ESTABLISHING PERFORMANCE INDICATORS TO EFFECTIVELY MANAGE JANMARG BRTS

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Contents

Ahmedabad - Overview

- Area 465 sq km
- Population 2010: 5.5 m
- Population 2031: 10 m
- Compact City, Mixed Land use
- Ring-radial network
- Total vehicles 2 m
- Avg Trip Length 5.5 km
- Public Transport:
  - BRT
  - AMTS

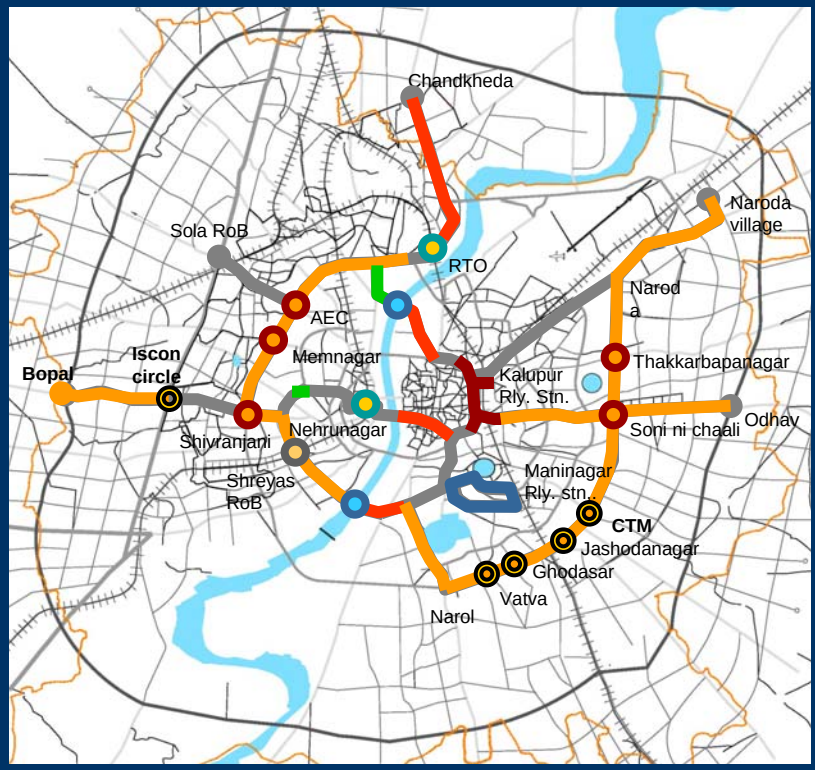
INTRODUCTION : AJL

- Ahmedabad Janmarg Limited (AJL) is a special purpose vehicle (SPV) set up by Ahmedabad Municipal Corporation (AMC);
- AJL to provide Bus Rapid Transit (BRT) services within the city of Ahmedabad;
- AJL is responsible for smooth, efficient and effective operations and maintenance of BRTS;
- AMC is responsible for providing and maintaining infrastructure and facilities for its operations

AJL System Background

- NETWORK and Not Corridors - Connectivity of important origin and destinations
- Connect ‘busy places’ but avoid ‘busy roads’
- Low income, low accessibility zones (old walled city)
- Formation of strong network for flexible route operations
- 80% of the network passes through low and middle income household areas.

To upgrade the overall mobility of the city



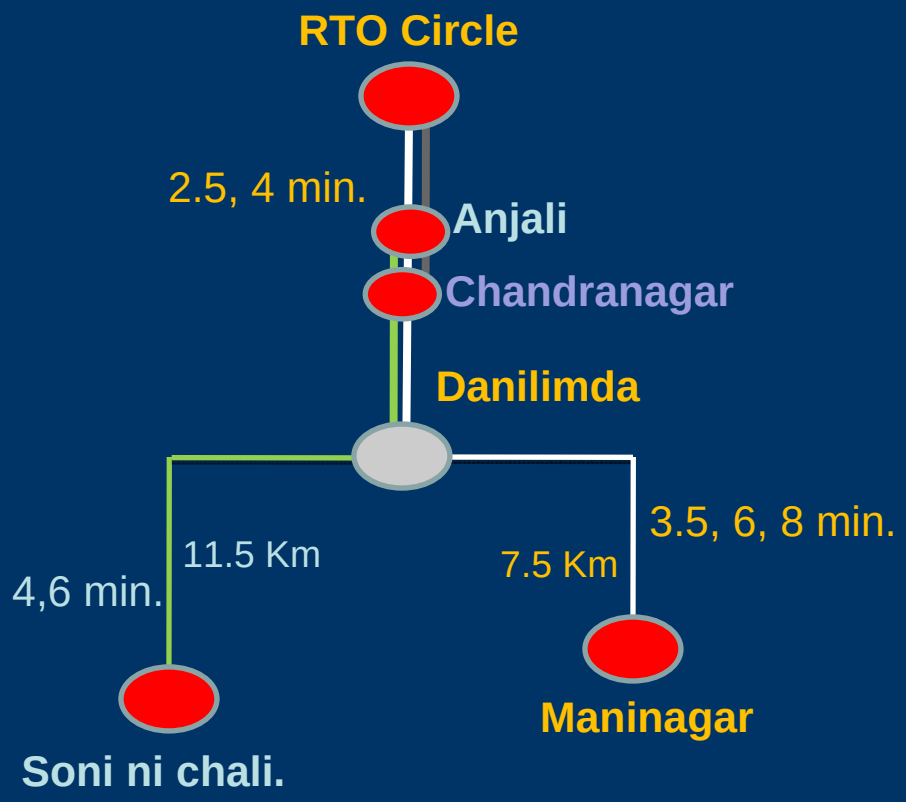
BRTS System Profile

- As of 15 October 2010
  - Service Span:
  - Operational Timings: 6:00 AM -- 11:30 PM.
  - Peak hours : 8:00 AM – 11:00 AM 5:30 PM – 8:30 PM
  - Network Km: 34 km
  - Daily Ridership: 84,000 passengers
  - Daily km per bus: 240 km
  - Daily revenue collection per bus: 10069 INR
- AJL transported 1,65,56,954 passengers and provided 24,90,370 kilometres of service in its first year.

BRTS Routes

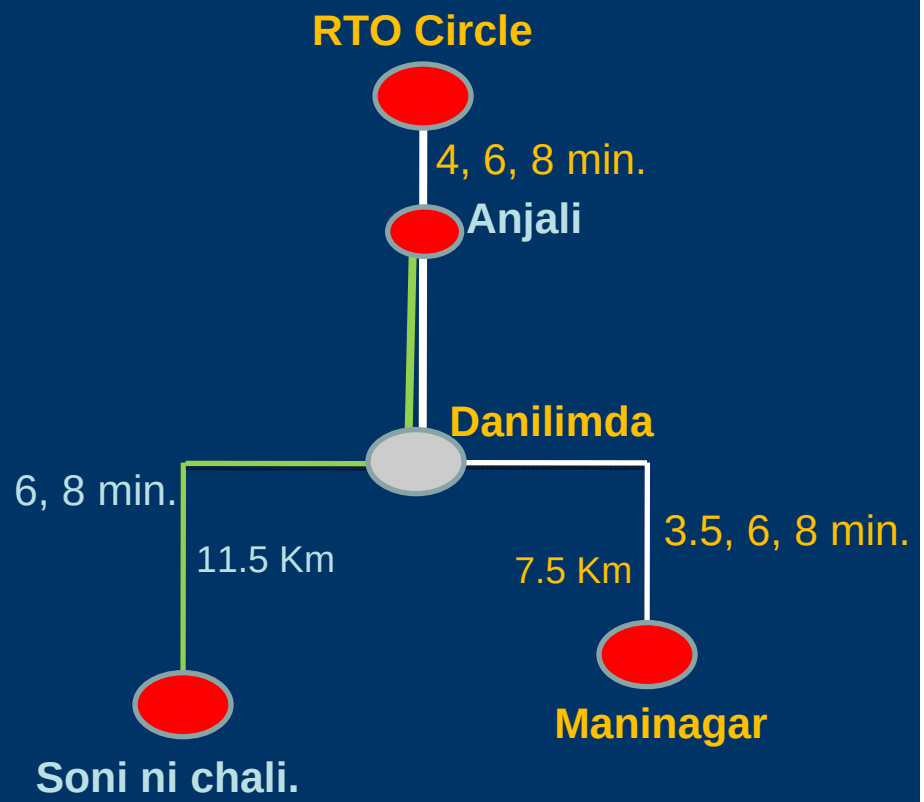
1. RTO – Maninagar loop : whole day at 2.5, 6, 8 minute frequency (31 buses)
2. Anjali – Soni ni Chali : whole day at 4, 6 and 8 minute frequency (14 buses)

Routes operated during Peak hours- 3 routes



Total No. of buses: 45
Overlapping segment : Anjali – Danilimbda
(2.1 km whole day)

Routes operated during off peak hours- 2 routes



Total No. of buses: 45
Overlapping segment : Anjali - Danilimbda
(2.1 km whole day)

BRTS System Elements

Vehicles: EURO III Diesel Buses, central doors, high floor, flat floor inside vehicle

Running Ways: Central Running Way, Closed System

Stations: Accessible, Level Boarding, 2 vehicles on either side

ITS: Public Information, Fare Collection, Automatic Vehicle Location Systems

Performance Measure and Monitoring:

- Performance Measure :
  - The performance measure through a systematic setting allows organization to evaluate its goals and use the information to improve its performance.
  - This tool is particularly important to provide consistent service with minimal resources and changing demand.
- Performance Monitoring:
  - the first step toward efficient and proactive management
  - to provide detailed, comprehensive information related to the performance of system so that corrective actions can be taken

Performance Measure : Literature

- *TCRP Report 88: A Guidebook for Developing a Transit Performance-Measurement*
  - customer, community, agency, driver /operator
- *TCRP Web Report 6: Transit Capacity and Quality of Service Manual (1999*)
  - the operator, passenger and vehicle point of view
- *Regional Transit Performance Indicators: A Performance Measurement Model,* (*Nakanishi, Yuko J., and G.F. List, 2000)*
  - stakeholder acceptance, reliability, clarity, number of measures, flexibility, timeliness and integration into agency decision making.

Performance Measure : AJL

- AJL BRTS system focused on Service Quality and Operational Efficiency

- Service Quality
  - reliability of service,
  - vehicle experience,
  - customer service

- Operational Efficiency
  - Expenditure
  - Revenues
  - Passengers
  - Safety and Reliability

Data Collection

- Internal :
  - Integrated Transit Management System
    - Automated Fare Collection System (AFC)
    - Automatic Vehicle Location System (AVL)
    - Passenger Information System (PIS)
    - Financial Management System (FMS)
- External : Surveys
  - Customer Survey
  - Vehicle and Station Maintenance Surveys
  - Operator Surveys

BRTS Performance: Trial Runs

- Three months – July 2009 – October 2009
- Goals:
  - Marketing and Educational Outreach for all stakeholders;
  - Testing systems such as docking of vehicles, turnstiles, public information systems, schedule run and cycle times, intersection management.
  - Surveys:
  - Each of the three months 200 survey were administered
  - The six surveys were designed to monitor the on time performance, system speed, system operator performance, daily ridership and activity, vehicle maintenance, and peak /off peak service performance in addition to customer satisfaction survey

BRTS Performance: Trial Runs

- Service Quality and Travel Behaviour

VEHICLE OWNERSHIP	
only Bicycle	22%
Only 2-wheeler	**60%**
2-Wheeler & 4- Wheeler	16%
None	2%

MODE USED BEFORE BRTS	
AMTS	**55%**
GSRTC	1%
Auto	11%
Shuttle	4%
Private vehicle	26%
Walk	4%

WILLINGNESS TO PAY MORE FOR BRTS	
Rs 1 - 7	42%
Rs 2 -10	**46%**
Rs 3 - 12	12%

PURPOSE FOR BRTS TRIP	
Education	18%
Work	**54%**
Social	28%

- Several written suggestion ranging from overcrowding during peak to comfortable ride, pedestrian crossings, safety
- AJL / CoE identified need to have rating for the system in additional to written comments

BRTS Performance: Trial Runs

Operational Efficiency Performance

1. On Time Performance:
   - 8 buses on time, 5 before time and 1 late – evening peak
2. Operator Performance:
   - vehicle docking and operator performance
   - If the gap between the vehicle and the station is less than 2”, the docking is considered perfect. The result showed that out of 28 operators, only handful had perfect docking at all times, more than 50 % (16 out of 28 operators) had initial problems with docking.
3. Ridership:
   - average daily ridership was between 18,000 to 25,000 passenger

BRTS Performance: Trial Runs

Operational Efficiency Performance

4. Vehicle and Station Maintenance:
   - A survey form of bus check is filled by system Operator SO's before start of their shift.
   - checked inside and outside of the bus for safe and clean bus
5. System Speed:
   - 24 km /hr
6. Peak hour monitoring:
   - Continuous monitoring of schedule of buses and peak hour

Trial Runs: Interpretations and Actions

- Operator Performance
  - improved system operator performance in areas of docking, and overall ride
  - Improved docking performance
- System speed was calibrated and policy speed limit was set at 25 kms/ hr.
- The peak route headway was adjusted as per demand and headways during peak was reduced from 6 min to 5 min.
- Peak travel direction was established from RTO to Chandranagar in the morning and reverse in the evening
- Customer Survey modified to add more specific input

BRTS Performance: First Year

System Goals

- The BRTS started with motto “Towards SAFE, ACCESSIBLE and EFFICIENT transport system. The system goals for AJL are
- To provide excellent quality of service to its customers
- To provide effective and efficient service to the community

Performance Measures

- Passengers
- Revenues
- Expenditure
- **Safety and Reliability (Added after fifth month)**

BRTS Performance: Passengers

	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th month	11th month	12th month
Route	R.T.O.-Chandranagar	R.T.O.-Chandranagar	R.T.O.-Kankaria	R.T.O.-Kankaria	R.T.O.-Kankaria	R.T.O.-Kankaria	R.T.O – Man. R.T.O - Narol	R.T.O – Man., R.T.O – Narol Anjali - Narol	R.T.O-Man., R.T.O – JN Anjali - JN	R.T.O-Man., R.T.O – JN Anjali - JN	R.T.O-Man., Anjali – Soni ni Chali	R.T.O-Man., RTO to CN Anjali – Soni ni Chali
Total buses operate/day	18	18	18-23	23	23 & 25 on Sunday	23	39 after 27 April (23 before)	39	41	41	43 after 9th Sept.(41 before)	45 after 25th Sept.(43 before)
Total Pax.	536749	715653 (33.3%)	971645 (81%)	1105814 (106%)	1090148 (103.1%)	1152704 (114.8%)	1512452 (182%)	1587426 (196%)	1729261 (222%)	1941532 (262%)	2162557 (305%)	2051013 (282%)
Avg. pax/day	17315	23086 (33.3%)	31343 (81.02%)	35672 (106%)	35166 (103.1%)	37184 (114.8%)	48789 (182%)	51207 (196%)	57394 (231%)	63,696 (268%)	69,759 (305%)	82,041 (410%)
Avg pax./bus/day	962	1283 (33%)	1416 (47%)	1551(61%)	1510 (57%)	1613 (68.%)	1484 (54%)	1314 (37%)	1381 (44%)	1554 (62%)	1673(74.8%)	1865 (94%)

Issues and Actions:

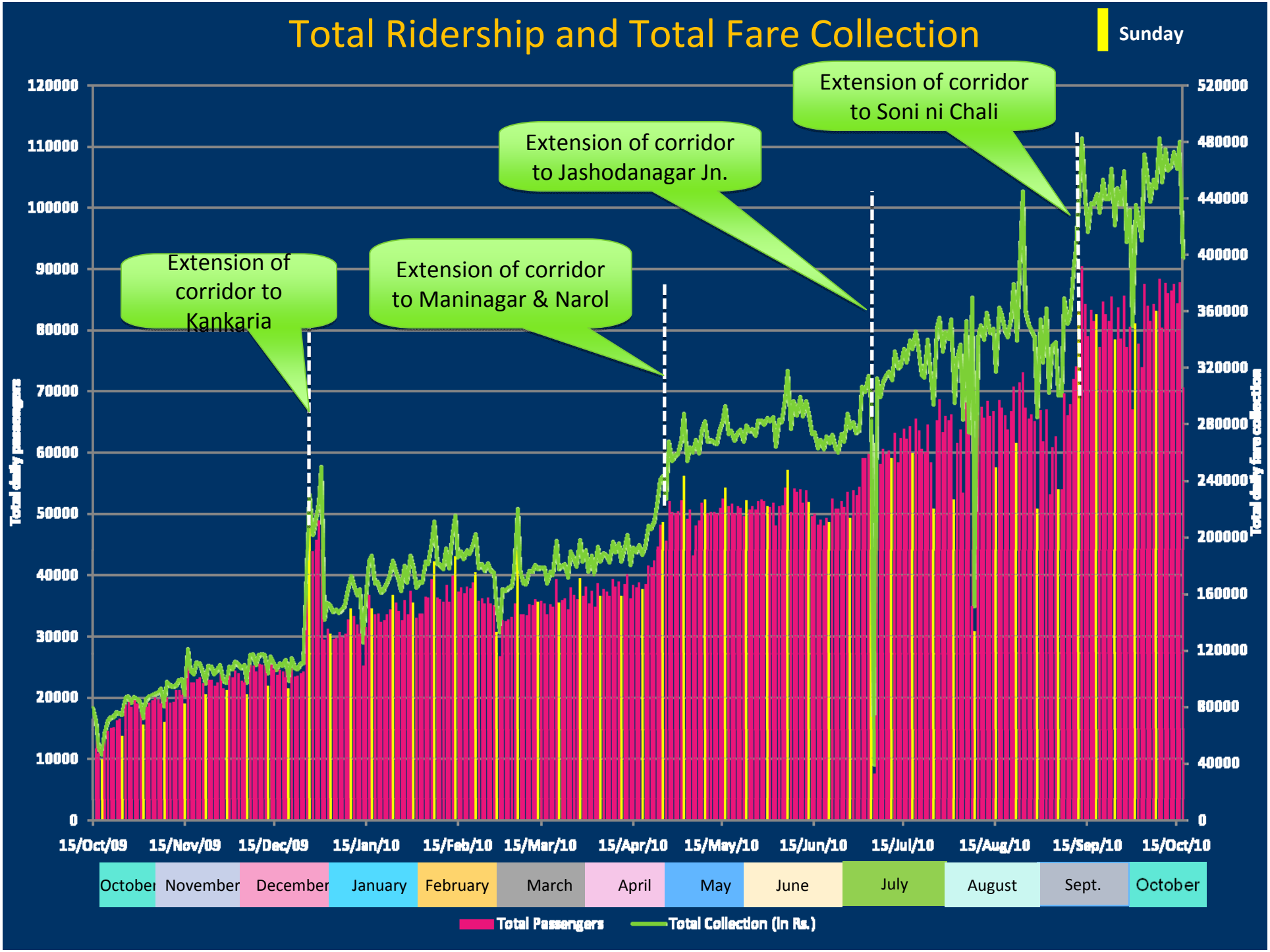
- Service to Kankaria lake in 3rd month changed the schedules
- More service needed on Sunday than weekday
- Social trips increased from 12% to 20%
- Sunday headway 4 min in late afternoon

BRTS Performance: Revenues

	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th month	11th month	12th month
Avg. Trip Length												
Week day	4.16	4.28	4.84	4.97	4.92	5.1	5.5	6.12	5.64	5.8	5.8	5.8
Weekend	NA	NA	5.54	5.89	6.33	6	6.10	6.20	6.41	6.4	6.1	6.3
Total buses operate/day	18	18	18-23	23	23 & 25 on Sunday	23	39 after 27 April (23 before)	39	41	41	43 after 9th Sept.(41 before)	45 after 25th Sept.(43 before)
Avg. Total Kms/bus /day	207 km	207 km	226 km	240 km	243 km	240 km	255 km	223 km	220 km	226 km	245km	240km
Total fare collection (INR)	2511888	3333705 (32.7%)	4664693 (85.7%)	5545853 (121%)	5463349 (117.5%)	5766524 (129.6%)	7929919 (216%)	8684495 (246%)	9087824 (262%)	10185731 (306%)	11692323 (368%)	11076507 (341%)
Avg. collection /day (INR)	81029	107539 (32.7%)	150474 (85.7%)	178898.5 (121%)	176237.1 (117.5%)	186016.9 (129.6%)	255804 (216%)	280145 (246%)	293155 (262%)	334488 (313%)	377,172 (368%)	443,061 (447%)
Avg. collection /bus/day	4502	5974 (32.7%)	6785 (50.7%)	7778 (72.8%)	7568 (68.1%)	8068 (79.2%)	7731 (71.7%)	7189 (59.7%)	7260 (61.3%)	8158 (81%)	9045 (102%)	10069 (124%)

Issues and Actions:

- Daily passengers increased over 410% and revenues increased over 440 %


Total Ridership and Total Fare Collection
Sunday
Extension of corridor to Kankaria
Extension of corridor to Maninagar & Narol
Extension of corridor to Jashodanagar Jn.
Extension of corridor to Soni ni Chali
Total daily passengers
Total daily fare collection
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
520000
480000
440000
400000
360000
320000
280000
240000
200000
160000
120000
80000
40000
0
15/Oct/09
15/Nov/09
15/Dec/09
15/Jan/10
15/Feb/10
15/Mar/10
15/Apr/10
15/May/10
15/Jun/10
15/Jul/10
15/Aug/10
15/Sep/10
15/Oct/10
October
November
December
January
February
March
April
May
June
July
August
Sept.
October
Total Passengers
Total Collection (in Rs.)

BRTS Performance: Expenditure

	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month
Total buses operate/day	18	18	18-23	23	23 & 25 on Sunday	23	39 after 27 April (23 before)	39	41	41	43 after 9th Sept.(41 before)	45 after 25th Sept.(43 before)
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Avg. collection /bus/day	4502	5974 -32.70%	6785 -50.70%	7778 -72.80%	7568 -68.10%	8068 (79.2%)	7731 (71.7%)	7189 -59.70%	7260 -61.30%	8158 -81.00%	9045 -102.00%	10069 -124.00%
Buses on road during off peak in %	50%	50%	40%	50%	50%	50%	54%	54%	56%	75%	62.50%	73%
% Revenue kms	90.30%	90.30%	96.60%	98.30%	98.30%	98.30%	98.6%	98.60%	98.50%	98.60%	98.60%	98.70%
% of Non-revenue kms	9.70%	9.70%	3.40%	1.70%	1.70%	1.70%	1.4%	1.40%	1.50%	1.40%	1.40%	1.30%
fppk												
Week day	1.08	1.07	1.02	0.99	0.98	0.97	0. 92	0.87	0.92	0.92	0.88	0.92
Weekend	NA	NA	0.94	0.91	0.88	0.94	0.88	0.85	0.87	0.88	0.81	0.89
Operating Ratio for Bus Operator	0.66	0.87	0.88	0.97	0.92	0.97	0.92	0.91	0.94	0.97	1.02	1.16

BRTS Performance: Safety and Reliability

	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th month	11th month	12th month
Load factor Week day Weekend	36% NA	48% NA	44% 49%	45% 62%	46% 59%	54% 60%	63% 71%	56% 72%	54% 63%	59% 66%	66% 62%	67% 65%
Inverse of (Breakdown/ 1000 KM)	10.15	37.21	25.73	55.8	42.6	56.08	25.5	**12.84**	**13.23**	**11.68**	**10.19**	**11.62**
Inverse of (accidents/ 1000 KM)	50.38	100.75	74.56	27.42	27.9	41.33	62.86	53.18	53.30	57.54	38.96	104.18
(Fatality rate / 1000 Km) for BRTS	0	0	0	0	0.01	0	0	0	0	0	0.01	0
Avg.Speed of BRTS	26	26	25	24.5	24.3	24.8	25	24.7	24.2	24	24	24

Issues and Actions:

- Safe driving issue : Driver training mid-year, incentives for operator since first year (PF, 500 IN for 3 month accident free incident, 5 best operators of month)
- Speeding: Operator driving speed monitoring by survey
- Maintenance: Surveys for bus before service

Accidents involving BRTS Vehicles

Accidents	1st Month (15 Oct–14 Nov '09)	2nd Month (15 Nov – 15 Dec '09)	3rd Month (16Dec '09 – 15 Jan '10)	4th Month (16 Jan–15Feb '10)	5th Month (16 Feb–18 Mar '10)	6th Month (19 Mar–18 Apr '10)	7th Month (19 Apr–19 May '10)	8th Month (20 May - 19 Jun '10)	9th Month (20 Jun '10 – 20 Jul '10)	10th month (21 Jul '10 – 20 Aug '10)	11th month (21 Aug '10 – 20 Sep '10)	12th month 21Sep'10-15 Oct '10
Total number of accidents	2	1	2	6	6	4	4	5	5	5	8	1
Fatalities	0	0	0	0	1	0	0	0	0	0	2	0
Serious injury	0	1	0	0	0	0	0	0	0	0	1	0
Minor injury	0	0	0	2	1	0	0	0	1	2	0	0
No injury	2	0	2	4	4	4	4	5	4	3	5	1
Safety= Inverse of (accidents/Thousand KM)	50.38	100.75	74.56	27.42	27.9	41.33	62.86	53.18	53.30	57.54	38.96	104.18

- Accidents during twelfth month involved a minor one.
- Reliability of service increased to 11.62

Note: Higher the number of accidents lower is the safety. Also depends on no. of kms

BRTS Performance: Service Quality

Surveys:

Customer Satisfaction

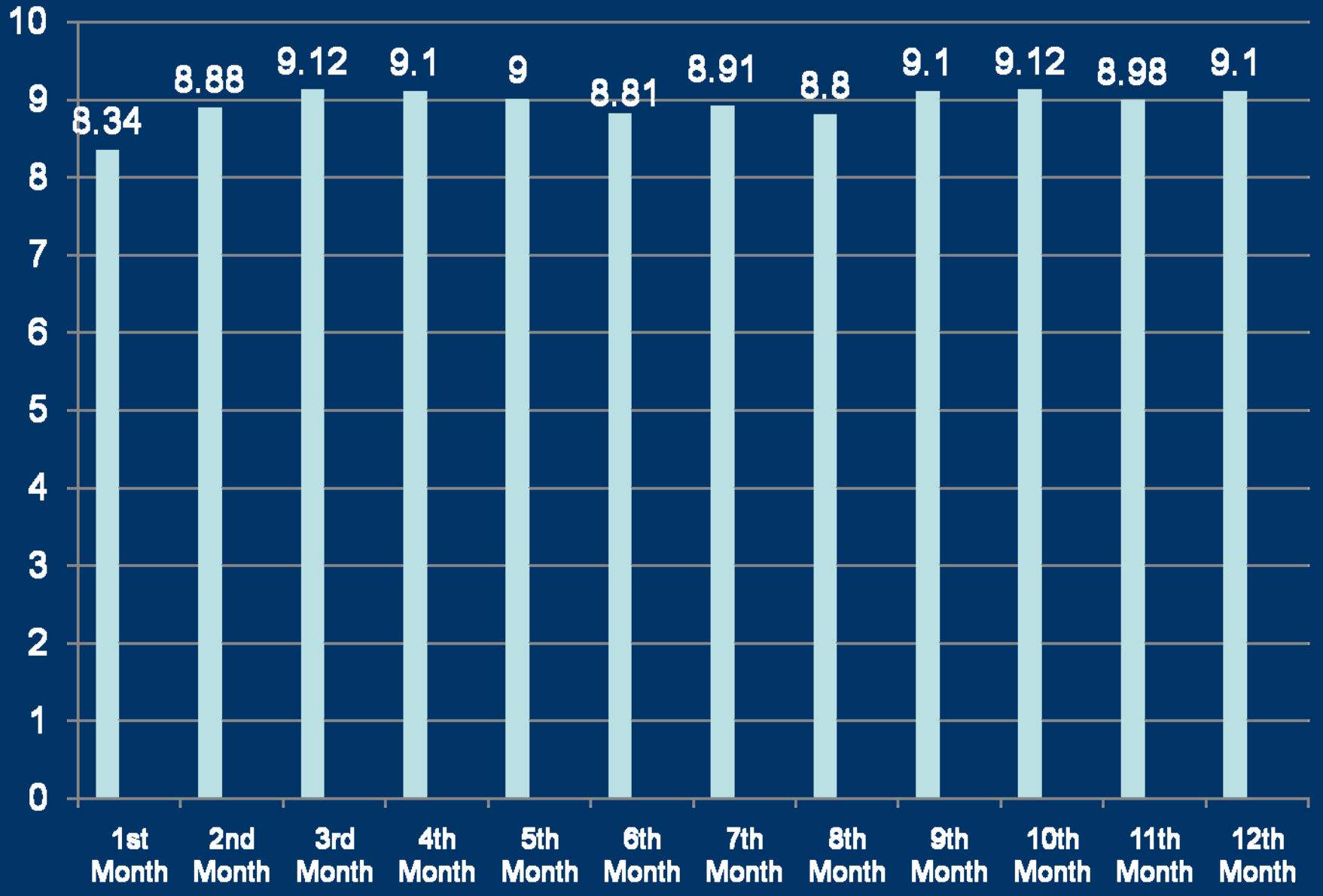
Vehicle and Station Cleanliness

Operator Driving

Issues and Actions:

- Safe driving issue :
- Maintenance:
- Vehicle docking:
- Active recruitment by AJL to hire managers and field officers
- Ongoing training of AJL staff and service operators

Service Quality : Customer Satisfaction

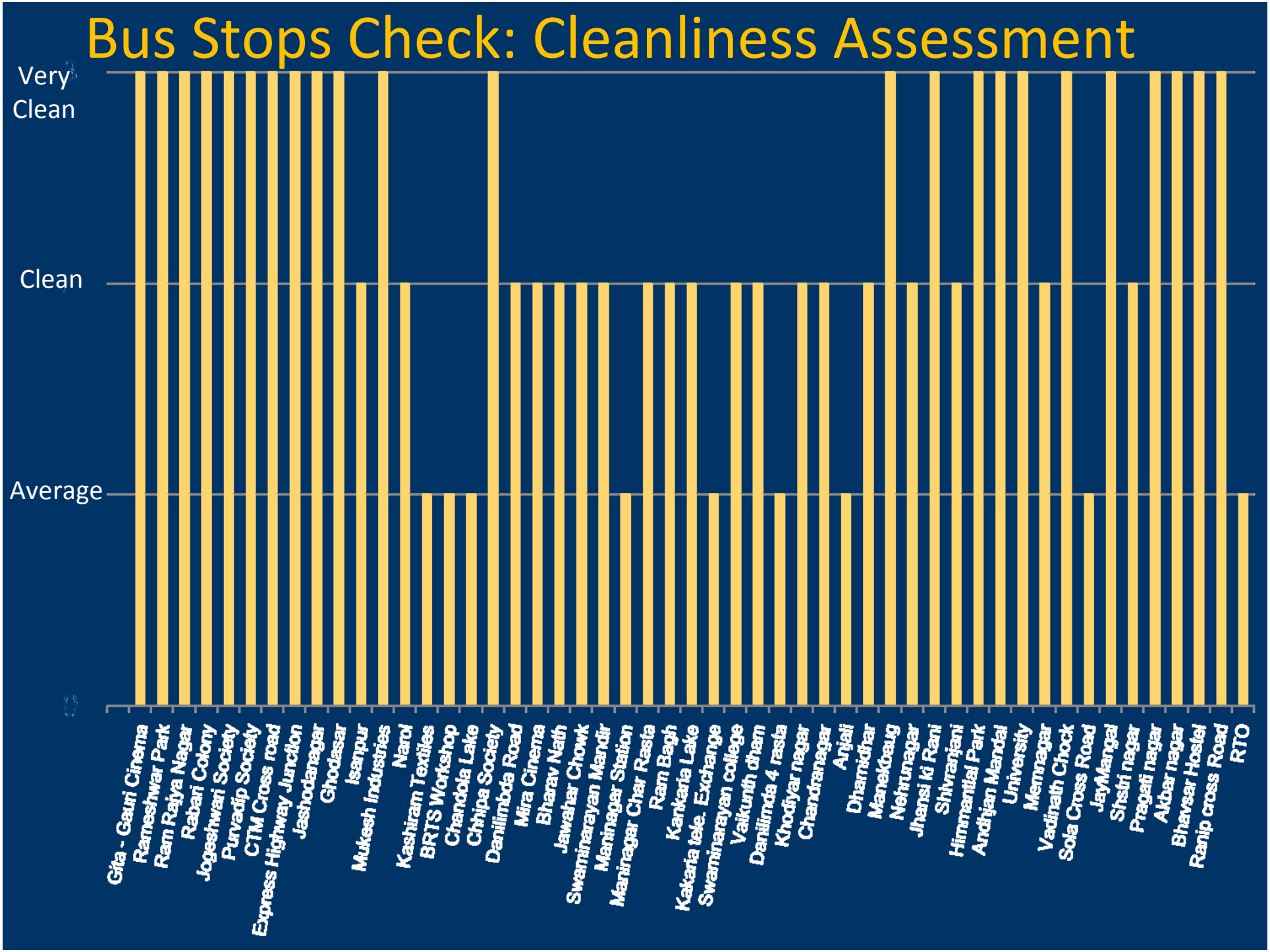


SO'sDriving Check

Bus Reg. No.	Docking	Smooth Driving	Noise	Vibration
3103	perfect	N (some jerks)	N	N
4854	Almost perfect	Y	N	Y
8796	Perfect	Y	Y	N
8796	perfect	N (some jerks)	Y	Y
8798	Almost perfect	N (some jerks)	N	Y
9006	Perfect	N (some jerks)	N	N
9006	Almost perfect	Y	N	N
9007	Perfect	Y	N	N
9008	Perfect	Y	N	N
9008	Almost perfect	Y	N	N
9010	Slightly far	N	N	N
9010	Perfect	N	Y	N
9012	Almost perfect	Y	N	N
9014	Perfect	Y	Y	N
9014	perfect	N (some jerks)	N	N
9015	Slightly far	N (some jerks)	N	N
9036	Almost perfect	Y	N	N
9041	Almost perfect	Y	N	N

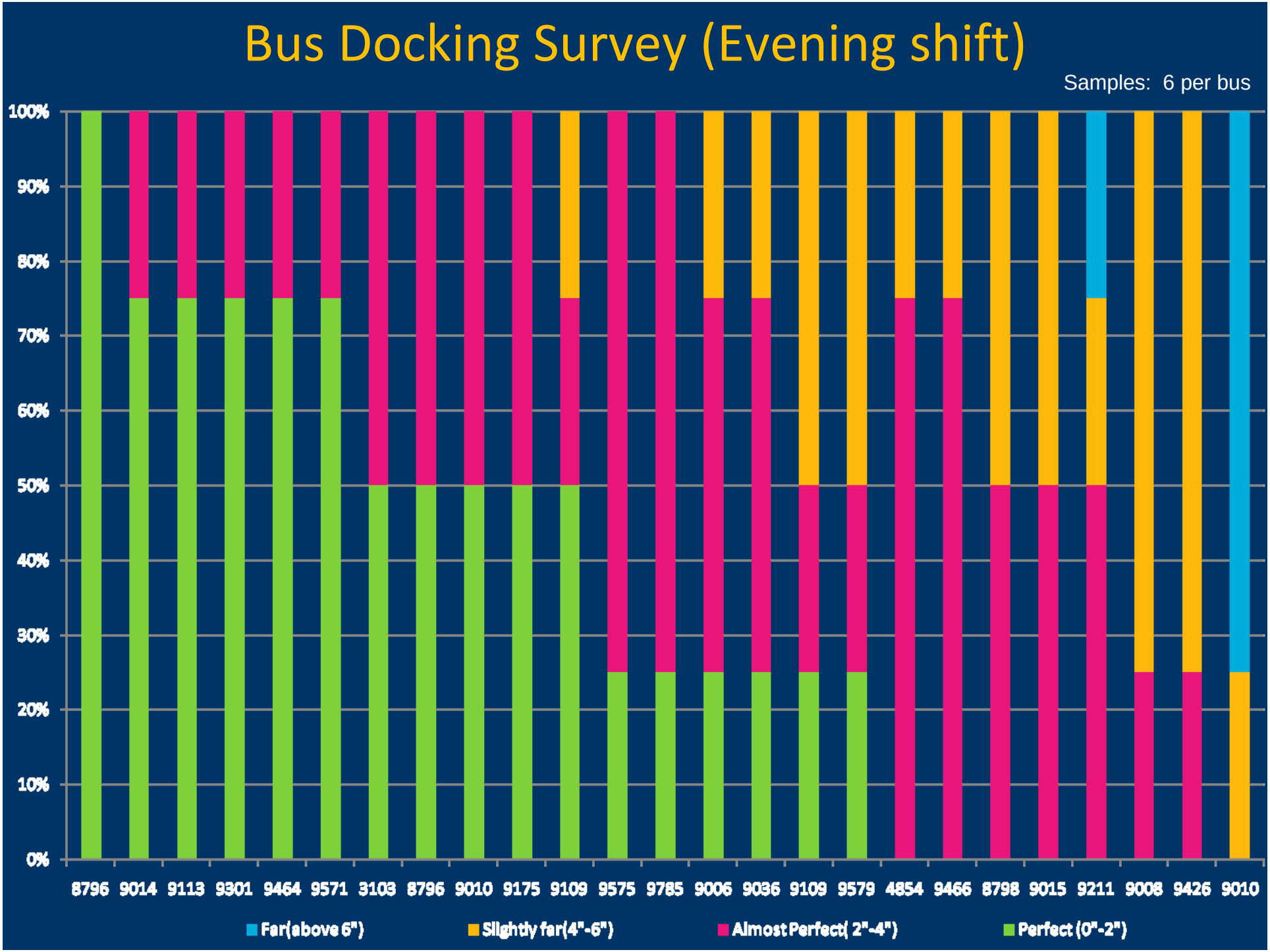
Bus Reg. No.	Docking	Smooth Driving	Noise	Vibration
9075	Almost perfect	Y	N	Y
9109	slighty far	N (some jerks)	N	Y
9109	perfect	N (some jerks)	N	N
9111	slighty far	N (some jerks)	N	N
9113	perfect	Y	N	N
9175	Almost perfect	Y	N	N
9175	Almost perfect	N	Y	Y
9211	Almost perfect	Y	Y	Y
9426	slighty far	N (some jerks)	Y	N
9464	perfect	N (some jerks)	Y	N
9466	Almost perfect	N (some jerks)	Y	Y
9467	Perfect	Y	N	N
9571	perfect	N (some jerks)	Y	Y
9573	Slightly far	N	N	Y
9577	Almost Perfect	Y	N	N
9579	Almost perfect	Y	N	N
9579	slighty far	N (some jerks)	Y	Y
9785	Almost perfect	N	Y	Y

Bus Stops Check: Cleanliness Assessment



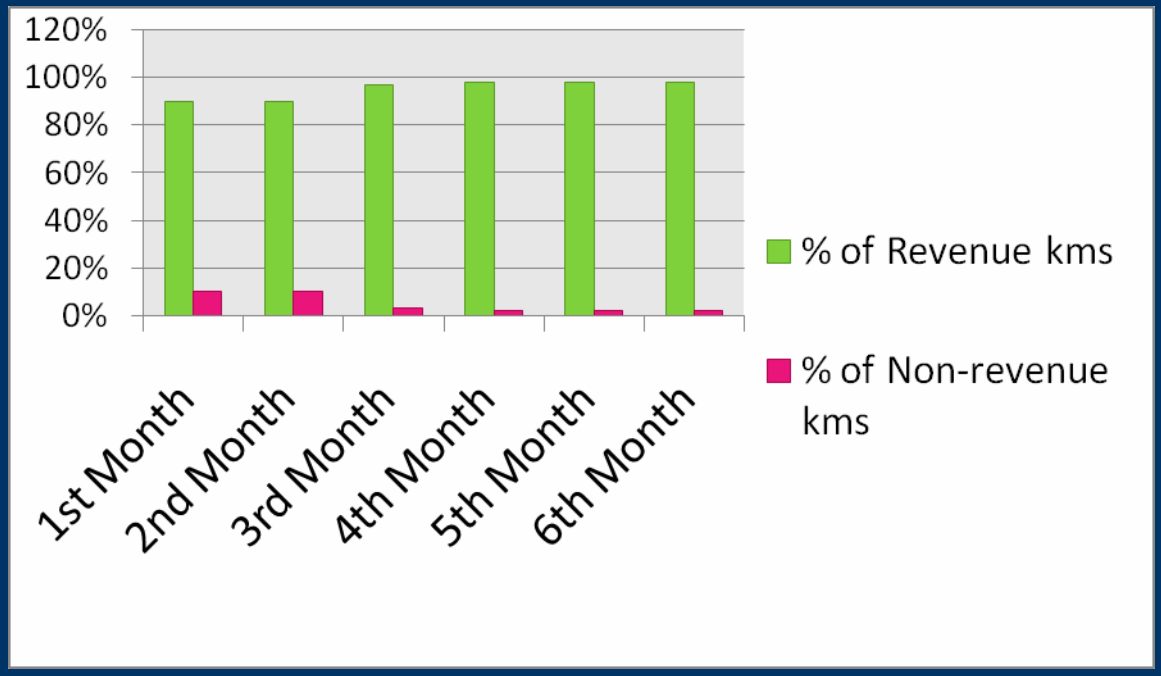
Bus Docking Survey (Evening shift)

Samples: 6 per bus



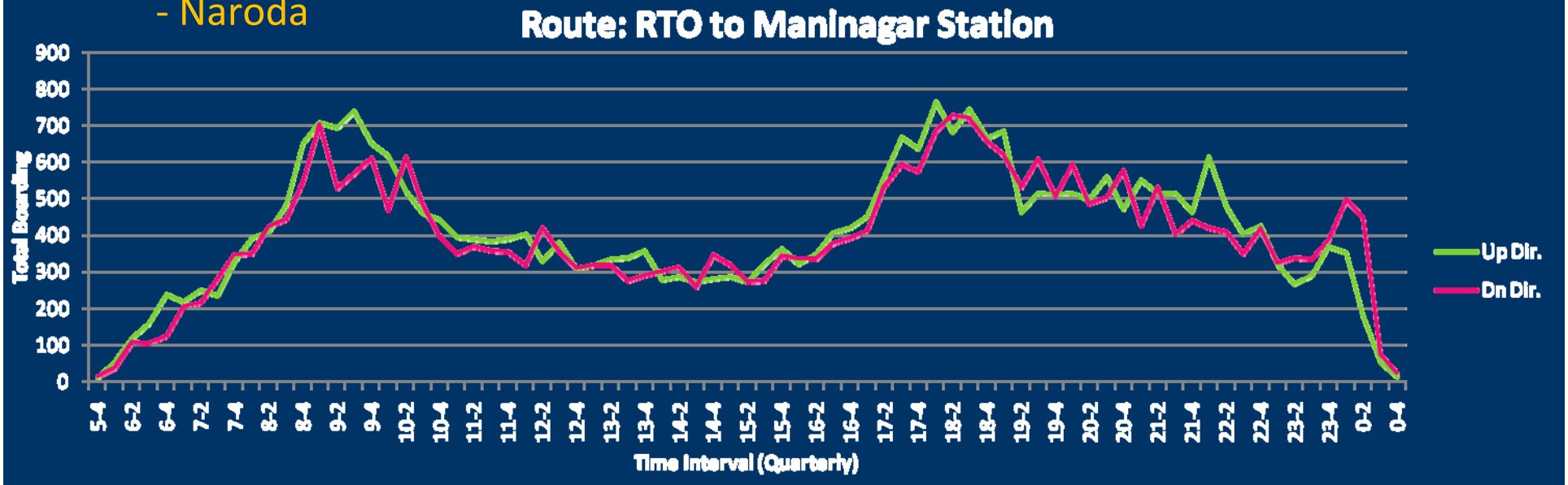
First Year: Interpretations and Actions

- With monitoring of schedule of vehicles and passenger activity per stop, AJL /CoE team were able to optimize the schedule to reduce the non revenue kilometres from 10 % to 2% just in six months.



First Year: Interpretations and Actions

- Customer Satisfaction surveys, passenger analysis every 15 mins
- Passenger activity is monitored on a daily basis
- Demand based scheduling method is adopted, peak headways changed from 6 min to 3.5 min
- Creation of two distinct routes at end of first year RTO – Maninagar, Anjali - Naroda



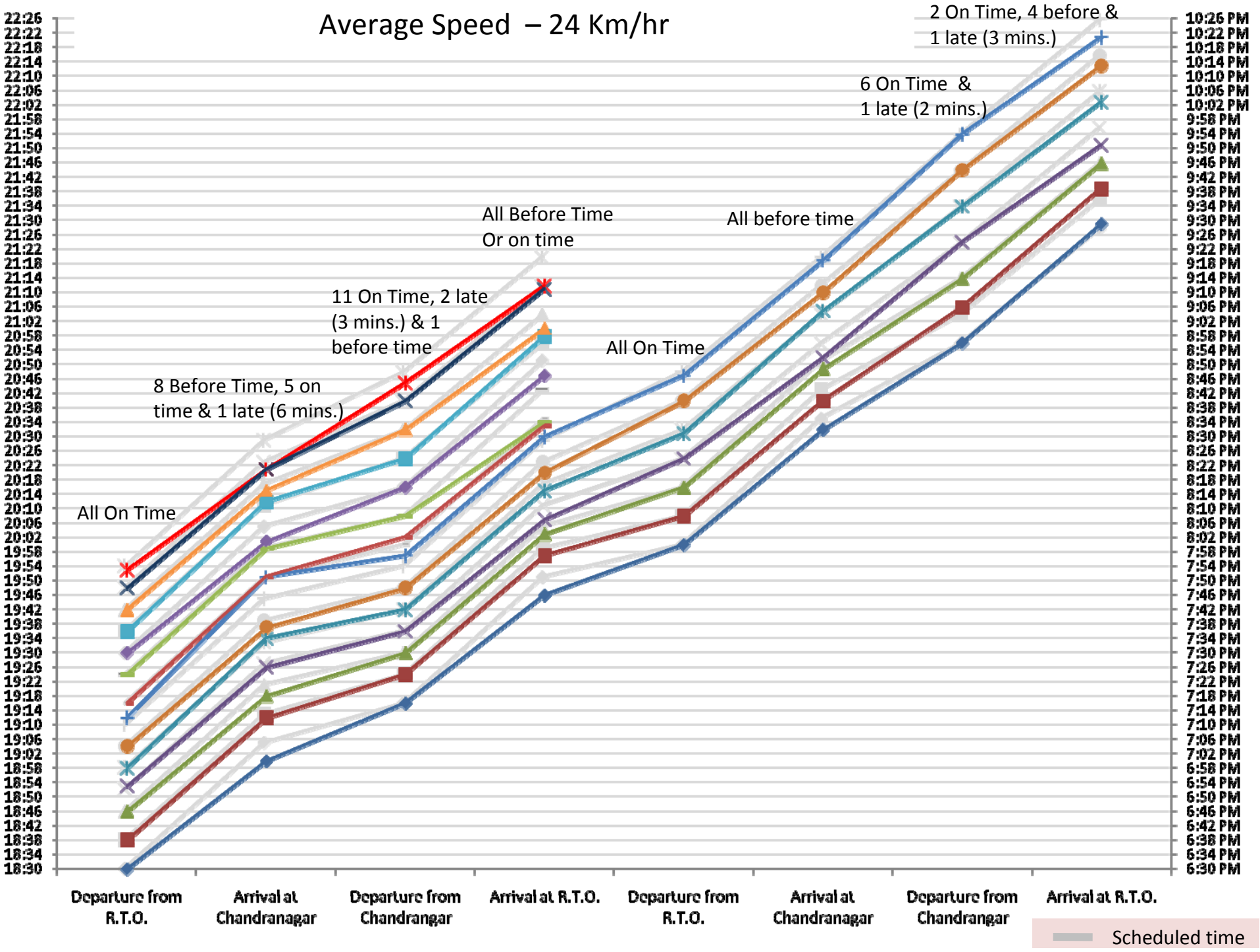
First Year: Interpretations and Actions

- Safety Issue
  - System speed is stable at 25 kms/ hr.
  - Operator training by AJL /Contractor
  - Operator Incentives by the contractors to reduce the turnover rate
  - Operator incentives include provident fund, monitory reward for accident free driving, operators of month award
- Passenger Comfort
  - Station and Vehicle survey to monitor cleanliness and other maintenance issue
  - Addition of field officers /managers to monitor vehicles during peak for bunching, on time performance and assist passengers at busy stations
  - Demand based headways reducing headways to 3.5 min

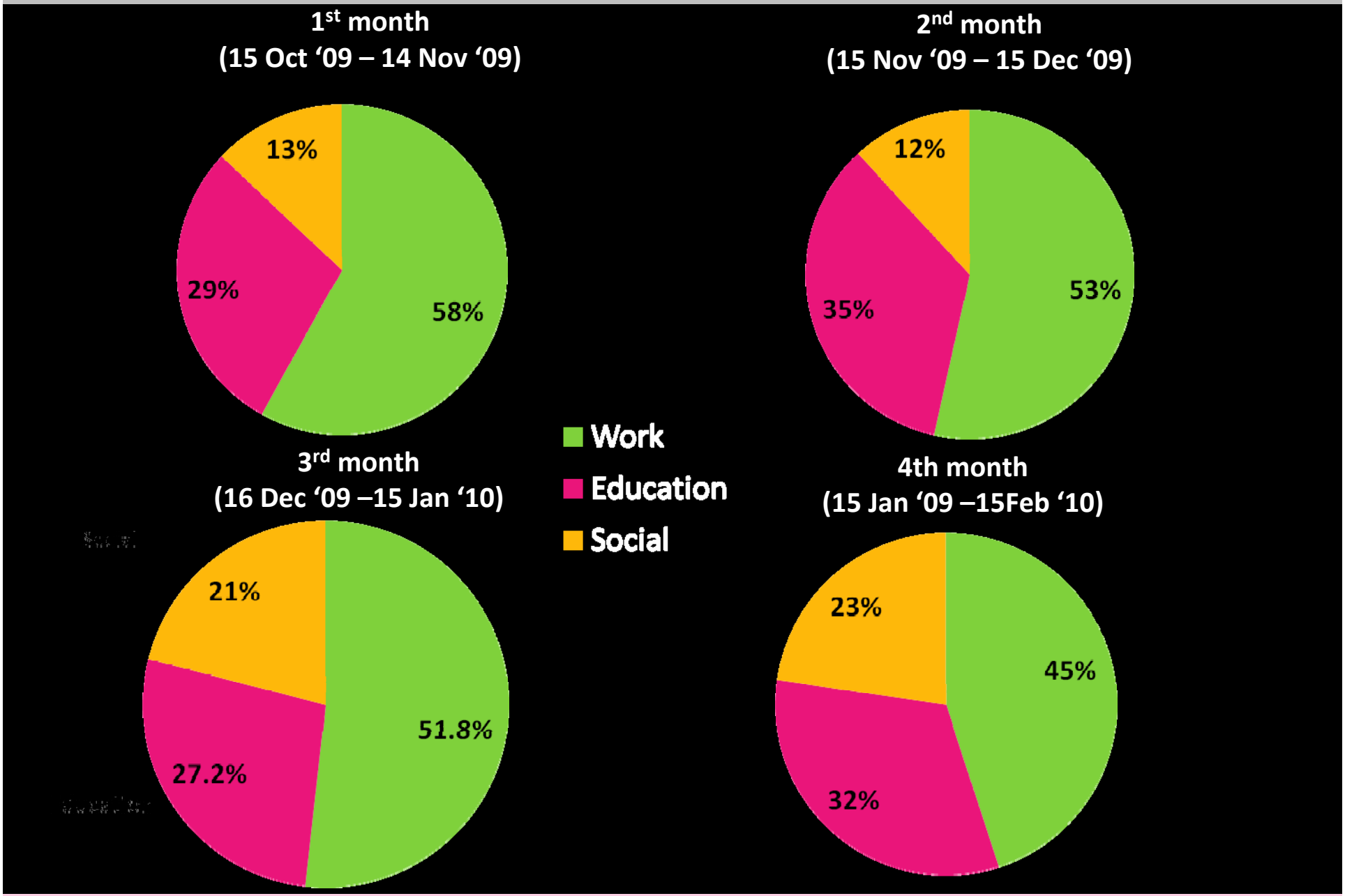
Outcome

- Understanding that as the system grows the monitoring and measures need to be added and adjusted
  - Route and System level measures need to be identifies separately

THANK YOU

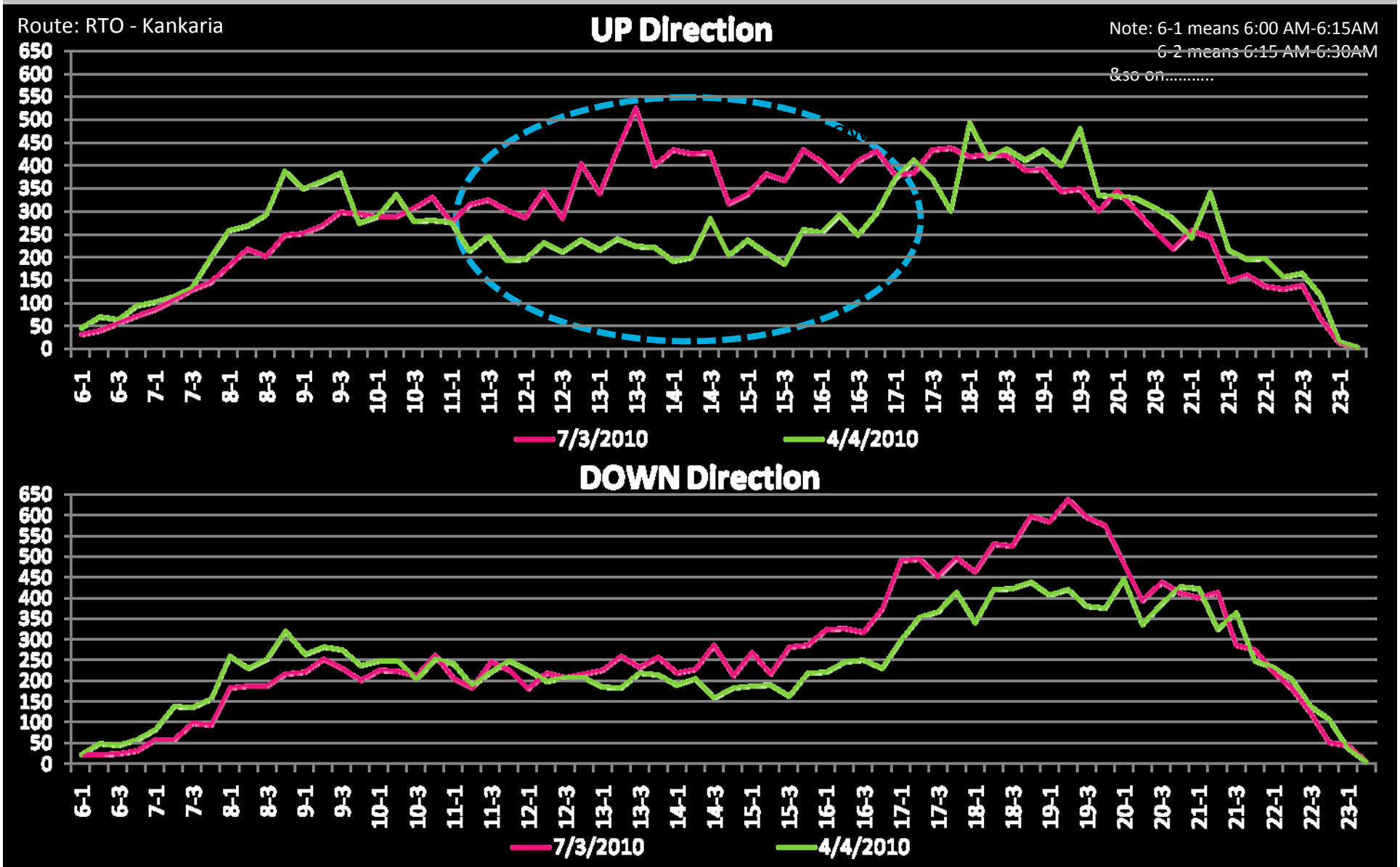

Average Speed – 24 Km/hr
All On Time
8 Before Time, 5 on time & 1 late (6 mins.)
11 On Time, 2 late (3 mins.) & 1 before time
All Before Time Or on time
All On Time
All before time
6 On Time & 1 late (2 mins.)
2 On Time, 4 before & 1 late (3 mins.)
Departure from R.T.O.
Arrival at Chandranagar
Departure from Chandrangar
Arrival at R.T.O.
Departure from R.T.O.
Arrival at Chandranagar
Departure from Chandrangar
Arrival at R.T.O.
Scheduled time

Purpose of Trip



Max. trips are for work

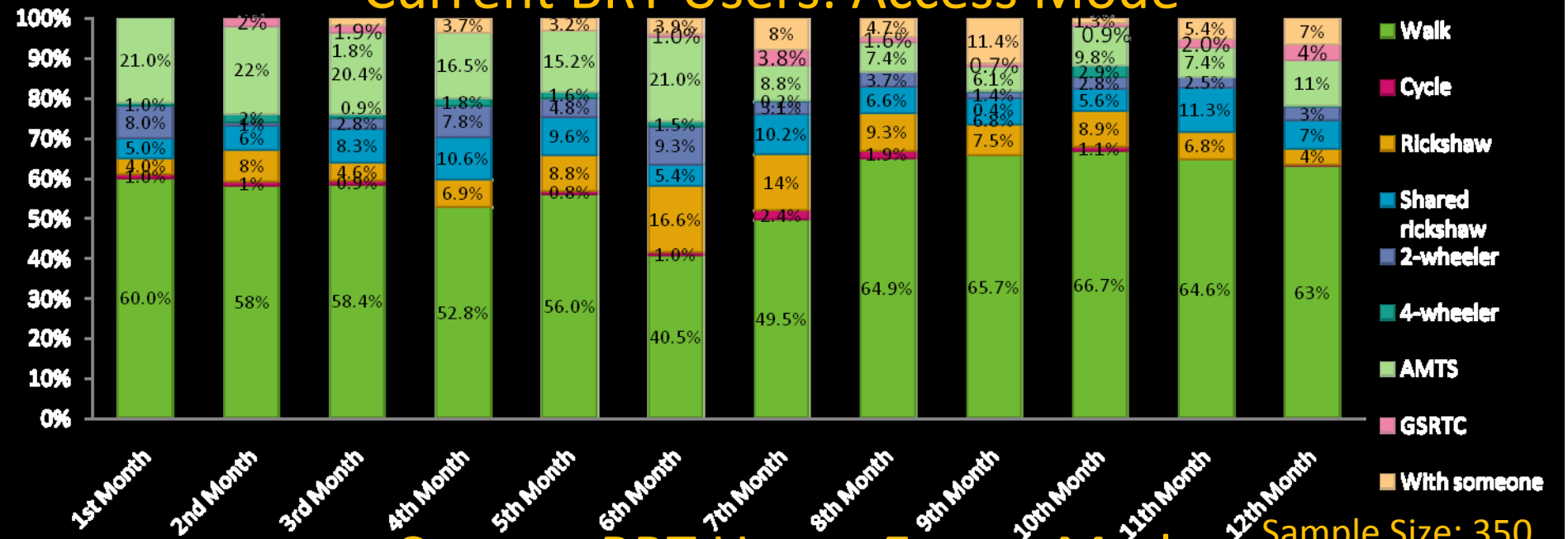
Pax. Trips at 15 minute time interval on 7th march '10 and 4th April '10



This scenario is only happens on weekends. The passenger traffic in afternoon hours have decreased in this month due to drastic increase in temperature. Passenger movement has shifted towards evening hours.

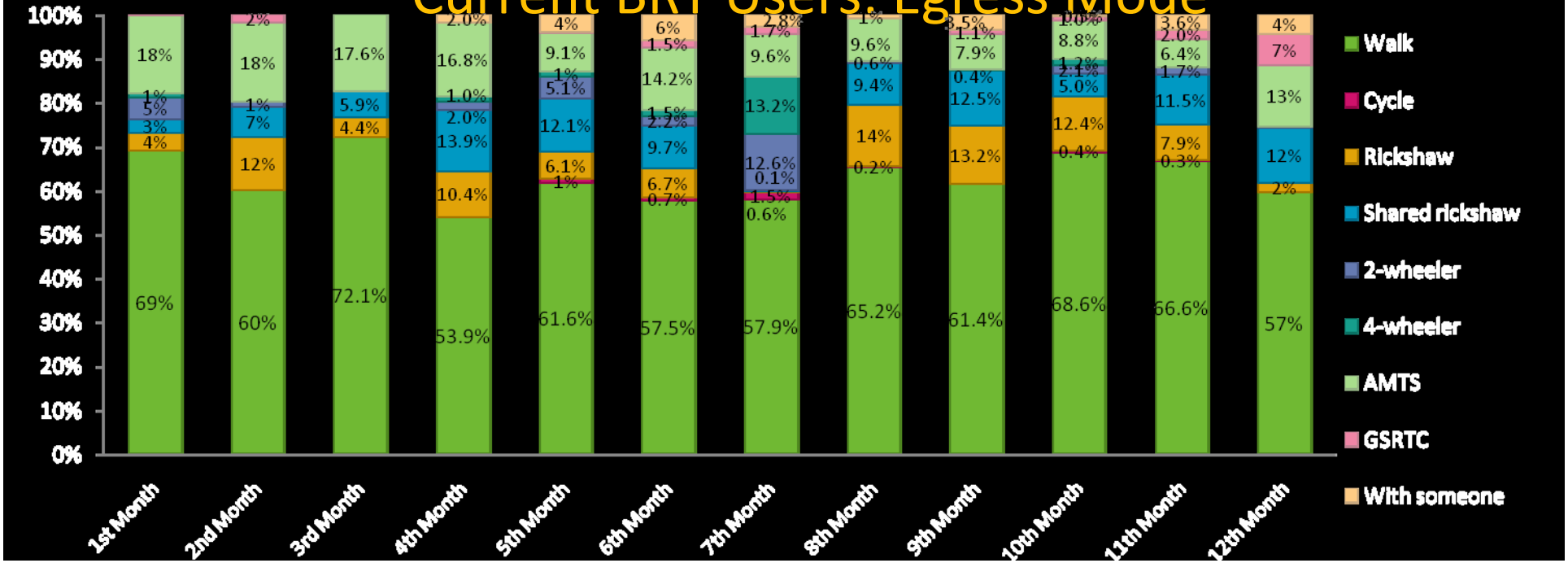
Current BRT Users: Access Mode

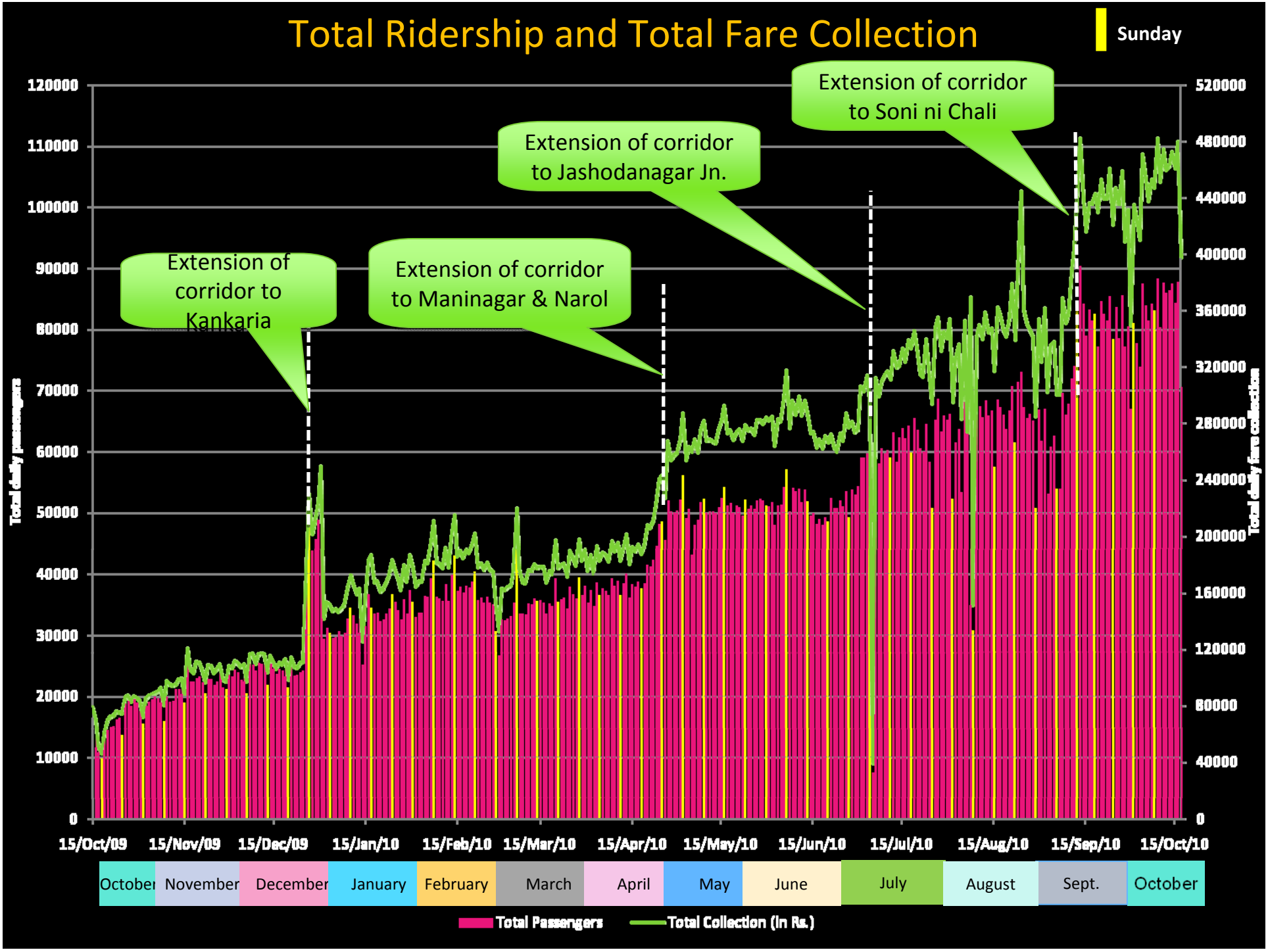
Sample Size: 350



Current BRT Users: Egress Mode

Sample Size: 350




Total Ridership and Total Fare Collection
Sunday
Extension of corridor to Soni ni Chali
Extension of corridor to Jashodanagar Jn.
Extension of corridor to Maninagar & Narol
Extension of corridor to Kankaria
Total daily passengers
Total daily fare collection
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
520000
480000
440000
400000
360000
320000
280000
240000
200000
160000
120000
80000
40000
0
15/Oct/09
15/Nov/09
15/Dec/09
15/Jan/10
15/Feb/10
15/Mar/10
15/Apr/10
15/May/10
15/Jun/10
15/Jul/10
15/Aug/10
15/Sep/10
15/Oct/10
October
November
December
January
February
March
April
May
June
July
August
Sept.
October
Total Passengers
Total Collection (In Rs.)

Accidents involving BRTS Vehicles

Accidents	1st Month (15 Oct– 14 Nov '09)	2nd Month (15 Nov – 15 Dec '09)	3rd Month (16Dec '09 – 15 Jan '10)	4th Month (16 Jan– 15Feb '10)	5th Month (16 Feb– 18 Mar '10)	6th Month (19 Mar– 18 Apr '10)	7th Month (19 Apr– 19 May '10)	8th Month (20 May - 19 Jun '10)	9th Month (20 Jun '10 – 20 Jul '10)	10th month (21 Jul '10 – 20 Aug '10)	11th month (21 Aug '10 – 20 Sep '10)	12th month 21Sep'10- 15 Oct '10
Total number of accidents	2	1	2	6	6	4	4	5	5	5	8	1
Fatalities	0	0	0	0	1	0	0	0	0	0	2	0
Serious injury	0	1	0	0	0	0	0	0	0	0	1	0
Minor injury	0	0	0	2	1	0	0	0	1	2	0	0
No injury	2	0	2	4	4	4	4	5	4	3	5	1
Safety= Inverse of (accidents/Thousand KM)	50.38	100.75	74.56	27.42	27.9	41.33	62.86	53.18	53.30	57.54	38.96	104.18

- Accidents during twelfth month involved a minor one.
- Reliability of service increased to 11.62

Note: Higher the number of accidents lower is the safety. Also depends on no. of kms