



**DMRC**

# Intelligent Transport System in Delhi Metro

By

**D K SINHA**

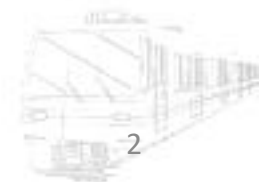
**CGM/DMRC**

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<http://www.delhimetrorail.com>

# INTRODUCTION

- DMRC as a public transport has shown continuous increase in its patronization.
- Challenges faced by DMRC
  - How to increase utilization/productivity of existing transportation infrastructure
  - Making services attractive by way of service quality for continued patronage
  - How to meet potential growth
  - Integration with other modes of transport
- ITS philosophy and methodology has been continuously resorted to for addressing the challenges



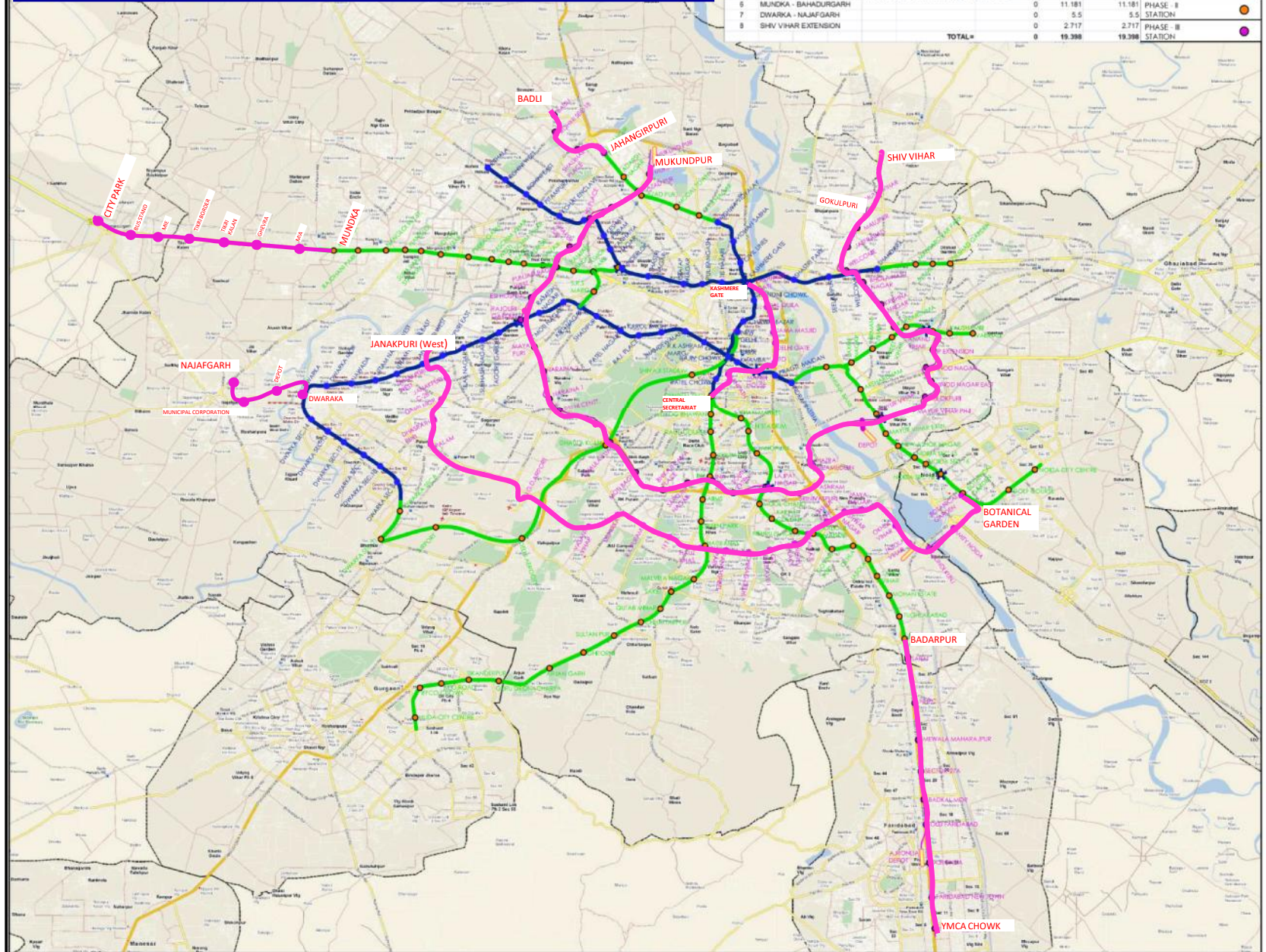
# METRO NETWORK PHASE -I+II +III

## PHASE-III CORRIDORS

	UNDERGROUND (Km)	ELEVATED (Km)	TOTAL LENGTH (Km)
1 MUKUNDPUR - ANAND VIHAR - DHALLA KUAN - YAMUNA VIHAR	14.386	41.311	55.697
2 JANAKPURI WEST - MUNIRKA -KALKAJI - KALINDIKUNI	17.288	16.206	33.494
3 CENTRAL SECT. - MANDI HOUSE - KASHMIRI GATE	9.37	0	9.37
4 JAHANGIR PURI - BADLI	0	4.489	4.489
<b>TOTAL=</b>	<b>41.044</b>	<b>62.006</b>	<b>103.05</b>
<b>Proposed Extensions in Phase-III</b>			
5 BADARPUR - FARDABAD (YMCA CHOWK)	0	13.875	13.875
6 MUNDKA - BAHADURGARH	0	11.181	11.181
7 DWARKA - NAJAFGARH	0	5.5	5.5
8 SHIV VIHAR EXTENSION	0	2.717	2.717
<b>TOTAL=</b>	<b>0</b>	<b>19.398</b>	<b>19.398</b>

## LEGEND

PHASE - I	
PHASE II	
PHASE III	
DEPOT	
INTER CHANGE STATION	
PHASE - I STATION	
PHASE II STATION	
PHASE III STATION	

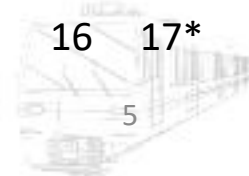
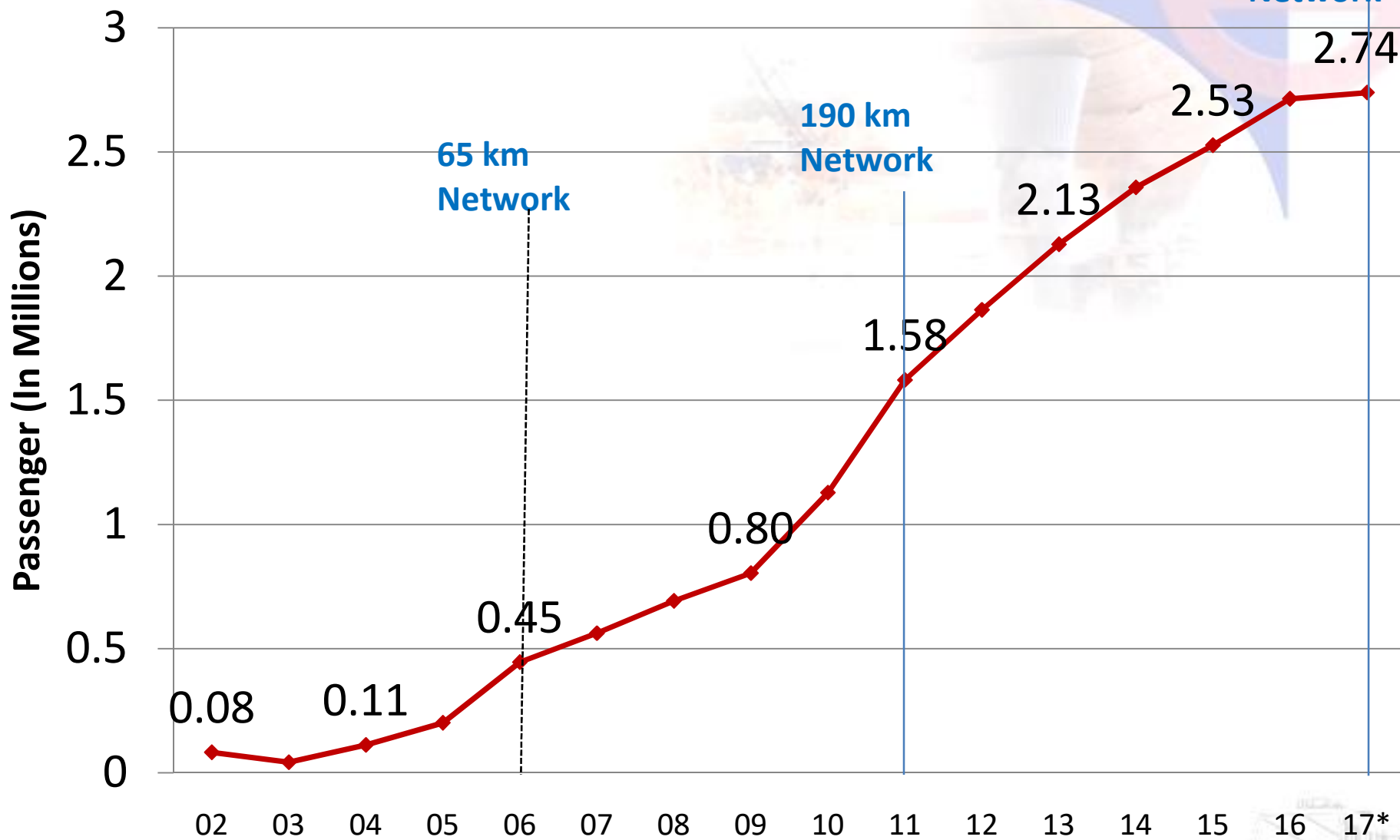


# TRAIN OPERATION AT A GLANCE

DELHI METRO	No. of stations (By Line)	NUMBER OF RAKES UTILISED	HEADWAY (In Min)	(PHPDT) (As on 4 <sup>st</sup> Sep '17)	Traffic Pattern
Line 1-RED	21	25	3'20"	25962	End to End Operation
Line 2-YELLOW	37	54	2'18"	51034	Intermediate reversal of alternate train at VW, and 1 in 4 at QM
Line 3&4-BLUE	51	61	2'35"	49747	Intermediate reversal of 1 in 3 trains at Dwarka
Line 5-GREEN	16	16	3'48"	9585	End to End Reversal
Line 6-VOILET	32	38	3'24"	23831	Intermediate reversal of alternate train at Badarpur
Airport Line	6	6	10'00"		End to End Reversal
<b>TOTAL</b>	<b>163</b>	<b>200</b>			



# Average Passenger/day



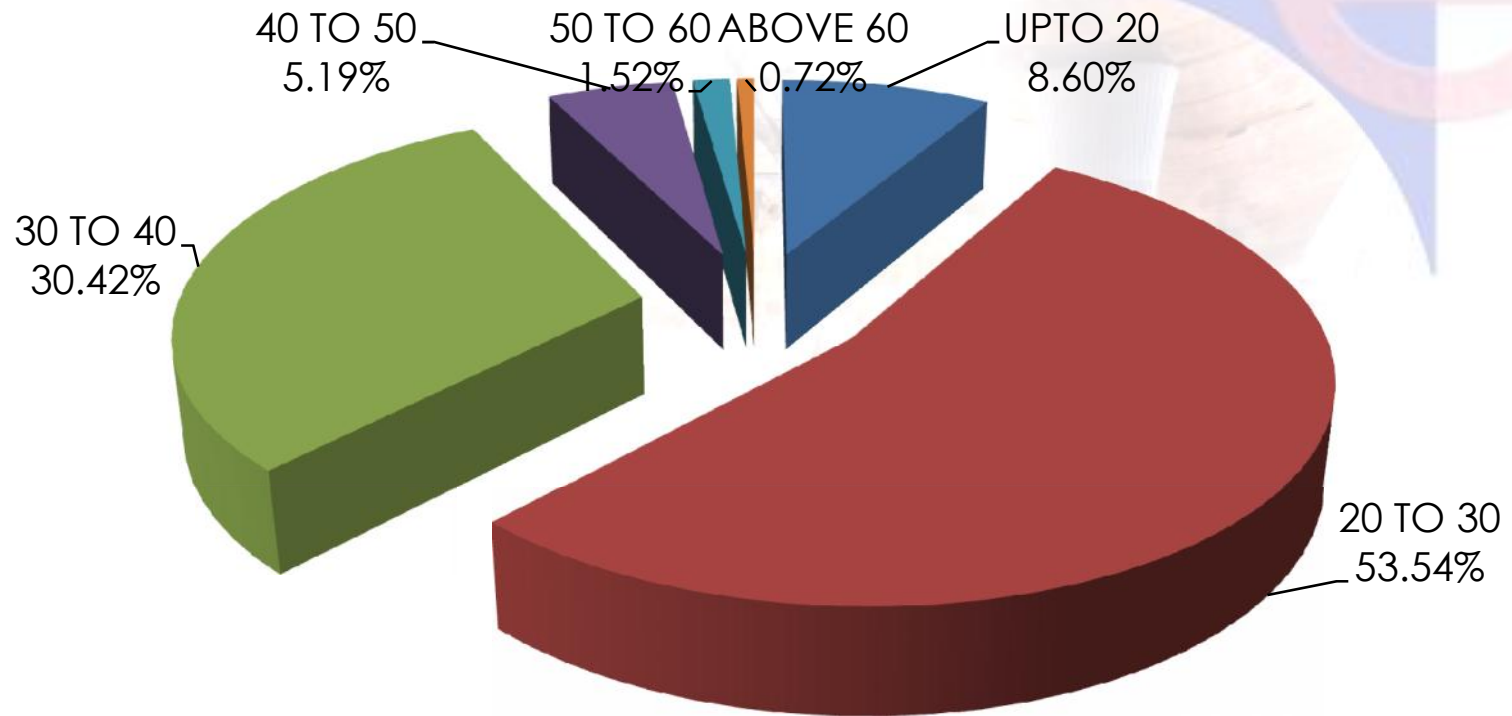
# MILESTONES (RIDERSHIP)

Date	Ridership	Remarks (First time)
25-Dec-02	114,835	0.1 Million
04-Aug-09	1,008,696	1.0 Million
08-Nov-10	1,559,166	1.5 Million
12-Aug-11	2,083,755	2.0 Million
08-Aug-13	2,508,480	2.5 Million
11-May-15	3,017,790	3.0 Million
<b>17-Aug-16</b>	<b>3,369,131</b>	<b>Ever Highest</b>

In last Five years there is an increase of 73.4% in ridership



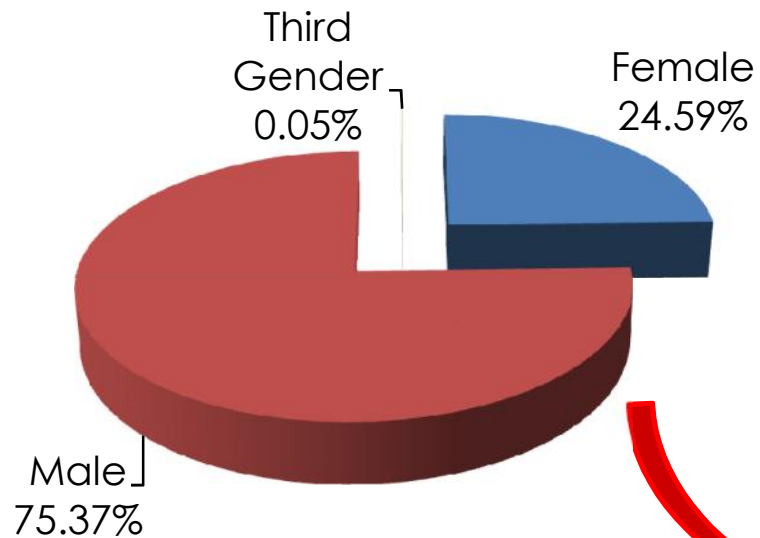
# AGE-WISE DISTRIBUTION



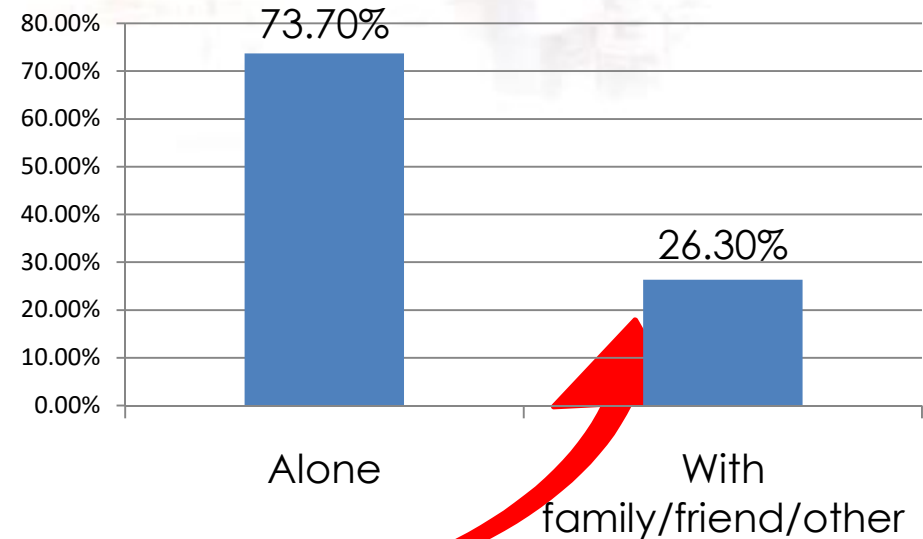
- It is seen that max. **53.54%** are in the age group of 20-30 years.
- 92.57% are below age of 40 years.
- 2.24% are above 50, of which 0.72% above 60.



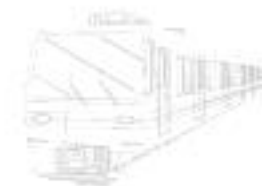
# GENDER-WISE DISTRIBUTION



Out of 24.59% female passengers only **26.30%** travelled with the family/friends and **73.70%** travelled alone i.e. 18.12% of total passenger.



## Female Passenger Bifurcation





# ITS in DMRC

ITS in DMRC involves:

- ❖ Operational efficiency through scheduling and management of trains
- ❖ Optimal infrastructure usage
- ❖ Reliability and Information management
- ❖ Efficiency in Ticketing system
- ❖ Traffic integration and Common mobility card



# Train Planning & Scheduling

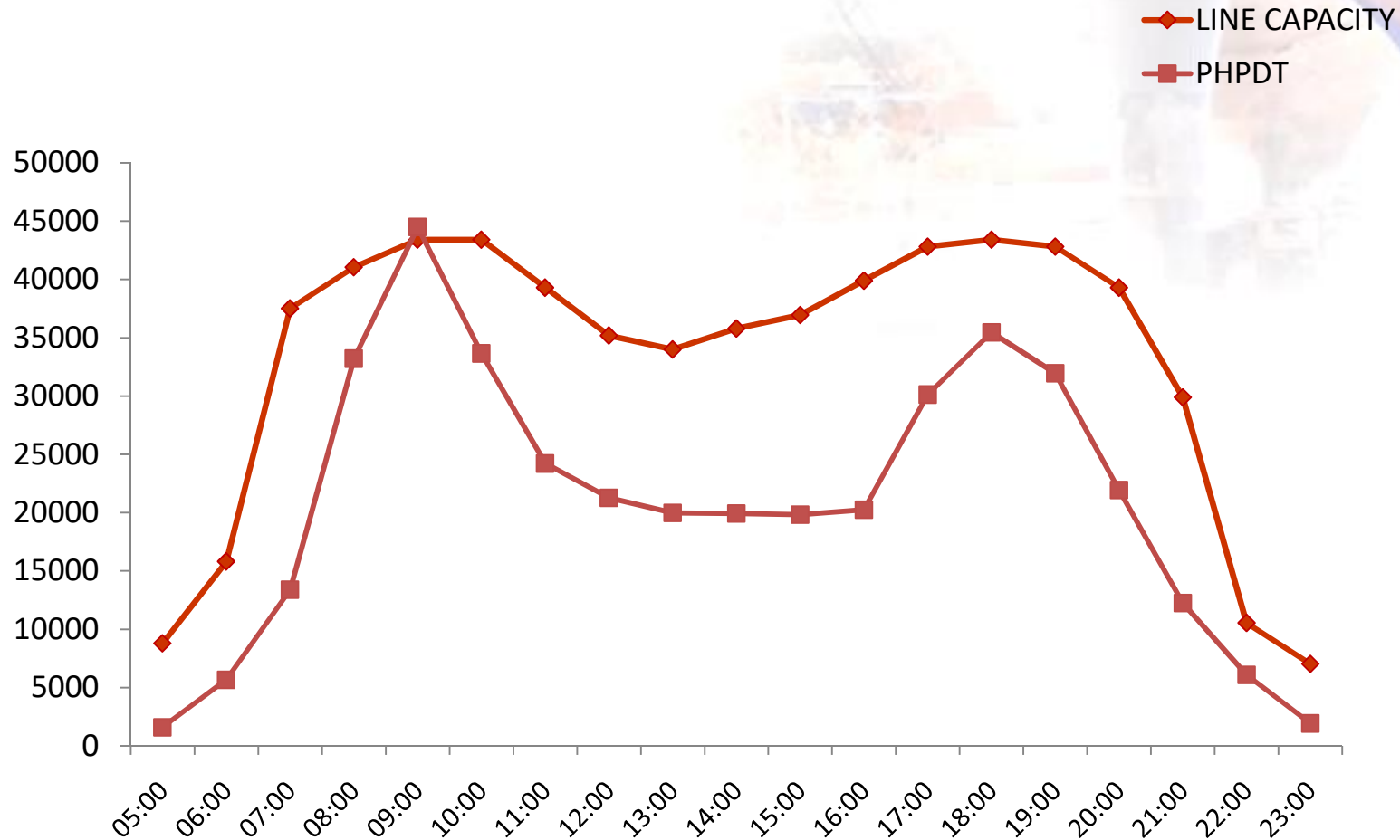
- Balances passenger needs, service performance and maintenance requirements- different (weekly, weekend, special) timetable prepared.
- Use of simulator – minimum operator input
- Train is tracked in the DMRC network through an unique ID. The information is available to the traffic controller in OCC in real time.
- Flexibility of addition/deletion of trips
- Interlacing of 6-car & 8-car rake in a manner to ensure maximum clearance capacity at crowded section during peak or peak of the peak time
- Non-symmetrical headway – to take care of directional traffic
- Implementation of energy saving speed profiles in train time table during off peak and holidays.
- Outstation night stabling of trains, this saves dead KMs, thus saves energy

# Rake Requirement

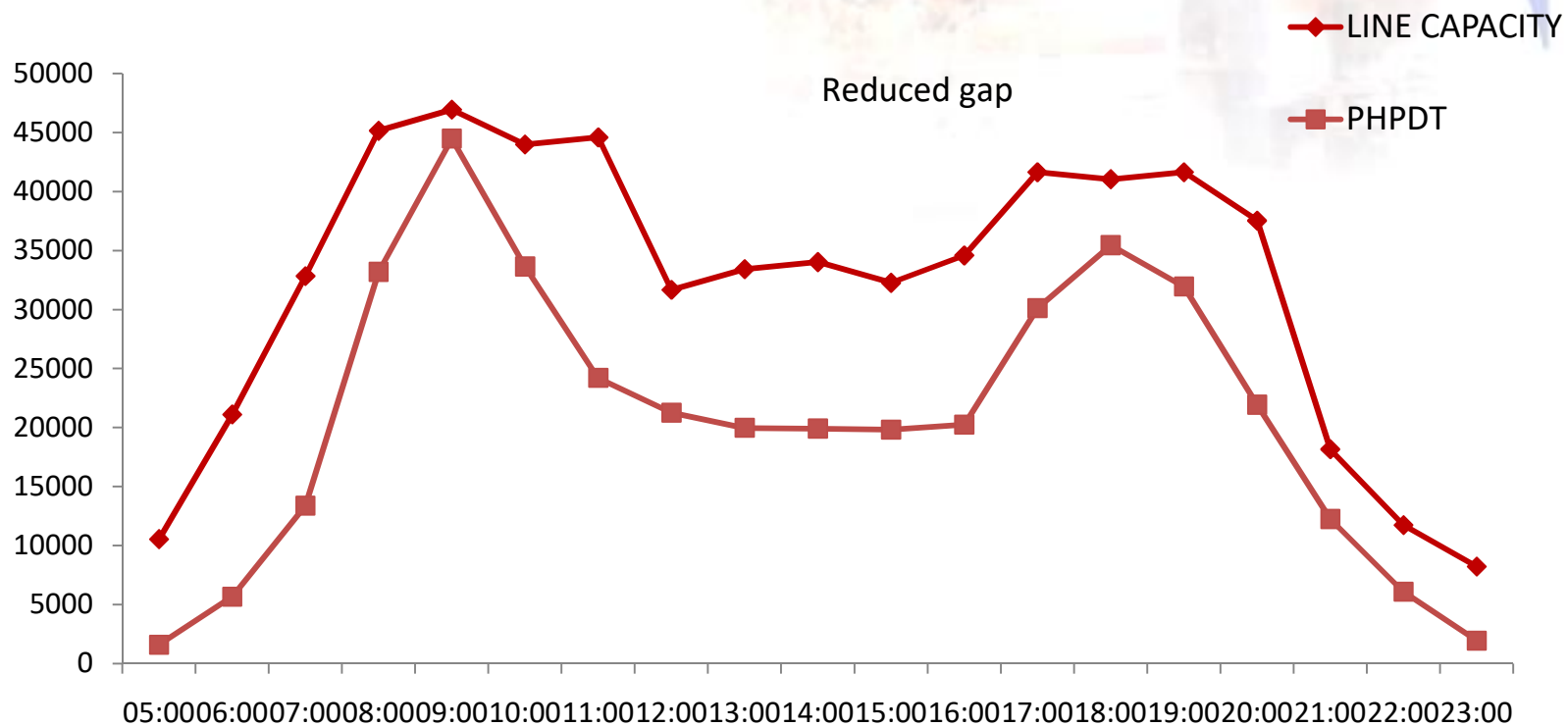
- ❖ Rake requirement
  - The rake requirement for different sections is based on the PHPDT figures.
  - PHPDT is calculated through station entry/exit figures.
- ❖ Real time insertion/ withdrawal of rakes
  - The ridership of the line on a particular day compared to the last 4 days average used for insertion/ withdrawal of rakes.
  - Ridership of a line is calculated in real time as the number of passengers exiting on the line.



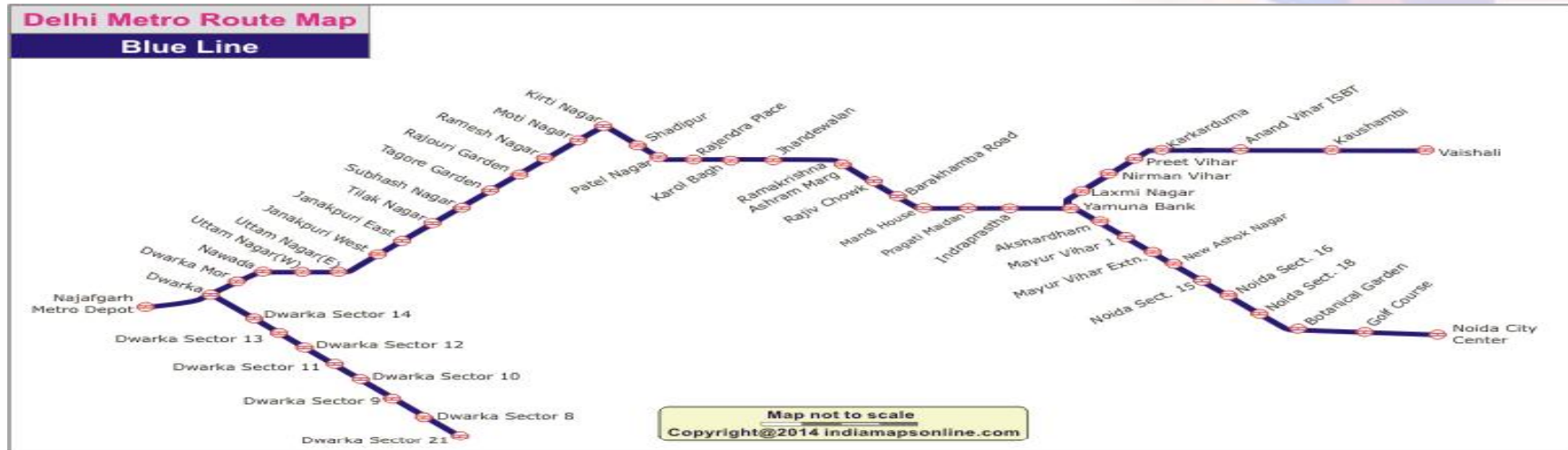
# Demand Vs Supply before rationalization



# Demand vs Supply After Rationalization



# Pattern of reversal on Blue line

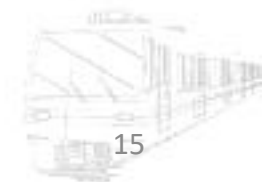


- Blue Line network has a split at Yamuna Bank depot.
- The traffic in Dwarka-Dwarka 21 is less. Previously, out of the two branches YBD-NCC had more traffic.
- This traffic pattern was met by reversing every alternate train at Dwarka and running two fixed loops Dwarka 21 to NCC (8-car rakes) and Dwarka- VASI (6-car rakes).
- This met the traffic pattern but there were bunching at Dwarka.
- Now with more 8-car rakes available and traffic of YBD-VASI also picking up, the traffic pattern has been changed to 2 out of 3 trains to go to Dwarka sub-city and do away with fixed loops.
- This has reduced the end to end runtime by around 2 minutes from 90 to 88 min. Also from Dwarka 21 trains for both VASI and NCC are available.



# Increasing productivity/ Optimal usage of Infrastructure

- ❖ Productivity of staff
- ❖ Operation and Security staff deployment:
  - TOM operator deployment (based on hourly token sale)
  - Customer care deployment during off-peak
  - CISF deployment at station
- ❖ Lift operation
- ❖ Escalator operation (direction of escalator in morning/evening)
- ❖ Denomination wise TOM window



# Reliability & Information Management

- Centralized incident management system
  - Environmental conditions viz cyclone, earthquake managed centrally from OCC
  - Alarm & incidences for various systems viz traction, signalling, rolling stock etc available at operation control centre
  - CCTV surveillance
  - System has redundancy and has fallbacks (degraded operations)
- Passenger information system
  - At stations (at concourse / platform)
  - Inside train
  - Outside premises through IVRS, mobile app etc





# Reliability & Information Management (cont.)

- Information available to Train controller
  - Train route info in real time
  - Continuous communication with Traffic controller with emergency feature
  - CCTV view of coaches
  - Intercomm with coaches
- Information available to Security personnel
  - Handheld set for communication
  - CCTV surveillance in control room
- Flight Information Display system on Airport Line



# Information (signages) at interchange station



# Information (signages) at interchange station



# Information Management: LCD screen in station

10/12/2017 Fare Revised of English 25x110 cm (L) (9)

## PUBLIC NOTICE

*As part of the two phase revision of Metro fares recommended by the 4<sup>th</sup> Fare Fixation Committee, fares under Phase-II of Fare revision are as given below:-*

### Revised Fares (Monday to Saturday)

Distance (KMs.)	Old fare as on 8 <sup>th</sup> October 2017 (₹)	New fare with Smart Card (₹)	New fare with Smart Card during peak hours (₹)	New fare with Smart Card during non-peak hours (₹)
0-2	10	10	9	8
2-5	15	20	18	16
5-12	20	30	27	24
21-32	40	50	45	40
>32	50	65	59	52

### Revised Fares on Sundays and National Holidays (26<sup>th</sup> Jan, 15<sup>th</sup> Aug & 2<sup>nd</sup> Oct.)

Distance (KMs.)	Old fare as on 8 <sup>th</sup> October 2017 (₹)	New fare with Smart Card (₹)	New fare with Smart Card (₹)
0-2	10	10	9
2-5	15	20	18
5-12	20	30	27
21-32	40	50	45
>32	50	65	59

### Enjoy the Benefits of Non-Peak Hours

**20% discount for Smart Card passengers entering Metro System during non-peak hours\***

**Window of almost 11 hours provided as non-peak hours:**

From	To
Start of revenue services	Before 8:00 AM
Hours	Before 5:00 PM
	8:00 PM
	Close of revenue services

\*For women - 10% discount on Smart Card + 10% discount during non-peak hours

### Safe and convenient commute for women

- Women only coach in every train
- Reserved seats for women in every coach
- CCTV surveillance at stations
- Female staff in every train
- Female ESE staff have been deployed at stations for looking after women passengers.

### Senior citizens

Reserved seats, lifts, escalators and ramps

24 X 7 HELP LINE - 155370

For further details, please visit DMRC website [www.delhimetrorail.com](http://www.delhimetrorail.com)

https://mail.google.com/mail/u/0/Inbox/?ui=2&ik=5&ui=2&ik=17&projection=1

DELHI METRO RAIL CORPORATION

1/2



# Information at Platform: Car consist on PIDS

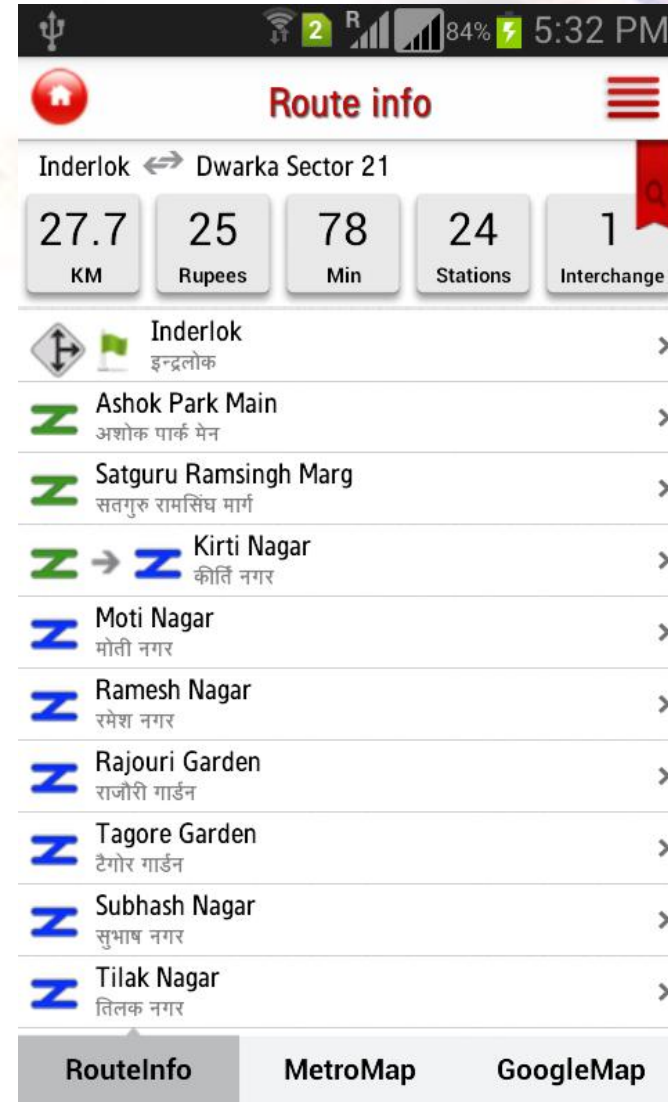
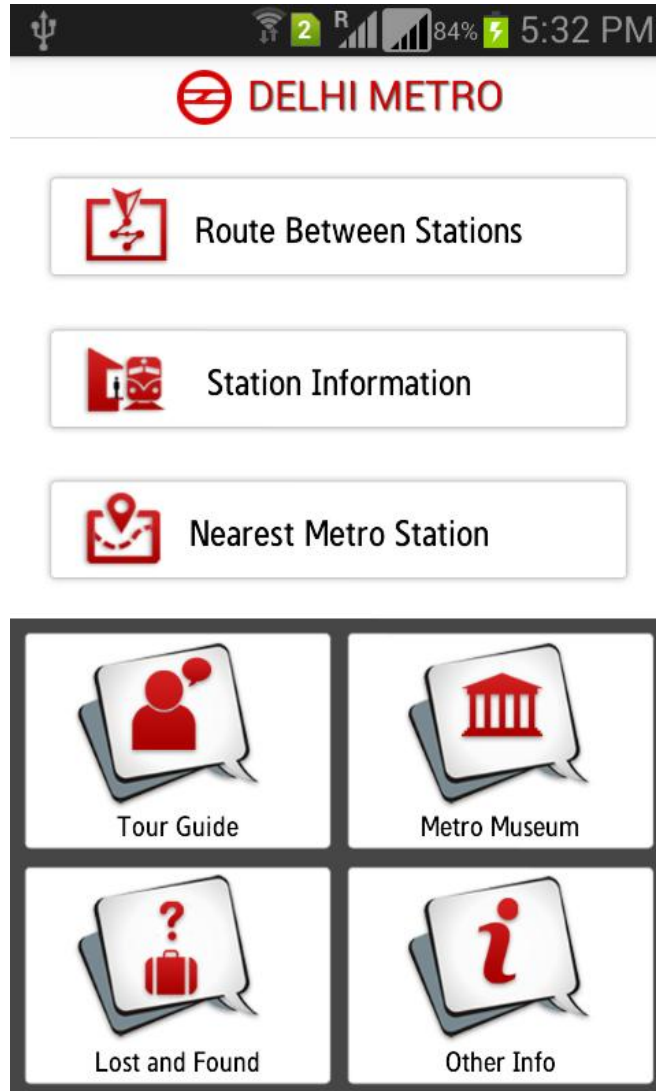


Information of car consist of the incoming train so that passengers can relocate



# Information (Planning journey)

## MOBILE APP



# Information (Planning journey)

## Google Map

The screenshot displays a Google Maps interface with a route planned from New Delhi to Select CITYWALK. The route is highlighted in orange and grey, passing through Pusa Hill Forest and Hazrat Nizamuddin Aulia Dargah. Transit options are shown as callouts along the route:

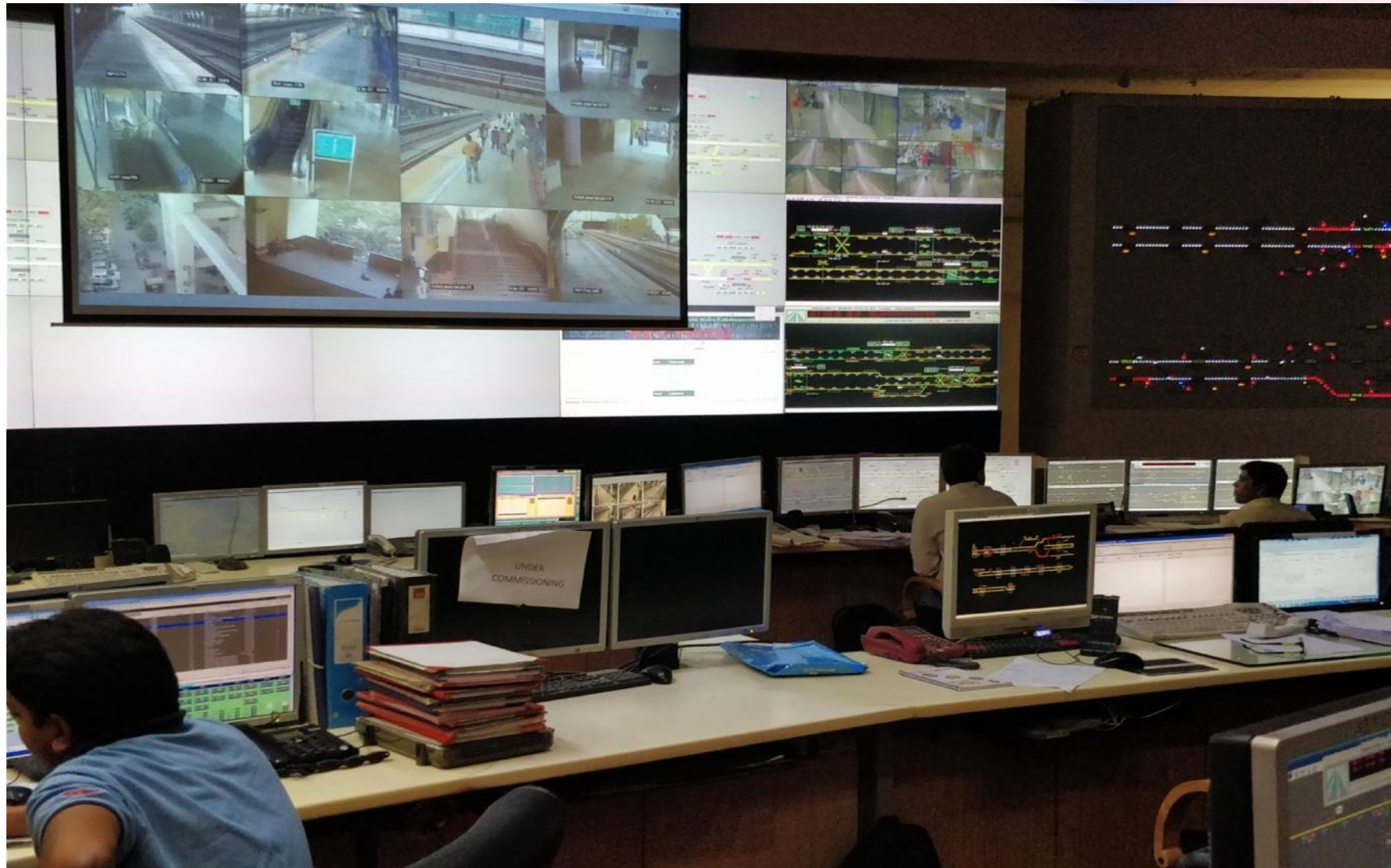
- 1 h 14 min every 20 mins (near Pusa Hill Forest)
- 1 h every 15 mins (near Hazrat Nizamuddin Aulia Dargah)
- 49 min every 3 mins (near Khirki Village)

The left sidebar shows the origin and destination, and three transit options with their respective schedules and train types:

Option	Time	Duration	Train Types
1	5:19 PM–6:08 PM	49 min	M Yellow Line, 448, 448CL, 493
2	5:24 PM–6:38 PM	1 h 14 min	548CL, 548EXT
3	5:35 PM–6:35 PM	1 h	Emu, Intercity Express, Ladies Special, 493, 534A

The bottom of the screen shows the Windows taskbar with the search bar, system tray, and date/time (17:18, 31-10-2017).

# CCTV surveillance in OCC





# CCTV surveillance in CISF control room



# Ticketing System of DMRC

- ❖ Drive towards cashless
  - Auto top-up through combo card
  - On-line recharge (web, wallet)
  - Payment through POS and Bharat QR code
  - Recharge through SMS
- ❖ Self service ticketing modes :Ticket vending machine
- ❖ Automation of penalty – recently introduced
- ❖ Peak/Off-peak fares introduced from May '17 for producing a more balanced traffic pattern during the day and better utilization of infrastructure
- ❖ Use of Smart card for small value payment within DMRC premises viz Sulabh, retail outlets etc on anvil



# Joint ICICI bank credit card with DMRC smart card



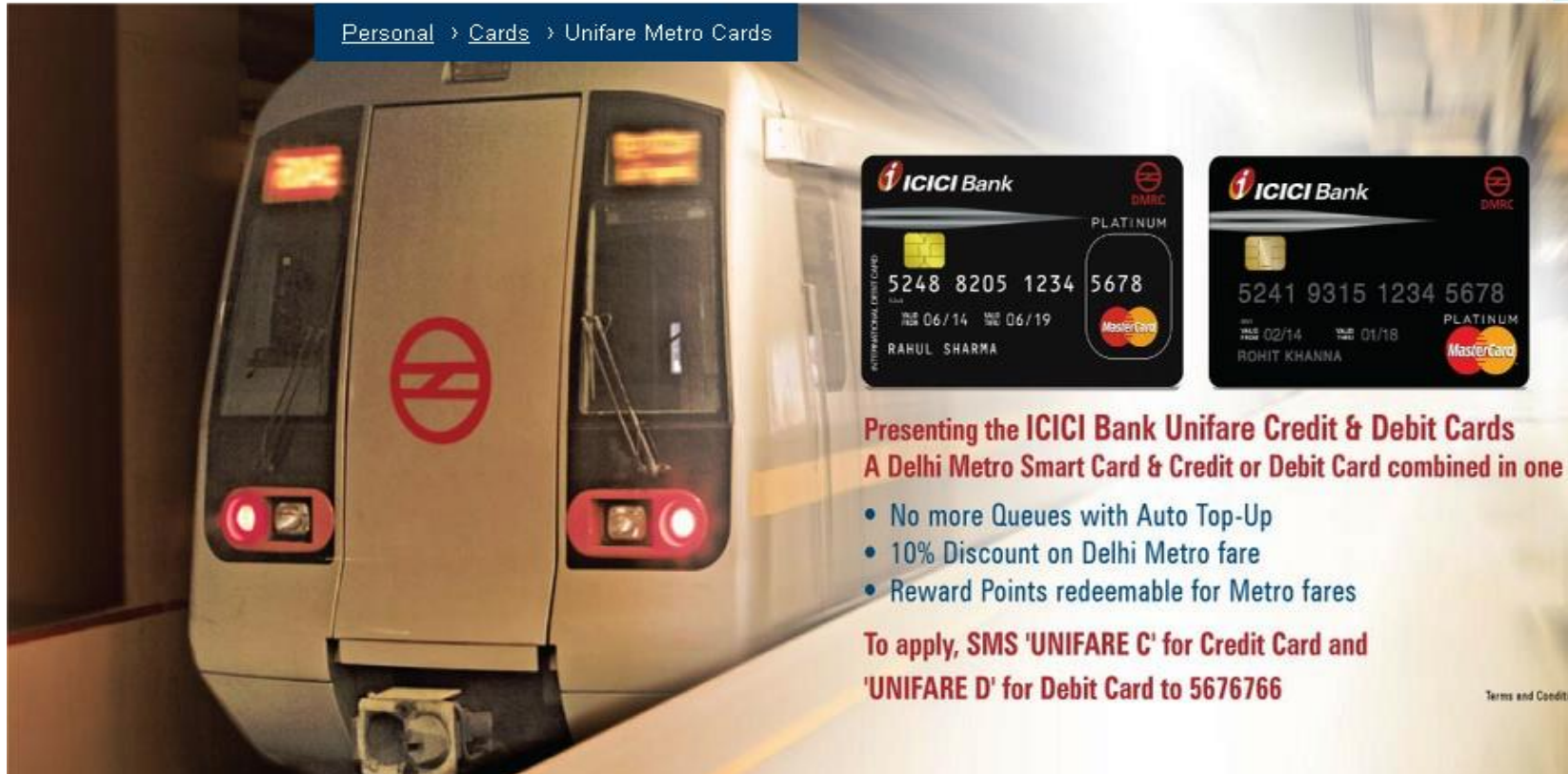
Products

Apply Online

Payments

Connect

Personal > Cards > Unifare Metro Cards



**ICICI Bank** DMRC PLATINUM  
5248 8205 1234 5678  
VALID 06/14 TO 06/19  
RAHUL SHARMA  
MasterCard

**ICICI Bank** DMRC PLATINUM  
5241 9315 1234 5678  
VALID 02/14 TO 01/18  
ROHIT KHANNA  
MasterCard

**Presenting the ICICI Bank Unifare Credit & Debit Cards**  
**A Delhi Metro Smart Card & Credit or Debit Card combined in one**

- No more Queues with Auto Top-Up
- 10% Discount on Delhi Metro fare
- Reward Points redeemable for Metro fares

**To apply, SMS 'UNIFARE C' for Credit Card and 'UNIFARE D' for Debit Card to 5676766**

Terms and Conditions

# Online Recharge Facility

Delhi Metro Rail Corporation Limited [IN] | <https://www.dmrsmartcard.com>

दिल्ली मेट्रो रेल कॉर्पोरेशन लिमिटेड  
DELHI METRO RAIL CORPORATION LTD.

ENGLISH

SIGN IN SIGN UP QUICK TOP UP

दिल्ली मेट्रो रेल कॉर्पोरेशन DELHI METRO RAIL

has launched  
TOP UP (Recharge) Facility  
Through SMS for  
SMART CARD Users

DMRC  
Card Engraved ID  
Amount  
Last six digit of  
ICICI Bank A/c  
SMS to  
9222208888

QUICK TOP UP

Card ID Amount\* (₹)

ia71M

CONTINUE

## BE A SMART TRAVELLER

Now recharge your smart card in 3 Easy Steps



\*AVMs are installed at METRO STATIONS near EFO(Excess Fare Office)/Customer Care. [Click here](#) to view the demonstration of this Web site.

## ANNOUNCEMENT

Fares on Airport Express Line To be Reduced From 24th July 2014. For more Details check what's new section

12 May 2014, hh 19:45

Change in Minimum Add Value in Smart cards through Token Value Machine

12 May 2014, 19:45

## WELCOME TO DELHI METRO SMART CARD PORTAL



DMRC Smart Card customers can get an instant recharge without queuing up at stations. They can recharge their smart card from anywhere in the world from this secure platform at no extra cost.

The users can view all the Top Ups done as he transacts and can use his Debit/Credit Card or Net Banking to pay online for an instant recharge. The easy steps are-1-Enter the amount and card information, 2- Secure pay and 3- Go to AVMs installed at majority stations.

ICICI account users can also recharge their cards with SMS facility. To view the sms format [Click here](#). After sending the SMS, go to AVMs installed at majority stations.

# Self service ticketing

TVM (Ticket vending machines)

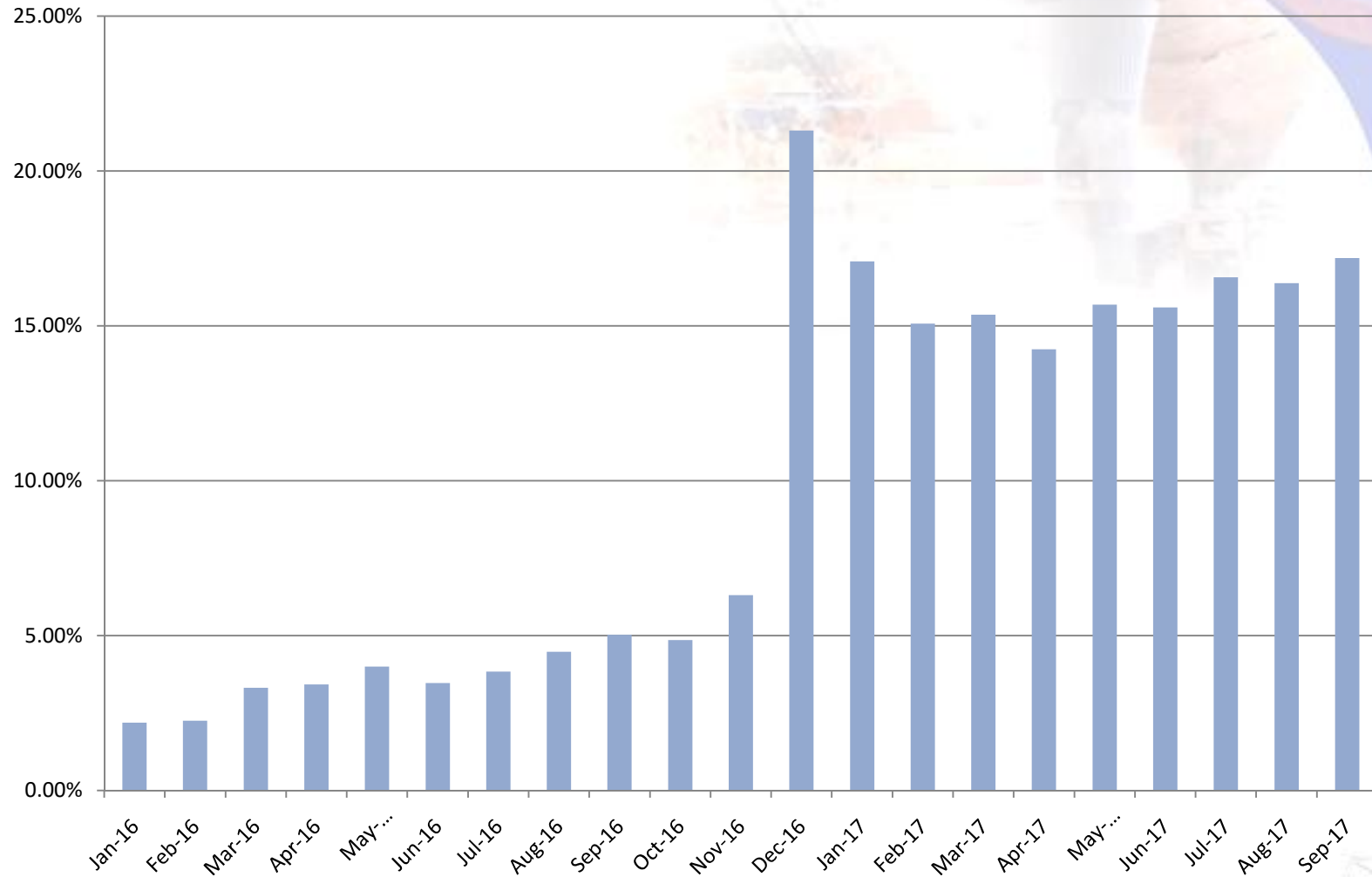


## % of total fare box collection

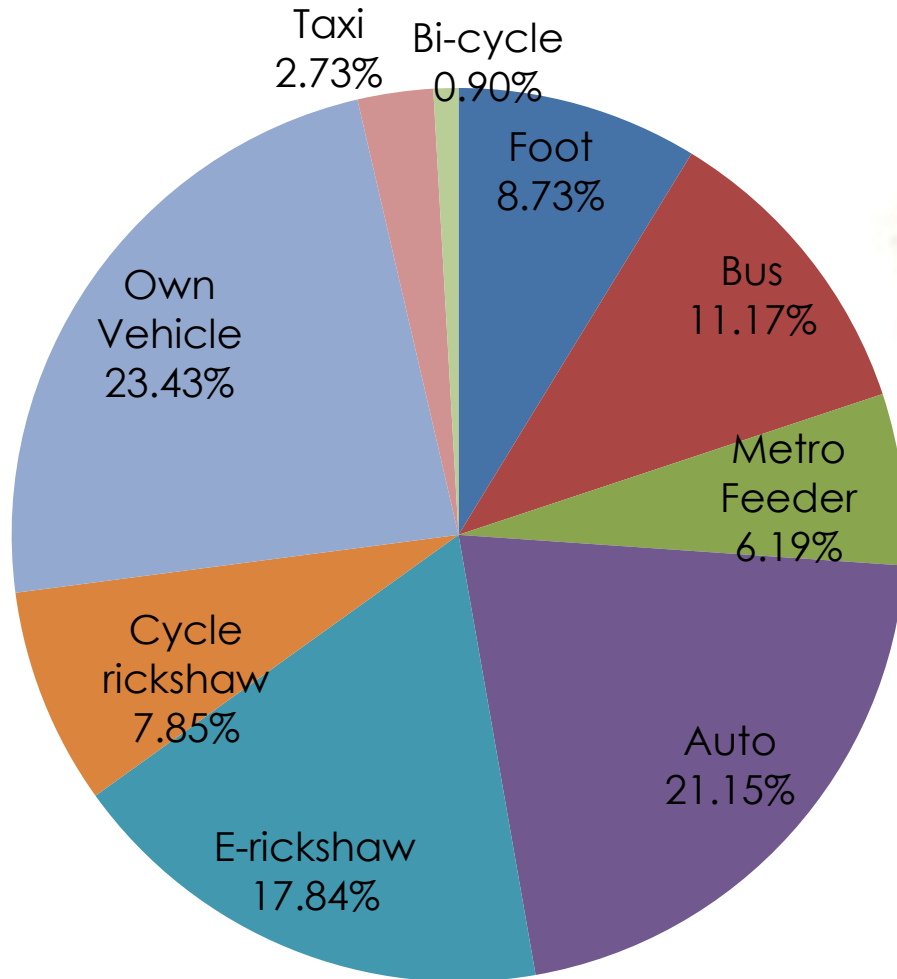
Heads		% share wrt Total earnings
Cash (Manual)		68.06
Cash (TVM)		15.94
POS		7.87
Auto-topup		0.02
TVM POS		0.01
Bharat QR Code		0.00
WEB	Credit	0.16
	Debit	0.08
	Internet Banking	0.12
	SMS	0.02
	Wallet (PayTM, ZipCash)	7.72
<b>Total Earning</b>		<b>100.00</b>



# Growth of cashless transaction as a % of total earning



# LAST MILE CONNECTIVITY



“How commuters reach the stations generally?”

➤ **23.43%** of total participants use their **Own Vehicle** to reach metro station closely followed by 21.15% who come by auto rickshaw.





# Last Mile Connectivity: Traffic integration

- Feeder Buses – 291 buses are being run presently
- Parking -Approx 3.25 lakh sqm space at 97 stations; Additionally multi-level parking at RHW, JPW and NDRU
- Other modes –
  - Halt and Go: Dedicated lane for autos
  - Cycle on Rent – Available at few stations
  - City check-in facility on Airport line
- Payment integration
  - DMRC has a permission from RBI to use DMRC card for allied activities and retail within its premises.
  - Integration with RMGL, Airport express line done
  - Integration with DTC and DIMTS at advanced stage of testing



# Traffic Integration: Parking



Parking at Rohini Sector 18 station

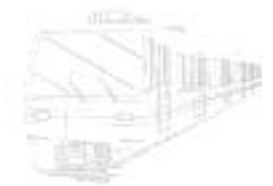
- Challenges presently: use by non-metro users
- Integrated ticketing with smart card is planned to be implemented



## Traffic Integration: Auto rickshaw



# CITY CHECK-IN FACILITY AT NEW DELHI METRO STATION



# Conclusion/ Way Forward

- ❖ DMRC ridership is on a rising curve
- ❖ DMRC has sustained high growth through planning and innovative ITS based measures
- ❖ Customer satisfaction survey – Consistently good feedback; customers are willing to recommend DMRC services to near and dear ones
- ❖ DMRC is an ever learning organization - There are a slew of ITS based measures on the anvil
  - Traffic integration and Management of station approaches
  - Introduction of UTO/DTO in next phase
  - Continued optimization of Time tables
  - Use of smart card at DTC, DIMTS, Parking etc
  - Use of social media viz twitter



Thank You  
for  
Giving an opportunity  
for sharing my views

