SELECTION TOOL - COIMBATORE

- E-buses need careful route & charging location selection to match technology with operational needs
- Evaluation of Coimbatore route network, depots and terminals for ideal locations
- Optimisation models to minimise cost of electrification were developed & using Knime + Python
- Routes, depots & terminal locations to minimise cost of electrification identified from analysis





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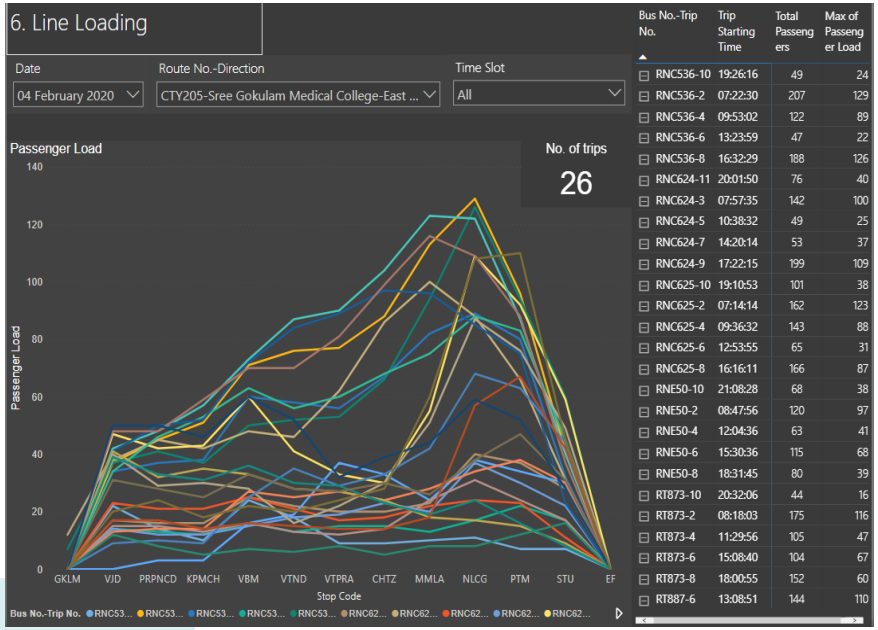
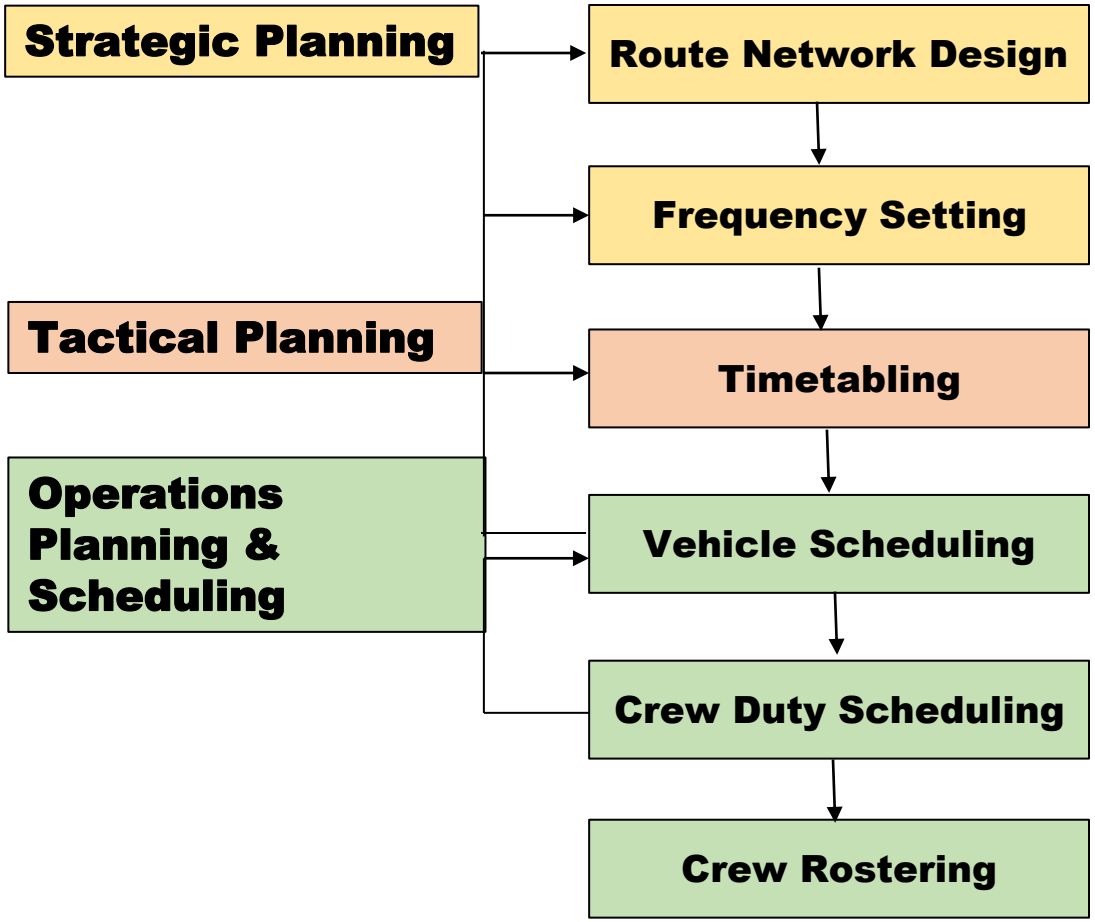
E-TRAM – ETM BASED TOOL FOR ROUTE ANALYSIS AND MONITORING (TRIVANDRUM)

- Open-source tool that enables PTA's with ETM data to monitor operational performance- route planning & system level assessment
- Helps in decision making for:
  - Route level frequency in peak & off-peak hours
  - Change in service types (express, limited services)
  - Route curtailment/extension
  - Dev. of infra. facilities at major boarding alighting locations.



SERVICE PLANNING AND SCHEDULE OPTIMISATION

- Route Network planning is strategic function undertaken once in few years acc. To changing travel demand patterns
- Scheduling is tactical activity more frequently on daily , monthly or quarterly basis according to changing operational requirement
- Scheduling is an intensive exercise to maximize service & minimize cost
- RR exercises based on city level & bus system level data
- However, data analytics for timetabling, vehicle and crew scheduling has limited application



KEY SUGGESTIONS / RECOMMENDATIONS

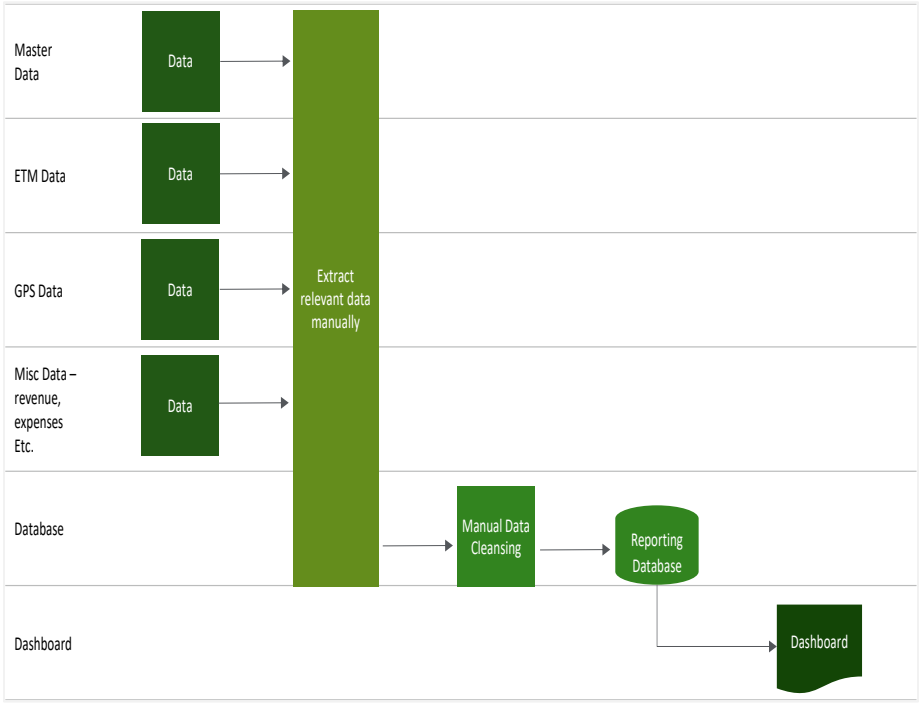
- Move towards data-driven and customer centric service provision
- Data Availability and its accuracy needs improvement
  - Replication of best practices to other cities
- Standardization of data formats & management practices at National Level
- Open data practices need to be encouraged (Sensitive info. On need to know basis)
- Technical assistancee to cities, building capacities across cities.
- Encouraging data science & Operations Research (OR) expertise in Indian PT sector
- Need India-specific tools and guidelines to mainstream proposed initiatives

KEY SUGGESTIONS / RECOMMENDATIONS

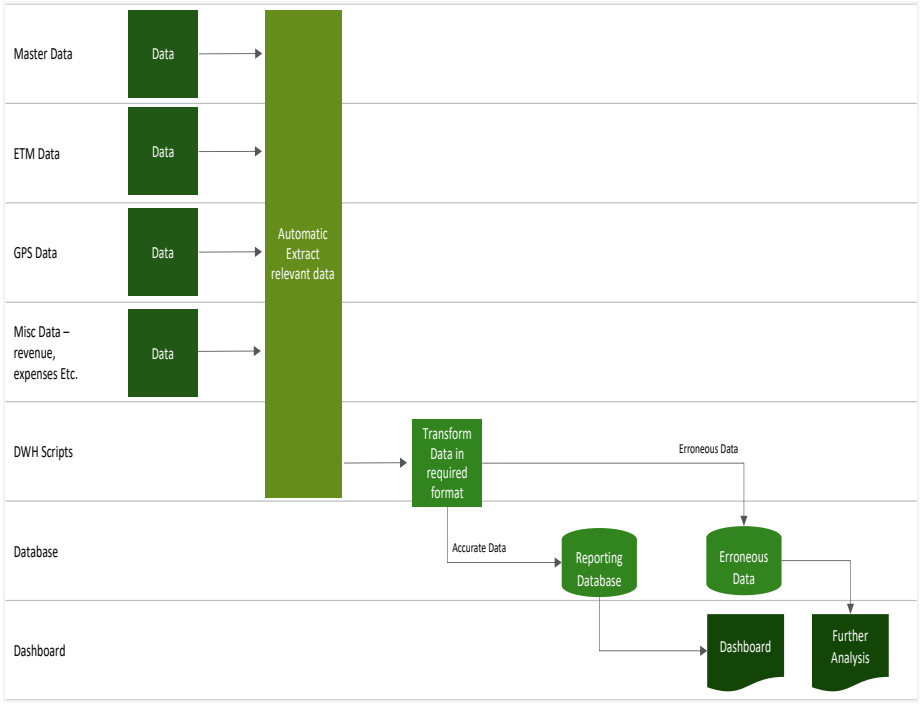
- Pilots for BI Dashboards and RR tool available on open source
- Planning and scheduling optimization tools need to be built for Indian cities
- National level programmes to build in-house data analytical capacity across PTA's
- Use of Data for customer centric planning & engagement
- Capacitating cities in key functions like
  - ITS procurement and implementation
  - Service planning and scheduling
  - Operations and contract management
- Actionable pilots and Centre Of Excellence (CoE) to demonstrate solution to other cities

AUTOMATED DATA WAREHOUSE (DWH)

Data could have issues despite the best of standards, and in such cases, it is pivotal to ensure that non-accurate data does not creep into the database.



Traditional Data Load – manual data cleansing and load



Automated extraction and data segregation

Thank-You

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