

Passenger Transportation in Indian Railways : Facilities & Challenges

Dr. Md. Sanauar Ali

Assistant Professor, PG Department of Commerce, R.D.S. College, Muzaffarpur.

Prof. (Dr.) Ram Chandra Singh

Dean, Head Faculty of Commerce, R.D.S. College, Muzaffarpur.

Paper Code : JCT-A18-SA-RCS-12

DOI : <https://doi.org/10.26703/JCT.v13i1-12>

Web Address : <http://jctindia.org/jct/april2018-v13i1-12.pdf>

Archive : <https://ideas.repec.org/a/jct/journal/v13y2018i1p83-92.html>

<Http://EconPapers.repec.org/RePEc:jct:journl:v:13:y:2018:i:1:p:83-92>



Citation: Ali, Dr. Md. Sanauar/Singh, Prof. (Dr.) Ram Chandra. Passenger Transportation in Indian Railways : Facilities & Challenges. Journal of Commerce and Trade April 2018; 13 : 1; Pp. 83-92. <https://doi.org/10.26703/JCT.v13i1-12>.

Abstract

Indian Railway (IR) is the third largest railway network in the world with 7349 railway stations, 1,44,698 railway bridges, 11461 locomotives, 70937 passenger coaches, 2,77,987 freight cars and 67368 route kilometers. Today IR operates 22550 trains each day, comprising 13329 passenger train and 9221 freight trains. It transports 3.04 million tones of freight traffic and 23 million passengers every day and 7.2 billion passengers per year. Railways an integral part of the transport network, play a crucial role in facilitating trade. The performance of this sector not only affects the global competitiveness of merchandise trade but also the performance of other service sectors such as tourism. Indian Railways has suffered from chronic and significant under investment as a result of which the network expansion and modernization have not happened at the requisite place leading to an erosion of the share in national freight and passenger traffic. It is management failure which failed to raise voice before the leadership/Govt. to the issue well in advance when Indian Railways major routes were becoming bottle neck for main movement rather major cause for slowing speed of trains due to abnormal delay enroot detention further increasing costs due to increased wagon turn round.

Keywords : Passenger facilities, fare structure, Capacity Constraints, Faster Trains, Challenges.

Classification-JEL : L62, L92

1. INTRODUCTION

The Indian Railway had a modest beginning in 1853 when the first train journeyed from Mumbai to Thane, covering a distance of 34 km. In the next 50 years, the railway network expanded rapidly, and by 1900 the total length of the network (route kilometers) increased to 39,835 km. The rate of growth declined during to next 50 years, reaching 53,596 km in 1950-51. In the next 65 years, since the beginning of the Plan era, the route length increased to 67368 km by 2016-17 an overall growth of about 23 per cent.

Today Indian Railways (IR) occupies a unique and crucial place in the country's

transport infrastructure. IR, managed directly by the Ministry of Railways, is the third largest railways network in the world under a single management with 7349 railway stations, 11461 locomotives, 70937 passenger coaches, 277987 freight cars and 67368 route km. IR operates 13329 passenger trains every day and 9221 freight trains. It transports 2.8 million tones of freight traffic and 23 million passengers every day.

a) Passenger Service Improvements : During the year 2016-17, India Railways introduced new trains, extended the runs and increased the frequency of existing trains, as given below :

b) Passenger Facilities: The allocation under the

Table 1

	Trains introduced	Runs Extended	Frequency increased	Total
Non-Suburban	227 trains	134 trains	18 trains	379
Suburban	2 trains	19 trains	6 trains	4
Total	229	153	24	406

Source: Indian Railways Year Book 2016-17

Plan Head “Passenger Facilities” in 2016-17 was Rs. 838.27 crore (budget Estimate) and Rs. 1920.66 crore (Revised Estimate)

1,253 stations have so far been identified for development under the Adarsh Station Scheme up to 31.12.16 out of which 1038 stations have already been developed.

During the Year 2016-17, 154 stations were provided with water coolers, 81 stations were electrified, 36 passenger lifts and 38 escalators were provided at stations.

Passenger Reservation System (PRS) :

New Generation e-Ticketing System (NGeT) :

In order to improve user experience while booking Reserved Rail Tickets online on , a new system (NGeT) with enhanced capacity and new features have been launched. The system has the capacity to book about 15000 tickets per minute. E-ticketing website for reserved tickets new handles about 62% of total reserved tickets.

c) Mobile Application for train enquiry : Train running status enquiry is now available through Mobile Applications. Railway Enquiry Application are available on Android, iOS and Windows Platforms. Train running enquiry status is also available on enquiry. Indianrail.gov.in. Information about train schedule, trains between stations, cancelled trains, reschedule trains and diverted trains is also available on the website.

d) Paperless Unreserved Ticketing through Mobile Phones : Paperless Unreserved Ticketing on mobile phones was launched at Mumbai and has since been extended to suburban sections of Chennai, Kolkata and Secundrabad and New Delhi-Palwal section of Northern Railway. This has eliminated the need for passengers to stand

in queue for getting tickets for journey in unreserved compartments of trains.

e) Parcel Management System (PMS) : Computerized system for booking, labeling tracking, loading/unloading and delivery of parcel packages is being implemented in place of the manual system. Computerized Parcel Management System has been implemented at Delhi-Howrah, Delhi-Mumbai, Delhi-Chennai, Howrah-Mumbai and Howrah-Chennai corridors.

2. IMPROVEMENT IN FACILITIES INSIDE PASSENGER COACHES

a) Provision of dustbins in all coaches : It has been now decided to provide suitable dustbins below the outside wash basin or on the end wall in all newly manufactured coaches including non-AC sleeper and second class coaches.

b) Cleanliness and Hygiene Intensive mechanized cleaning of coaches : Mechanized cleaning of coaches is being carried out in the coaching depots through professional agencies. Heavy duty machines such as high pressure jet cleaners, floor scrubbers, vacuum suction cleaners etc. are deployed for the purpose.

c) Clean Train Stations scheme : Clean Train Station Scheme is provided for limited mechanized cleaning attention to passing through trains during their halts at selected stations enroute. 39 such Clean Train Stations have been made operational by 31.03.2017.

d) Catering Services : New Catering Policy has been issued on 27th February 2017 with the objective to provide quality food to rail passengers by unbundling of catering services on trains. IRCTC has been mandated to carry out the unbundling by creating a distinction primarily between food preparation and food by creating a distinction primarily between food preparation and food distribution. In order to upgrade quality of food preparation IRCTC to set up new kitchens and upgrade existing ones.

The low recovery of costs on the passenger segment and high freight rates have led to an imbalance in the revenues from these

Table 2 : Recovery of costs Unit cost vis-à-vis Yield per unit. (Figs. In paise)

2008-09	Coaching Service			Freight Service		
	Cost per PKM	Earnings per PKM	Ratio	Cost per PKM	Earnings per PKM	Ratio
2009-10	48.86	26.13	53.5%	63.74	96.90	152.0%
2010-11	52.87	25.96	49.1%	65.84	97.41	147.9%
2011-12	52.60	26.32	50.0%	67.63	100.44	148.5%
2012-13	54.38	26.99	49.6%	69.64	104.17	149.6%
2013-14	57.76	28.52	49.4%	75.28	128.50	170.6%
2014-15	63.85	31.53	49.4%	80.55	137.50	170.7%
2015-16	74.48	36.78	49.3%	88.57	151.20	170.7%
2016-17	78.44	38.74	49.3%	95.71	163.40	170.7%
	81.49	40.25	49.3%	96.35	164.50	170.7%

Source : Indian Railway year book 2016-17, published by Directorate of Statistics New Delhi.

two business segments. This is quite clear from table below.

3. FARE STRUCTURE

There was no increase in passenger fares in 2016-17. In order to improve the earnings the concept of Flexi fare system has been introduced w.e.f. 09.09.2016 in Rajdhani, Shatabdi & Duronto train service. Under this scheme, the fare increase by 10% with every 10% of berths sold subject to maximum limit of 1.5 times in classes Second AC, Sleeper, Second sitting (reserved) AC Chair Car and 1.4 times in 3rd AC Class. No change has been made in the fare for 1st AC and Executive class of travel.

In the case of new trains such as Humsafar and Antyodaya due to higher capital cost and various additional facilities provided, dynamic fare structure has been introduced. In Humasafer trains, the fare has been fixed at 1.15 times the basic fare of AC3 Tier Superfast Mail/Express for the first passenger block of 50% and thereafter at 10% increase for every 10% increase in the passenger block for the remaining 50%.

4. NON-FARE REVENUE (NFR) PUSH

Non-fare revenue is non-traiff earnings, garnered by monetizing physical assets such as railway stations, trains and other infrastructure

available with India Railways, Indian Railways, non-fare revenue is less the 5% of overall revenue, against range of 10-33% in developed countries below table :

5. PASSENGER RESERVATION SYSTEM (PRS)

Passenger Reservation System (PRS) is running at more than 3,422 locations, and it handling more than 3,000 trains. The locations include non-railhead centers. Computerized reservation terminals have been expanded in remote corners through India Post PRS centre (presently functional at 346 post offices) as well as non-railhead PRS facilities have been extended through State Government and local bodies. In addition, the facility. E-ticket has been made available for all mail and express trains through IRCTC website. The progress of proliferation of PRS locations over the years is an indicated below.

a) Unreserved Ticketing System (UTS) : A pilot project was sanctioned for Unreserved Ticketing System in 2002-03 and a nationwide project in 2003-04. UTS is now functioning at more than 5979 locations on Indian Railways. This covers most of the important stations of Indian Railway

b) Automatic Ticket Vending Machines (ATVMs) : So far, about 3000 ATVMs and CoTVMs have been installed. Further more ATVMs are planned

Table 3

Comparative percentage of total revenue generated through non-fare revenue in various countries

Country	Major Operations (National Level)	Indicative Per centage
Germany	Deutsche Bahn	34
Japan	Japan Railway Company	30
Hong Kong	MTR Corporation Ltd.	29
Russia	Russian Railways	12
France	French National Railway Company	10
Spain	Renfe Operadora	7
India	Indian Railways	<5

Source : Indian Railways, Lifeline of the nation White paper February 2015

Table 4 : No. of locations with PRS facility

Years	Number
2012-13	3019
2013-14	3146
2014-15	3201
2015-16	3350
2016-17	3422

Source: Indian Railways annual report & accounts 2016-17

Table 5 : No. of locations with PRS facility

Years	Number
2012-13	5619
2013-14	5778
2014-15	5835
2015-16	5860
2016-17	5979

Source: Indian Railways annual report & accounts 2016-17

for implementation across all the Zonal Railways. The ATVMs facilitate purchase of unreserved tickets, platform tickets and recharging of season tickets by the passengers by way of touch screen facility.

c) Mobile Ticketing on Indian Railways : IRCTC Manages the website www.irctc.co.in for online booking of reserved tickets. About 62% of reserved tickets are now booked online on this website. Reserved tickets can also be booked on mobile application through Mobile Apps like

Android & Window are available for booking reserved tickets.

d) LHB Coaching : Consequent upon the introduction of the first rake of indigenously designed LHB Coach in December 2003 and pursuant to the decision taken to convert more & more conventional coaches in LHB, 144 pairs of train services have till now been converted/inducted with LHB coaches including all the 21 pairs of Rajdhani Express train and 22 pairs so Shatabdi Express trains. Conversion of the rakes of the remaining train services to LHB design is in progress.

6. CLEANLINESS AND HYGIENE

a) Intensive mechanized cleaning of coaches : Mechanized cleaning of coaches is being carried out in the coaching depots through professional agencies. Heavy duty machines such as high pressure jet cleaners, floor scrubbers, vacuum suction cleaners etc. are deployed for the purpose.

b) Clean Train Stations scheme : Clean Train Stations Scheme is provided for limited mechanized cleaning attention to passing through trains during their halts at selected stations enroute. 39 such Clean Train Stations have been made operational by 31.03.2017.

c) On Board House keeping Scheme (OBHS) : On Board House keeping Scheme (OBHS) has been prescribed in all Rajdhani, Shatabdi, Duronto & other important long distance Mail/Express trains for frequent cleaning of coach toilets, doorways, aisles & passenger compartments during the run of the trains.

In addition, following steps have been taken to maintain Cleanliness at Stations :

1. Provision of Integrated Housekeeping Contracts at Major stations.
2. Use of CCTVs is being extended for monitoring cleanliness work at major Stations.
3. Third party Survey of passenger perception on Cleanliness standards of 407 major railways stations completed in 2016.

7. THE SAFETY

There were 103 consequential train accidents in 2016-17 as compared to 106 accidents during 2015-16. Train accidents per million train Kms. An important index of Safety. On IR dropped from 0.10 in 2015-16 to 0.09 in 2016-17.

8. MEASURES TO IMPROVE SAFETY

a) Safety Focus – to reduce accidents caused by human errors, a multipronged approach with focus on introduction of newer technologies, mechanization of maintenance, early detection of flaws, etc. to reduce human dependence in the first place, alongwith upgrading the skills of the human resources were the prime drivers for accident prevention.

b) Periodical Safety Audits – of different Divisions by multi-disciplinary teams of Zonal Railways as well as Inter-Railway Safety Inspections were conducted on regular basis. During 2016-17, 84 Internal Safety Audits and 31 Inter-Railway safety Inspections were carried

safety category employees attended refresher training.

c) Level Crossings : Level crossings are meant to facilitate the smooth running of traffic in regulated manner governed by specific rules & conditions. Status of level crossings on IR as on 01.04.2017 is as under.

9. PASSENGER FACILITIES

a) IR-DRDO Bio Toilets in IR BG Coaches : To overcome the environmental degradation and maintain hygiene in railways premises, RDSO in association with DRDO (DRDE/Gwalior) has developed IR-DRDO Bio-toilets which is being fitted on existing & new coaches.

b) Development of World class Interior in Coaches : First model rake of world class AC and Non AC coaches was flagged off and is running between Varanasi and New Delhi is Mahamana Exp.

c) Water Purification System in Indian Railway Passenger Coaches : RDSO has developed and MCF/RBL has fitted Water Purification System in

Table-6 : Explains the Comparative position of train accidents during last year.

Year	Collisions	Derailments	Level Crossing Accidents	Fire in trains	Misc. Accidents	Total*	Train accidents per million train Kms.
2010-11	05	78	53	02	01	139	0.14
2011-12	09	55	61	04	02	131	0.12
2012-13	06	48	58	08	--	120	0.11
2013-14	04	52	51	07	03	117	0.10
2014-15	05	60	56	06	04	131	0.11
2015-16	3	64	35	0	4	106	0.10
2016-17	5	77	20	1	0	103	0.09

*Excludes Konkan Railway

Source : Indian Railway year book 2016-17, ministry of railways, Govt. of India, New Delhi.

out.

c) Training facilities – for drivers, guards and staff connected with train operation have been upgraded. Disaster Management Modules have also been upgraded. During 2016-17, 1,05,164

Table -7 : Level Crossing

Number of manned level crossings	19480	72%
Number of unmanned level crossings	7701	28%
Total number of level crossings	27181	

Source: Indian Railways Year Book 2016-17

22 numbers Antyodaya Coaches (LWS) for trail.

d) First Indigenous Air-Conditioned EMU : First Indigenous Air-conditioned EMU for Mumbai sub-urban with 3-phase propulsion system has been developed and manufactured by ICF for operation in Western Railway.

e) Air Conditioned Metro for Kolkata Metro : Air conditioned metro with 3-phase electric and bolsterless bogie similar to other metro coaches has been manufactured by ICF and one rake has been turned out in July 2017.

10. FASTER TRAINS

Mission Raftaar announced in Railway Budget 2016-17 aims to increase the average speed of all non-suburban passenger trains by 25km per hour (kmph) in five years. To achieve this, loco-hauled commuter trains will be replaced with main line electric multiple unit/diesel electric multiple unit trains (can operate at speeds of 130kmph and above), twin pipe air brake systems will be introduced on freight trains, powering arrangement for freight trains with a ratio of 1.5-2.0 (international ratio is 2.0-2.5) will be implemented, timetables, reviewed, and constraints in fixed infrastructure on routes removed.

Also, a high speed rail project from Mumbai to Ahmedabad has been sanctioned, which involves laying of a high speed track. A special purpose vehicle (SPV), national High Speed Rail Corporation Ltd. Has been incorporated to execute the project. Financial and technical assistance is being provided by the Government of Japan (using Shinkansen technology). The project is proposed to be commissioned by 2023.

Gatiman Express, a semi-high speed train capable to travelling at a maximum speed of 160 kmph was introduced in April 2016. This is the fastest passenger train currently in India, which runs between Agra and Delhi.

11. CHALLENGES

The biggest challenge facing Indian Railways today is the inability to meet the demands of its customers, both freight and

passenger, Apart from the quantum of investment, quality of delivery is also an issue. Cleanliness, punctuality of services, safety, quality of terminals, capacity of trains, quality of food, security of passengers and ease of booking tickets are issues that need urgent attention.

It is a management failure which failed to raise voice before the leadership/ Govt. to the issue well in advance when Indian Railways major routes were becoming bottle neck for main movement rather major cause for slowing speed of trains due to abnormal delay enroot detention further increasing costs due to increased wagon turn round.

12. CAPACITY CONSTRAINTS

In Railways capacity to run trains in a given section are called sectional capacity.

In other words, maximum number of trains (passenger + freight) that can run through a section within 24 hours is called sectional capacity.

$$\text{Sectional Capacity} = \frac{1440 \times R}{T + t}$$

1440 denotes total minutes in 24 hours.

T = is the maximum running time taken by the slowest train in the critical block section, critical block section means the running time between two stations as the space between station is called block section.

R = Efficiency factors.

t = Block Operating Time

However, it is not a subject of study for this research work but when capacity constraints highlighted as a subject problem faced by railways it is essential to elaborate it. Railways productivity is transportation and from it railways earns revenue. So meaning of maximum trains means earning more and more revenues.

13. TECHINCAL CAPACITY CONSTRAINTS

By and large it is also a part of sectional capacity. Big stations where trains originate and terminate are called terminals. Like New Delhi, Howrah, Chennai Central an so others. Stations

dealing with passengers are called passenger terminals and stations dealing with freight business are called freight terminals.

With the growing population and industrialization of country need for transportation developed.

And here it can also be emphasized that either railways could not foresee its need in time or it was deliberately ignored.

For example as on date need for metro approaching trains in more numbers is a burning necessity. But Railways is handicapped to fulfill this requirement for want of adequate terminal capacity.

For example more no. of trains for Delhi / Mumbai metro from North Bihar is required, but for want of terminal capacity at Muzaffarpur Junction it cannot run.

14. SAFE JOURNEY OF TRAINS

Like punctuality it is also an area of

interest for rail users. And in simple words accidents are mainly outcome of dense traffic without or inappropriate capacity. When capacity constraints are handled strengthening of bridges, tracks, use of modern coaches / engines / wagons / advance or latest signalling is used. All these efforts make the train journey safe and fail proof.

15. THE CHALLENGES

As the growth in the economy picks up in the years to come, IR will have a challenging task ahead because of line and terminal capacity constraints in transporting the incremental traffic. Therefore, there is need for significant investment in the network, especially the HDN routes and its feeder and other important routes. This would include prioritized capacity enhancement works such as doubling/ tripling/ quadrupling and traffic facility works like Intermediate Block Sections, bypasses, longer loops for running long haul trains.

Table-8 : Line Capacity Utilization on Indian Railway

Railway	<80%	80- 100%	100-120%	120-150%	>150%	OTOS*	Total
Central	34	9	11	12	7	1	74
East Cost	16	9	9	16	2	4	56
East Central	16	13	19	22	16	5	91
Eastern	22	22	41	1	--	3	89
North Central	11	3	7	22	2	1	46
North Eastern	12	6	12	6	6	--	42
North Frontier	18	10	4	14	3	11	60
Northern	70	26	29	23	10	4	162
North Western	39	7	6	3	1	4	60
South Central	20	32	23	8	9	--	92
South Eastern	24	13	14	17	1	2	71
S. East Central	9	6	9	7	2	--	33
Southern	53	38	25	15	--	--	131
South Western	38	12	--	--	--	1	51
West Central	1	4	7	6	3	--	21
Western	32	18	17	21	4	48	140
Total	415	228	233	193	66	84	1219

*OTOS: One Train only System

Source :Indian Railway White Paper 2015, lifeline of the nation, published by ministry of railways 2015, New Delhi.

16. CONGESTION OVER IR (INDIAN RAILWAYS)

Across zones, the availability of Line Capacity on High Density Network & other important routes is illustrated below (492 out of total 1219 Section i.e. 40% of Sections are running at 100% or above Line capacity) in Tables below.

17. PUNCTUALITY

At present, the punctuality of Mail/Express trains over the Indian railways is about 80 percent. The average punctuality of Mail/Express trains achieved over the IR system on terminating basis in the last five years is depicted in Table below:

The Punctuality of Mail/Express trains (arriving at destinations on right time) during the year 2016-17 was 77% as per Integrated Coaching Management System (ICMS). The computer based on-line system was adopted from January 2009 for analyzing Punctuality Performance.

18. CONCLUSION

Indian Railways have made giant strides in the last 3 decades where in its traffic, both freight and passenger, have sustainably grown. In spite of this, the Railways have not been able to keep pace with the traffic growth in the country resulting in their inability to meet those challenges.

Table-9 : Punctuality of Trains

Year	Punctuality Percentage	Avg. No. of Mail/Exp Train Run Per Day
1210-11	69.00%	1266
2011-12	75.00%	1348
2012-13	79.00%	1430
2013-14	83.00%	1505
Upto November 2015	78.00%	1414

Source : Integrated coaching management system. Outcome and performance budget of Railways for 2016-17, Ministry of Railways, New Delhi2016.

It is time to revamp Indian Railways because it the largest single employer in the world, controlling 1.3 million employees, is not

Figure-1 : Surveys & Feedback from Passengers Graph showing percentage of passengers agree or disagree on the questioner asked.

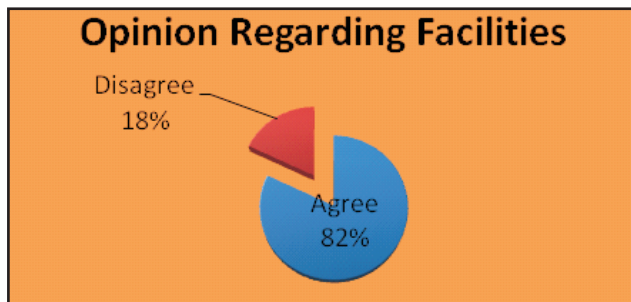


Figure-3 : Graph showing % of Convenience for passenger

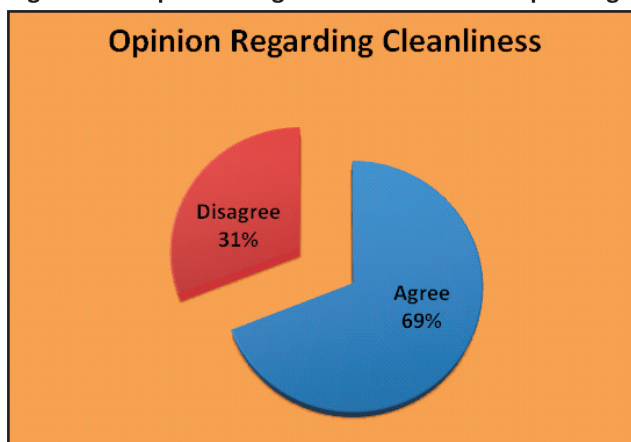
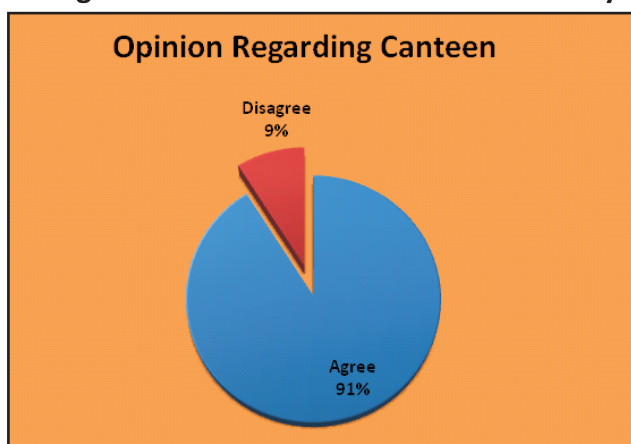


Figure-4 : Graph showing % of Agree or Disagree for the cleanliness in Indian Railways



able to meet the growing needs of the country. The market share of freight traffic at one time used to be above 75%. It is now less than 25%. This is primarily due to railways inability to carry the available traffic on its congested network. For passenger traffic, it is difficult for any

Figure-5 : Graph showing % of agree or disagree for the facilities provided in the Canteen

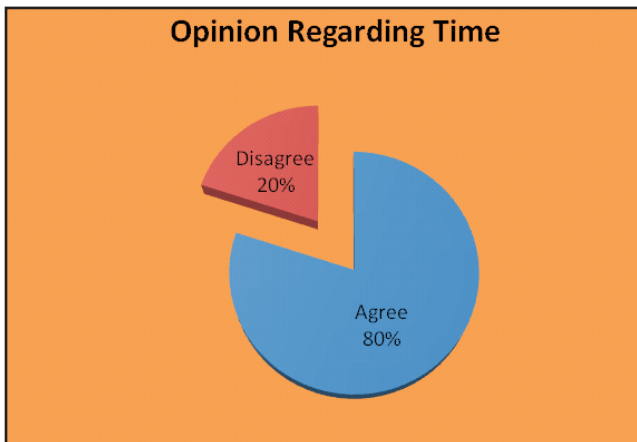
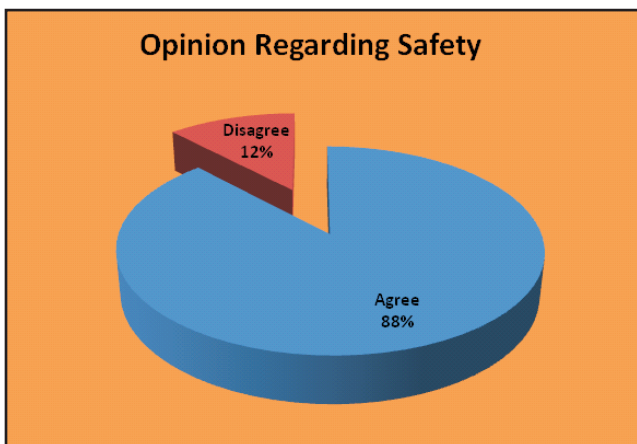


Figure-6 : Graph showing % of agree or disagree for the time management scheduled



Graph showing % of agree or disagree on the safety facilities

passenger to travel at will with a confirmed reservation. For any reorganization of changing rules and regulations, the basic goal has to be kept in view which should be:

"Indian Railways will carry all the offered freight, passenger and parcel traffic efficiently, safely and to the full satisfaction of its customers"

An accident due to fire in train has been a big challenge for Indian Railways. Indian Railways should introduce fire proof coaches and phase out older coaches as fast as possible to stop such accidents. It should also start using fire Retardant furnishing Material and introduce fire detective systems in trains. India Railway should also introduce LHB coaches for all the trains so as to check Damage during Accidents. Whenever the coaches collide the Bath room

portion of coach Collapses and passengers remain safe.

Indian Railway should appoint security guard cum passenger attendant in each coach to assist passengers in boarding and detrainning as well as opening and closing of the doors of coaches at stations as per requirement. What may be the duty lists of TTEs but practically they have failed to deliver their duties and most of the time they never take care of passenger problems and they are involved only in ticket checking or other malpractices. As far as the cost of appointing such security guard/ passenger attendant is concerned Railway can charge security cum service charge from passengers which the passengers will gladly pay if the proper service is provided

Indian Railway require finance for modernization however the required budgetary support is absent. For example, the provision of automated signaling system to prevent the crashes is missing. The stiff competition between private airlines has brought serious threat on upper class passengers of the railways.

Challenge is speedy creation of infrastructure is being met by IR by requesting funding by state governments and other beneficiaries and execution of projects through Special purpose Vehicles.

Major issues regarding the passenger satisfaction are availability of accommodation, transit time, punctuality, cleanliness at stations and trains, catering services and reservation facilities.

Similarly, Major issues regarding freight customers are availability of suitable terminals for loading and unloading timely availability of rolling stock and speedy & seamless transit times of freight trains.

Indian Railways needs to address the issue of improving the security provided on board the trains comprehensively to encompass setting of norms, provision of adequate resources, coordination among staff and evaluating the results thereof.

REFERENCES

1. Indian Railways Annual Report & Account 2015-16, 2016-17
 2. Indian Railways Year Book 2015-16, 2016-17
 3. National Transport Development Policy Committee 2013.
 4. Indian Railways White Paper, Life line of the national 2015.
 5. Time of India The Times of India (India) 15 April 2010.
 6. European Railways Agency (ERA).
 7. Rail Transport Journal June 2016, Vol XXV No. 1 New Delhi
 8. Ministry of Railways 2012 Planning commission 2013.
 9. Reforms on Track, Investment Trajectory, June 2017
 10. Government of India Ministry of Railways Expert Group for Modernization of India Railways.
 11. Outcome performance Indian Budget 2016-17.
 12. G.M.'s Annual Journal Reports 2015.
 13. The Indian Express News Paper 22 Nov. 2016, New Delhi
 14. Indian Railways Magazine Jan 2017.
 15. Report of the committee for Mobilization of Resources for Major Railways Projects and Restructuring of Railway Ministry and Railways Board. 2015.
 16. Indian Railways Vision 2020.
 17. Indian Railways Magazine April 2018
 18. Indian Economy survey 2017
 19. Rail Transport Journal jan-July 2017,Vol-xxvi No-1
-