ITS project for Mysore City Transport

National Award for e-Governance, 2016 - 2017
Gold Award
presented to
Nations First Intelligent Transport System with Mobile app
at Mysore City, Karnataka
for
Innovative Use of ICT by State Government
IPSUs/Cooperatives/Federations/Societies

National e-Governance Gold Award -2016

Karnataka State Road Transport Corporation

Objectives:

- To improve **quality** & **convenience** of public transport

- To promote use of **sustainable** transport modes

- To enable commuters to make **informed choices** on travel modes

- To reduce **passenger wait times**

- To **optimize operations, improve fleet utilization, schedules, and vehicle availability** with accurate information

Why Mysore?

- **City of Palaces & Cultural Capital of the State**
- **Top ten tourist destination in India**
- **3.5 million tourist /annum**
- **Education & Research Hub**
- **Demonstrate the project at a National and International level**

MIS REPORTS
BUNCHING OF BUSES
SCHEDULE ADHERENCE
BUS BREAK DOWN
ROUTE DEVIATION
MISSED TRIPS
SCHEDULE DEPARTURE
SCHEDULE ARRIVAL
DEPARTURE PUNCTUALITY
ARRIVAL PUNCTUALITY
SCHEDULE PERFORMANCE
OPERATIONAL SUMMARY
CONTROL CHART

In-house designed and deployed reports

Project Components

- Real Time Passenger Information System- SMS/IVRS/Boards/Commuter Portal

- In-Vehicle display System

- Automated Voice Announcement System

- Central Control Station

- Automatic Vehicle Location System

- Enterprise Management System

- MIS Reports

- Training

SMS- 161   IVRS-18004255220
Commuter Portal – mitra.ksrtc.in
Mobile App – MITRA KSRTC Mysuru (Official)

PROJECT SCOPE
- 500 buses
- 105 bus shelters
- 2400 bus stops
- 45 platforms
- 6 bus terminus

193 boards @ 111 locations

Component View

CCS / Data Centre

- ✓ Video Wall
- ✓ Application / Database Servers
- ✓ Network Firewall / Routers / Switches

Applications

- ➢ ITS
  - ➢ ETA
  - ➢ MIS Reports
- ➢ GIS
- ➢ EMS

Power

- ✓ DG Set – 82.5 KVA
- ✓ UPS – 20 KVA x 2

Training

- ✓ Crew Training
- ✓ Officials Training

PIS Display Boards

- ✓ Shelters - 2" 2 Line – 59
- ✓ Shelters – 2" 4 Line - 63
- ✓ Platforms – 4" 4 Line – 45
- ✓ Terminals – 10 Line – 20
- ✓ Terminals – 16 Line – 6

Commuter Related

- ➢ Commuter Portal
- ➢ SMS
- ➢ IVRS

In-Bus Equipments

- ✓ VMUs - 500
- ✓ In-Bus Displays – 500
- ✓ Voice Announcement System

ITS

Key Challenges

Planning Phase

Procurement Phase

Deployment Phase

Operations Phase

Planning

- Implementing the project for the first time in KSRTC

- Lack of subject knowledge

- Requirements study and analysis

- Conceptualisation of ITS & control room driven bus operations

- Utility analysis of each component of ITS project

- RFP Preparation with Technical and Functional Specifications

- Understanding of the Technology & Solutions

- Budget Estimates and financial viability

- Multi-Agency Co-ordination

Procurement

- International Competitive Bidding (WB Guidelines), new to KSRTC

- Manual Tendering v/s e-tendering

- Finalizing the Contract Terms and Special Conditions of Contract

- Setting up Minimum Qualification Criteria – Financial & Technical

- Setting up Bid Evaluation Methodology –Financial, Technical & Project Management

- Evaluation of the documents supporting bidders qualifications

- Multi-Agency Co-ordination

Deployment

- ✓ Unavailability of historical project data (lessons learnt from previous ITS implementations in Indian conditions of this scale)

- ✓ Non-availability of best practices & guidelines

- ✓ Time to map / adapt technologies vs. existing business processes

- ✓ Additional rework to meet ITS solution requirements - (routes redefined)

- ✓ Stabilize solution while continuously optimize business process

Deployment

- ✓ Synchronizing massive daily operational changes to system requirements

- ✓ Delayed stakeholder engagement (PMC, M&E)

- ✓ Long period gap between Project conceptualization to awarding Contract

- ✓ Recurring requirement changes
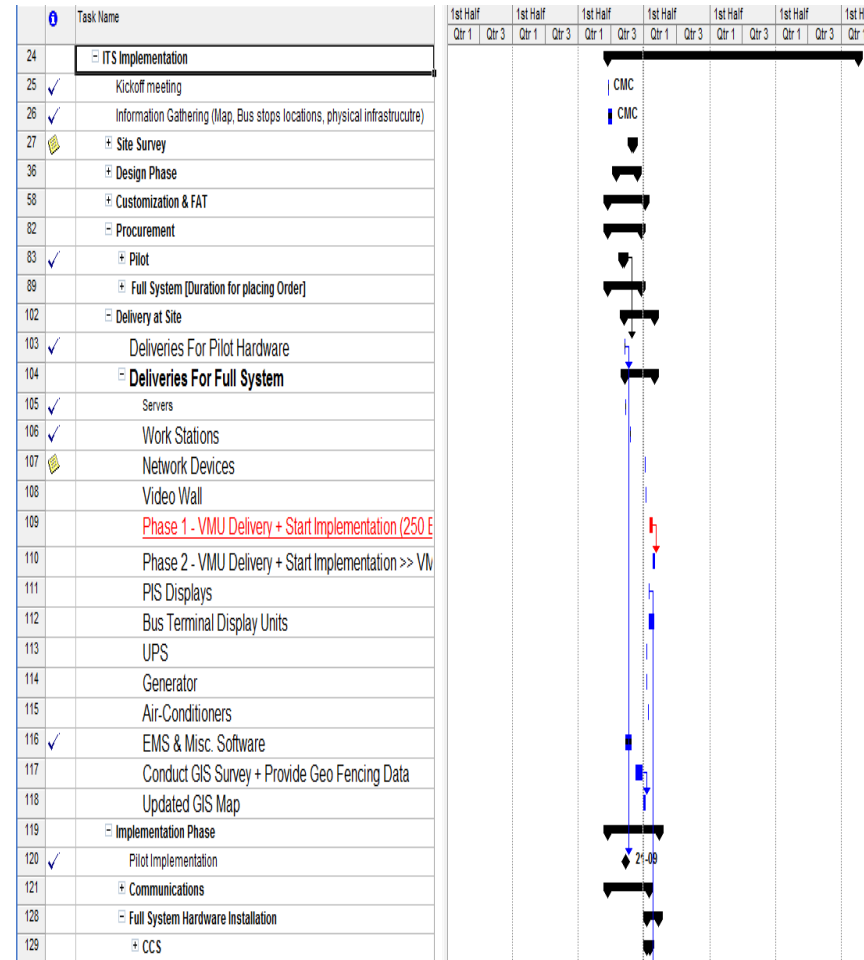
- ✓ Project Implementation Plan

Key Challenges

Deployment – Project Implementation Plan

		Name	Duration	Start	Finish	Predecessors
1		KSRTC ITS Project - Mysore	76 days	9/29/11 8:00 AM	12/27/11 5:00...	
2		PILOT START	0 days	9/29/11 8:00 AM	9/29/11 8:00 AM	
3		PRE PILOT ACTIVITIES	18 days	10/3/11 8:00 AM	10/22/11 5:00...	
4		Rework & Submit SRS	11 days	10/3/11 8:00 AM	10/14/11 5:00 PM	2FS+2 days
5		Review SRS	5 days	10/15/11 8:00 AM	10/20/11 5:00 PM	4
6		Submit Test Plan & Test Cases	6 days	10/8/11 8:00 AM	10/14/11 5:00 PM	2;4FF
7		Review Test Plan & Finalize	5 days	10/15/11 8:00 AM	10/20/11 5:00 PM	2;6
8		Rework & Sign-off SRS	2 days	10/21/11 8:00 AM	10/22/11 5:00 PM	5;7
9		Submit FAT plan - VMU + In-Bus Display + P...	5 days	10/3/11 8:00 AM	10/7/11 5:00 PM	2FS+2 days
10		FAT - VMU + In-Bus Display	2 days	10/14/11 8:00 AM	10/15/11 5:00 PM	2FS+12 days;9
11		FAT - PIS Display	2 days	10/8/11 8:00 AM	10/10/11 5:00 PM	2FS+7 days
12		SFAT	2 days	10/3/11 8:00 AM	10/4/11 5:00 PM	2FS+2 days
13		SIGN-OFF	8 days	10/6/11 5:00 PM	10/15/11 5:00...	
14		Sign-off - PIS Display	0 days	10/10/11 5:00 PM	10/10/11 5:00 PM	11
15		Sign-off - VMU + In-Bus Display	0 days	10/15/11 5:00 PM	10/15/11 5:00 PM	10
16		Sign-off - Software Gaps idenfitied	0 days	10/6/11 5:00 PM	10/6/11 5:00 PM	12FS+2 days
17		PILOT RUN	24 days	10/14/11 8:00 AM	11/10/11 5:00...	
18		Server Room ready	12 days	10/14/11 8:00 AM	10/27/11 5:00 PM	2FS+12 days
19		Finalize Pass/Fail criteria for Pilot	5 days	10/22/11 8:00 AM	10/27/11 5:00 PM	2;18FF
20		Pilot Run	10 days	10/28/11 8:00 AM	11/8/11 5:00 PM	18
21		Review & Analyze MIS Reports	10 days	10/31/11 8:00 AM	11/10/11 5:00 PM	16;20SS+2 days
22		Review & Feedback on Software	2 days	11/7/11 8:00 AM	11/8/11 5:00 PM	16;20FF
23		Review & Feedback on VMU	3 days	11/5/11 8:00 AM	11/8/11 5:00 PM	15;20FF
24		Review & Feedback on Display Boards	2 days	11/7/11 8:00 AM	11/8/11 5:00 PM	14;20FF
25		Pilot Complete	0 days	11/10/11 5:00 PM	11/10/11 5:00 PM	20;21
26		Implementation of Required Changes	30 days	11/11/11 8:00 AM	12/15/11 5:00...	
27		Software Rework	10 days	11/11/11 8:00 AM	11/22/11 5:00 PM	25
28		VMU + In-Bus Display	30 days	11/11/11 8:00 AM	12/15/11 5:00 PM	25
29		PIS Display	30 days	11/11/11 8:00 AM	12/15/11 5:00 PM	25
30		UAT + Final Acceptance Testing	10 days	12/16/11 8:00 AM	12/27/11 5:00 PM	8;21;27;28;29

		Task Name
24		ITS Implementation
25	✓	Kickoff meeting
26	✓	Information Gathering (Map, Bus stops locations, physical infrastrucutre)
27		Site Survey
36		Design Phase
58		Customization & FAT
82		Procurement
83	✓	Pilot
89		Full System [Duration for placing Order]
102		Delivery at Site
103	✓	Deliveries For Pilot Hardware
104		Deliveries For Full System
105	✓	Servers
106	✓	Work Stations
107		Network Devices
108		Video Wall
109		Phase 1 - VMU Delivery + Start Implementation (250 E
110		Phase 2 - VMU Delivery + Start Implementation >> VM
111		PIS Displays
112		Bus Terminal Display Units
113		UPS
114		Generator
115		Air-Conditioners
116	✓	EMS & Misc. Software
117		Conduct GIS Survey + Provide Geo Fencing Data
118		Updated GIS Map
119		Implementation Phase
120	✓	Pilot Implementation
121		Communications
128		Full System Hardware Installation
129		CCS

Contract Award - 2011

Procurement & Installations -2012

Testing, Running & Stabilisation

Operational Acceptance – October 2015

Initial Plan - 30 Tasks
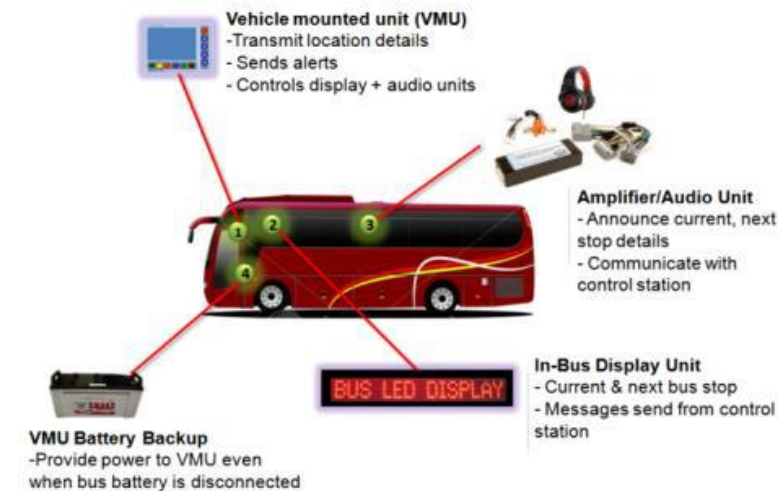Build, Pilot & Rollout –by Vendor

Revised Plan - 185 Tasks
Planning, Design, Build, Procurement and Implementation

Deployment

✓ Excessive rework during geo-fencing

  ▪ Multiple trips to capture, validate, and test physically

✓ Buses available only at night (for installations)

✓ Non-standard "in-bus" environment

different bus types/ designs

  ▪ Impractical to standardize procedures

  ▪ Non-standard cabling needs

  ▪ Issues of batteries, VMU etc.

✓ Design change requirements during implementation

Vehicle mounted unit (VMU)
-Transmit location details
- Sends alerts
- Controls display + audio units

Amplifier/Audio Unit
- Announce current, next stop details
- Communicate with control station

In-Bus Display Unit
- Current & next bus stop
- Messages send from control station

VMU Battery Backup
-Provide power to VMU even when bus battery is disconnected

Deployment

- ✓ Longer installation time than planned (old buses)

- ✓ Availability of same voice-over (recording) for implementing changes

- ✓ Longer time to freeze PIS (passenger information system) format requirements

- ✓ Display multi-language formats as per specifications

- ✓ Non-availability of a single font (for Kannada + English)

- ✓ Unable to perform Over The Air (OTA) activity for operational changes

Deployment

- ✓ Non-standard bus shelters

- ✓ Unplanned effort & cost - additional concrete shelter reinforcement

- ✓ Non-availability of power supply at bus-shelters (Corporation, Ad agencies)

- ✓ Continuous VMU issues and bus power supply issues

- ✓ Integrating existing in-bus equipment (protocol mismatch)
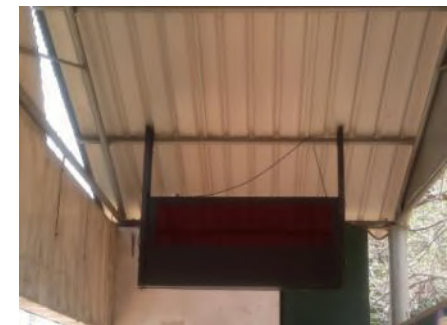
Deployment

- ✓ Excessive vibrations in rural routes - affecting in-bus equipment performance

- ✓ Security of ITS equipment in public places

- ✓ Availability and applicability of local insurance policies for ITS projects

- ✓ Availability of 100% GPRS signal

- ✓ Lack of flexibility (in contract) to deal with field realities and changes

- ✓ Residual ambiguity in RFP -Technical vs. functional requirement conflicts.

Deployment

✓ Geo-fencing shelter less bus stops

✓ Missing requirements in the beginning (dead KM)

✓ Building competency within available time constraints

✓ Timely availability of skilled labour

✓ Ensuring effective promotions & communications (ITS and its benefits)

✓ Initial resistance to change by crew – fear of scrutiny

Deployment

- ✓ Adherence to geo-fence routes by crew

- ✓ Adherence to schedules and trips by crew

- ✓ Ensuring multi-lingual trainings to crew

- ✓ Ensuring continuous and refresher training

- ✓ Other stakeholders

  - ▪ Getting timely approvals and support from various local authorities like hospitals, tourist spots, railways, for deploying the PIS display boards

Operations

- ✓ Control Room monitored and ITS enabled operations in Indian road conditions

- ✓ Ensuring security & maintenance of in-bus equipments and PIS boards

- ✓ Ensuring uninterrupted power supply at bus shelters (not owned by KSRTC)

- ✓ Effective usage of ITS by all categories of staff

- ✓ Integrating ITS system within KSRTC existing IT solutions

- ✓ Contract Management (Warranty, Adjudicator, LD imposition etc)

Operations

- ✓ Effective execution of Public Outreach & Communications prog

- ✓ Achieving key SLAs with respect to servicing and performance

- ✓ Enabling data availability for Mobile Application Users and ado

  of Data Sharing Policy

- ✓ Technology upgradation/enhancements like

   fuel automation, mobile app etc.

- ✓ Meeting ever increasing commuter requirements

- ✓ Replicating the same system to other cities

Benefits of ITS

Commuters	Management	Society
✓ Real Time Information on bus arrival and departure	✓ Real time Tracking of Buses	✓ Promotes Public Transport usage
✓ Real time tracking	✓ Control room monitoring	✓ Reduction in carbon foot prints
✓ Next stop bus announcement and display within the bus	✓ Dynamic scheduling of Buses	✓ Immediate access to accident/incident information
✓ Reduced waiting time at bus shelters	✓ Schedule rationalization and Overtime reduction	✓ Brings down traffic congestion
✓ Comfortable Trip planning	✓ Digitalization of operations	✓ Safety of commuters & pedestrians
✓ Value added SMS and IVRS Services	✓ Driving behavior analysis	✓ Involvement of all stakeholders
✓ Exclusive Commuter Portal – mitra.ksrtc.in/	✓ Tool to defend Motor Vehicle Claim Cases	
✓ Mobil app	✓ Cost reduction benefits	

## Passenger wait time in minutes
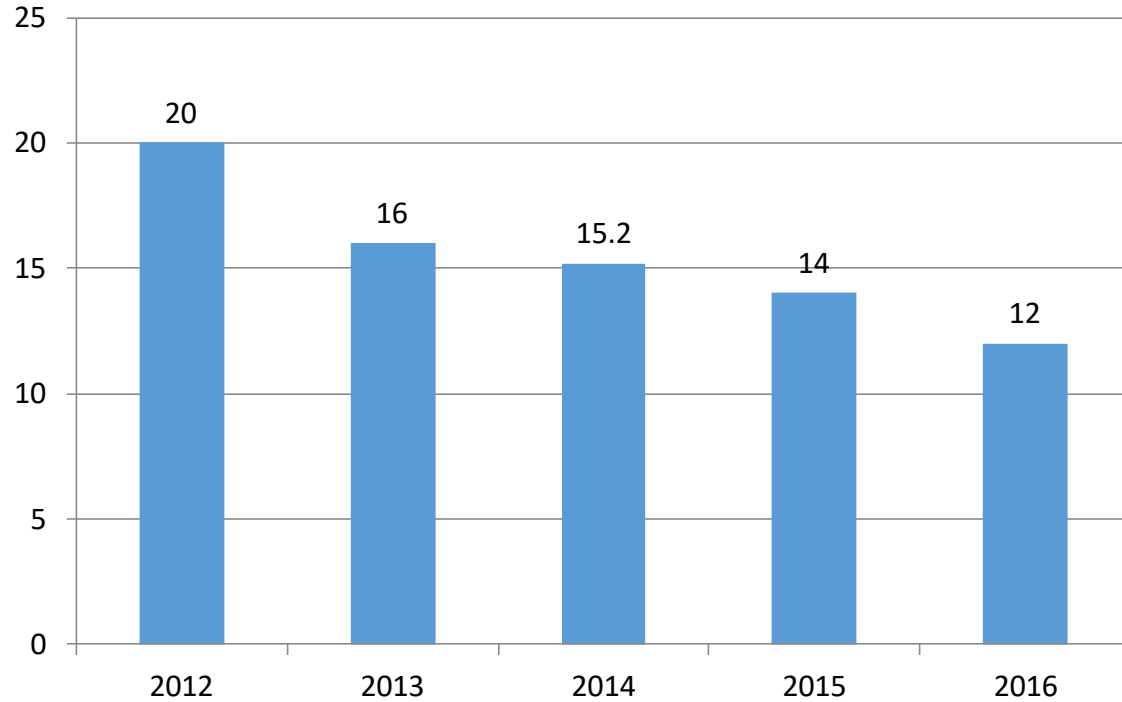
Source: M/s Intercontinental Technocrats Pvt Ltd. (Monitoring & Evaluation Consultants)

2016 estimated by KSRTC

Driving Behaviour

MONTH	BUS STOPS SKIPPED	SPEED VIOLATIONS	SUDDEN ACCELARATION	HARSH BRAKES
Oct-15	5	6	15	7
Jan-16	2	1	3	1
Apr-16	1	2	2	2
Jul-16	2	1	2	2
Jan-17	1	1	2	3

Modal share of KSRTC (%)
2016 estimated at 46.3%
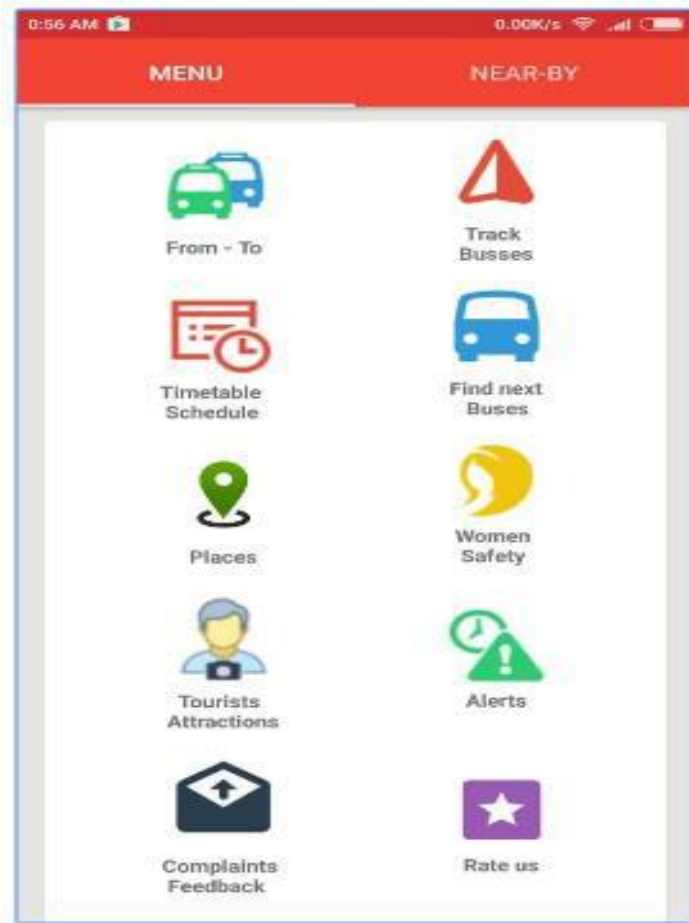
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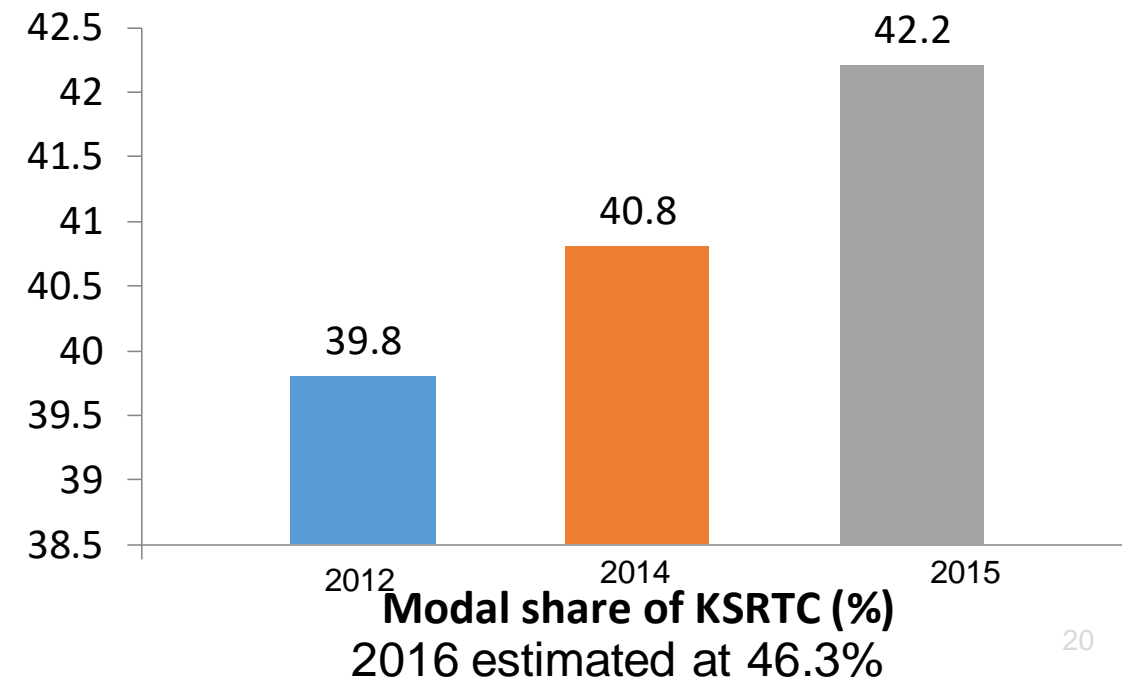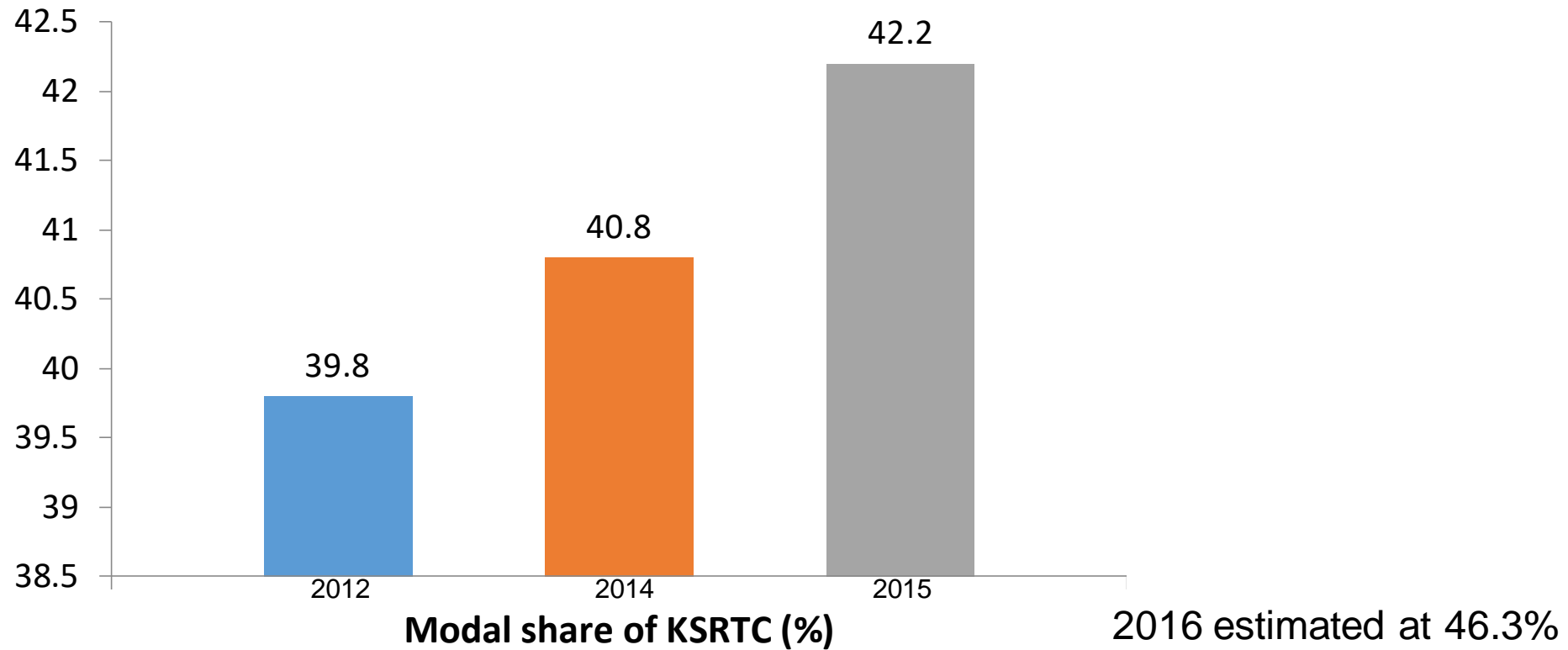
63% of commuters use bus schedule for planning their trip.

77% of commuters prefer getting bus arrival information at bus stops itself.

Source: M/s Intercontinental Technocrats Pvt Ltd. (Monitoring & Evaluation Consultants)

- Mobile App developed by students through Appathon
- More than 90 students attended in February 2016

MITRA-KSRTC-
Official App

Launch of Mobile App on 30th May, 2016 by Sri. D.S.Mishra, Additional Secretary, MoUD, GoI

SUTP Newsletter – March 2016 edition (http://sutpindia.com/skin/pdf/SUTP-Newsletter_Mar_2016.pdf**)**
"Dr. Humera Aiman shifted to Public transport because SMS Services instilled confidence".

Sustainability & Replicability…

- Performance audit by IISc-Bangalore,
- Independent Review & Monitoring Agency (IRMA)

The MoUD, GoI showcased Mysore Intelligent Transport System through video during Hon'ble Prime Minister of India visit in UN Climate Change Conference, COP 21 in Paris held from 30th Nov to 11th December, 2015.

National Media Meet organized in Feb-2017

Mysore ITS project featured in "What Makes a Sustainable City?" – A sampling of Global Case Studies Highlighting Innovative Approaches to Sustainability in Urban Areas published by World Bank Group.

https://openknowledge.worldbank.org/handle/10986/23580

KSRTC helping hands to other cities and Success story published by World Bank Report…

Way Forward...

- Organized Knowledge Exchange Workshops at Mysore

- More than 200 transport officials visited

- Implemented VTMS in 2000 buses

- ITS introduced in 1739 buses across 37 cities in Karnataka

- Rolling out VTMS in 16000

- Launching Public Outreach & Communications program

- Launch of Open Data Policy

- Integration with IT applications like fuel automation etc.,

CIRT Training Statistics

- **Total 167 - participants Chandigarh Transport undertaking, TNSTC, Sikkim Nationalized Transport, Uttarakhand, BEST, Solapur Municipal Transport, APSRC, TSRTC, GSRTC, Haryana, Meghalaya, Nagaland State Transport, KSRTC, NEKSRTC, Kalayan Dombivili, Calcutta Tramways, BMTC, Assam Transport Dept.etc and from MoRTH.**

Lessons Learnt

Project Planning

- Project Plan & Stakeholder Responsibilities
- Project Phasing
- Implementation Plan
- Site Surveys
- Documentation

Image source – www.employmentblawg.com

Project Procurement

- RFP Preparation & SLAs
- Selection Process
- Placement of PMC & Vendor on time

Lessons Learnt

Implementation

- Frequent site visits and reviews
- Installation
- Software & Hardware Deployment
- Training
- STU Operational Changes

Benchmarking and documentation

The Simplest Experiential Learning Cycle

DO IT.

What? What happened? What were the results?

So What? What do these results imply? How did I influence the outcome?

Now What? What will I do differently next time?

Image source – www.edbatista.com

Thank You