



Performance Indicators of Indian Railways at Glance

V Murugaiah* and Raghavendra Prasanna Kumar†

Abstract

Indian Railways is aware of the need to be up-to-date with modern technological developments and best global practices to cash on the growing opportunity in freight and passenger business and provide the desired level of service to its passengers and customers. In this research paper, an attempt is made to evaluate the overall performance of Indian railways over the last ten years & to study the comparative position of train accidents and measures to improve safety by Indian Railways. The outcome of the study will explain in detail about the efficiency of Indian railways. Indian railways have always shown keen interest in taking advantage of technology to provide safety for the passengers.

Keywords: Indian Railways, Freight and Passenger, development, technology, operating ratio.

Introduction

According to the Government of India, Ministry of Railways (2015), Indian Railways (IR) is a great national asset. A single transport network that connects far flung areas of the country. It is one of the largest transportation and logistics networks of the world which runs 19,000 trains. It runs 12,000 trains to carry over 23 million passengers per day connecting about 8,000 stations spread across

*Davangere University, Karnataka; India; murugaiah.valleti@gmail.com

†Davangere University, Karnataka; India; raghuhbk1988@gmail.com

the sub-continent. It is equivalent to moving the entire population of Australia. It runs more than 7,000 freight trains per day carrying about 3 million tonnes of freight every day.

Its network of 65,000 route kilometres is more than one and half times the circumference of the earth. It has joined the select club of countries comprising China, Russia and United States Railways with an originating freight load of 1008.09 million tonnes (i.e. one billion plus) in 2012-13. During 2013-14, Indian Railways carried 1.05 billion tonnes of revenue earning freight traffic and was expected to carry 1.1 billion tonnes in 2014-15.

The efficiency of Indian Railways is measured using asset utilization, cost/revenue performance, passenger and freight rates and Staff Productivity. The following indicators are also taken into consideration for the calculation of efficiency, namely efficiency ratio, net revenue and surplus of Indian Railways, freight volume and revenue of Indian Railways, passenger volume and revenue of Indian Railways, average rate per passenger and ton kilometre, number of staff, total wages and pension funds of Indian Railways.

Low operation ratio will give good result in the improvement of performance. The ratio depends on gross earnings as well as on working expenses. The commercial department which earns the revenue, is entitled to as much credit for an increase in earnings as the operating department which controls expenditure for decrease in working expenses.

Working expenses are clear as the spending experienced in linking with the administration, operation, maintenance and repairs of lines open for traffic. This also includes appropriation to pension fund and the contribution made to DRF to meet the cost of replacements and renewals. Gross earnings are defined as the true earnings in an accounting period whether actually realised or not. The earnings include coaching, goods and sundry earnings.

Indian Railways has two types of customers, viz. passenger and freight. The major issues regarding passenger satisfaction are availability of train accommodation, transit time, punctuality, and cleanliness at stations and in trains, catering services, reservation facilities, etc. Similarly, major issues regarding freight customers are availability of suitable terminals for loading and unloading,

availability of rolling stock and speedy and seamless transit times of freight trains.

Objectives of the study

- To analyse the financial performance of Indian Railways.
- To study the Comparative position of train accidents and administrative measures taken to improve safety by Indian Railways.

Research Methodology

This research paper is descriptive in nature and mainly depending on secondary data collected from official website of Indian Railways and Railway year books. To find-out the overall financial performance of Indian Railways, the study period chosen is 2005-06 to 2014-15. Compound annual growth rate, simple percentage and correlation are the statistical tools used to analyse available data.

Data Analysis

Overall Performance of Indian Railways is as follows:

Table 1A-Capital Assets of Indian Railways

Year	Assets (in crores)	
	Capital at Charge	Total Investment
2005-06	65,878.37	1,12,180.41
2006-07	76,030.69(15%)	1,30,168.71(16%)
2007-08	88,521.14 (16%)	1,51,434.35(16%)
2008-09	1,04,301.25 (18%)	1,76,726.41(17%)
2009-10	1,23,000.69 (18%)	2,03,315.37(15%)
2010-11	1,43,220.57 (16%)	2,31,615.25(14%)
2011-12	1,61,447.97 (13%)	2,57,958.35(11%)
2012-13	1,83,488.08 (14%)	2,89,374.87(12%)
2013-14	2,08,844.28 (14%)	3,24,662.40(12%)
2014-15	2,42,116.97 (16%)	3,68,758.21 (14%)

Note: Capital at charge is the book value of the capital assets of Railways.

Note: Figures in brackets indicates year over year growth.

Source: Indian Railways Summary sheet 2014-15

Table 1-A finds capital at charge increased by 15% in the year 2006-07, 16% in 2007-08, 18% in 2008-09 and 2009-10, 16% in the year 2010-11, 13% in the year 2011-12, 14% in the year 2012-13 and 2013-14 and 16% in the year 2014-15.

Total investment increased by 16% in the year 2006-07, 16% in 2007-08, 17% in 2008-09, 15% in the year 2009-10, 14% in the year 2010-11, 11% in the year 2011-12, 12% in the year 2012-13 and 2013-14 and 14% in the year 2014-15.

Compound Annual Growth Rate (CAGR): 13.90% for Capital at Charge, 12.64% for Total investment, it is observed over the last 10 years capital at charge and total investment increasing and growing at a consistent rate.

Table 1-B reveals that locomotives (a powered railway vehicle used for pulling trains), plays important role in carrying the freight and passenger from one place to another place. Due to improvement in technology and for smooth flow of work, Indian railways prefer the Diesel and Electric locomotives consistently.

It is evidence that the number of Diesel and Electric locomotives has consistently been increasing due to increase in the passenger and freight traffic. Compound Annual Growth Rate for Diesel Locomotives is 1.77%. Compound Annual Growth Rate for Electric Locomotives is 4.64%.

Due to increase in the passengers, coaching stocks are also increasing consistently to accommodate the passengers. Compound Annual Growth Rate for passenger coaching stocks is at 3.1%; this explains there is a need for more and more passenger coaching stock which will aid in the growth of Indian Railways.

Table 1 B Rolling Stock (in units)

Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Locomotives										
Steam	44	43	44	43	42	43	43	43	43	43
Diesel	4,793	4,816	4,843	4,963	5,022	5,137	5,197	5,345	5,633	5,714
Electric	3,188	3,294	3,443	3,586	3,825	4,033	4,309	4,568	4,823	5,016
Coaching Stock										
Passenger	38,156	38,855	40,696	42,079	43,526	45,048	46,688	48,037	50,194	51,798
EMU / DMU / HMU	5,894	6,454	6,641	6,984	7,487	8,053	8,617	9,184	9,371	9,725
Rail Cars	40	41	38	38	37	34	34	35	35	35
Other coaching vehicles	5,612	5,905	6,180	5,985	6,477	6,500	6,560	6,622	6,792	7,000
Wagons	2,07,983	2,07,723	2,04,034	2,12,835	2,20,549	2,29,997	2,39,321	2,44,818	2,52,833	2,54,006

Source: Indian Railways Summary sheet 2014-15

Table 1 C Total No. of Employees (in thousands), Wage bill (in Crore) and Avg. Wage Bill (in Rs)

Year	No. of Employees	Wage Bill	Avg.Wage Bill
2005-06	1,412	23,919.9	1,69,770
2006-07	1,398	24,159.08	1,73,799
2007-08	1,394	25,891.99	1,86,067
2008-09	1,386	39,993.35	2,90,784
2009-10	1,362	51,719.42	3,82,472
2010-11	1,332	51,776.57	3,94,112
2011-12	1,306	58,638.28	4,56,357
2012-13	1,307	67,004.42	5,27,295
2013-14	1,334	75,893.05	5,85,620*
2014-15	1,326	84,748.01	6,57,829

Source: Indian Railways Summary sheet 2014-15

Table 1-C reveals that, from 2005-06 onwards there is a decrease in the number of employees up to 2011-12, again it started to decrease from the year 2014-15. Compound Annual Growth Rate for the number of employees from 2005-06 to 2014-15 is -0.63%. Due to sixth pay commission, there was considerable change in the salary of the Indian Railways employees from Group A to Group D level. Even though the number of employees is decreasing regularly, the Wage Bill and Average Wage Bill is increasing at a rapid rate due to shuffles in allowances such as TA, DA and other allowances. Compound Annual Growth Rate for wage bill was 13.49%. Compound Annual Growth Rate for Average Wage bill was 14.51%. There is a very low difference in the comparison of Wage Bill and Average Wage Bill. Decrease in the number of employees over the years is a major concern for the Indian Railways.

Table 1D Transportation Output

Year	Train Km (in millions)		Vehicle and Wagon Km (in millions)	
	Passenger and proportion of mixed	Goods and proportion of mixed	Vehicle (Kms)	Wagon (Kms)
2005-06	534.4	291.0	15,004	32,434
2006-07	551.7	305.4	15,741	34,259
2007-08	567.5	325.5	16,714	36,695
2008-09	591.2	340.6	17,588	16,134
2009-10	624.5	356.0	18,678	17,063
2010-11	655.4	368.9	19,646	17,749
2011-12	681.5	391.4	20,816	19,140
2012-13	703.8	400.8	22,309	18,912
2013-14	733.4	418.8	23,542	19,546
2014-15	759.3	401.9	24,802	18,930

Note: Vehicle/wagon kilometre – Unit of measure of distance which corresponds to movement of a vehicle/wagon over a distance of 1 kilometre.

Source: Indian Railways Summary sheet 2014-15.

Table 1-D shows that there is a moderate degree of negative correlation (-0.69) between the vehicles and wagons for the last ten years. Compound Annual Growth Rate for vehicle in transportation output is 5.15%, Compound Annual Growth Rate for wagon in transportation output is -5.24%. It is very much clear that there is a considerable increase in passengers and train and more kilometres have been covered by trains from 2005-06 to 2014-15. In case of wagon transportation of goods there is a clear increase, however wagon kilometres is gradually becoming lesser.

Table 1 –E Volume of Traffic

Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Passenger Traffic										
No. of passengers originating (in millions)	5,725	6,219	6,524	6,920	7,246	7,651	8,224	8,421	8,397	8,224
Passenger kms. (in millions)	615,614	694,764	769,956	838,032	903,465	978,508	1,046,522	1,098,103	1,140,412	1,147,190
Passenger earnings (in crore)	15,080.77	17,176.01	19,783.25	21,866.48	23,414.44	25,705.64	28,246.43	31,322.84	36,532.25	42,189.61
Average lead (in kms.)	107.5	111.7	118	121.1	124.7	127.9	127.2	130.4	135.8*	139.5
Average rate per passenger-km. (in paise)	24.5	24.7	25.7	26.09	25.9	26.3	27.0	28.5	32.0*	36.8
Freight Traffic										
Tonnes originating (in millions)										
Revenue earning traffic	666.5	727.75	793.89	833.39	887.79	921.73	969.05	1,008.09	1,051.64	1,095.26
Total traffic	682.4	744.56	804.11	836.61	892.22	926.43	975.16	1,014.15	1,058.81	1,101.09
Net tonne kms. (in millions)										
Revenue earning traffic	439,596	480,993	521,371	551,448	600,548	625,723	667,607	649,645	665,810	681,696
Total traffic	441,762	483,422	523,196	552,002	601,290	626,473	668,618	650,625	666,728	682,612
Earnings from freight carried excl. wharfage & demurrage charges (in cr)	35,534	41,073	46,425	51,749	56,911	60,687	67,743	83,478	91,570	1,03,100
Average lead-Total traffic (in kms.)	647	649	651	660	674	676	686	642	630	620
Average rate per tonne km. (in paise)	80.83	85.39	89.04	93.84	94.77	96.99	101.47	128.50	137.53	151.24

Source: Indian Railways Summary sheet 2014-15.

Table 1-E shows that there is 3.69% of Compound annual growth rate of passengers originating over the last years, 6.42% Compound annual growth rate of passenger kilometres and 10.84% of Compound annual growth rate of passenger earning. It is important to note that the earning is having more impact due to increase in the fare charged to passengers.

Compound Annual Growth Rate for freight earning excluding wharfage & demurrage charges is 11.24%.Compound Annual Growth Rate for Average lead-Total traffic (in kms) is - 0.43%.Compound Annual Growth Rate for average rate per tonne kms (in paise) is 6.47%

Compound Annual Growth Rate is the supporting values for the last ten years.

Calculation

Compound Annual Growth Rate for Gross revenue =11.08%

Compound Annual Growth Rate for Working expenses incl. depreciation, etc. and miscellaneous expenses=11.55%

Compound Annual Growth Rate for Net revenue receipts=7.72%

Compound Annual Growth Rate for Percentage of net revenue receipts to the Capital-at-charge= -5.43%

Compound Annual Growth Rate for operating ratio (per cent) =0.86%

Compound Annual Growth Rate for Dividend to General Revenues and payment to States in lieu of tax on Passenger fares = 9.60

Compound Annual Growth Rate for Excess (+)/ Shortfall (-) =5.86%

Table 1-F reveals Gross revenue receipts has increased by 15% in 2006-07, 13% in 2007-08,11% in 2008-09, 9% in 2009-10, 8% in 2010-11, 10% in 2011-12, 19% in 2012-13,13% in 2013-14, 12% in 2014-15.

Working expenses including depreciation, etc. and miscellaneous expenses has grown up by 4% in the year 2006-07, 9% in 2007-08,32% in 2008-09, 15% in 2009-10, 8% in 2010-11, 10% in the year 2011-12, 13% in 2012-13,17% in 2013-14, 10% in 2014-15.

Table 1-F Operating Revenue and Expenditure (` in Cr)

Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Gross revenue receipts	56,315.51	64,785.84	73,276.57	81,658.98	89,229.29	96,681.02	106,245.28	1,26,180.43	1,43,213.87	1,61,017.25
YOY Growth		15%	13%	11%	9%	8%	10%	19%	13%	12%
Working expenses incl. depreciation, etc. and miscellaneous expenses	48,309.63	50,332.71	54,942.55	72,484.53	83,685.20	90,334.88	99,463.68	1,12,565.24	1,31,464.80	1,44,178.76
YOY Growth		4%	9%	32%	15%	8%	10%	13%	17%	10%
Net revenue receipts	8,005.88	14,453.13	18,334.02	9,174.45	5,544.09	6,346.14	6,781.60	13,615.19	11,749.07	16,838.49
YOY Growth		81%	27%	-50%	-40%	14%	7%	101%	-14%	43%
Percentage of net revenue receipts to the Capital-at-charge	12.15	19.01	20.71	8.80	4.51	4.43	4.20	7.42	5.63	6.95
YOY Growth		56%	9%	-58%	-49%	-2%	-5%	77%	-24%	23%
Operating ratio (per cent)	83.72	78.68	75.94	90.46	95.28	94.59	94.85	90.19	93.6	91.25
YOY Growth		-6%	-3%	19%	5%	-1%	0%	-5%	4%	-3%
Dividend to General Revenues and payment to States in lieu of tax on Passenger fares	3,667.92	4,246.81	4,902.93	4,717.67	5,543.34	4,941.25	5,656.03	5,348.94	8,008.67	9,173.55
YOY Growth		16%	15%	-4%	18%	-11%	14%	-5%	50%	15%
Excess(+)/	4,337.96	10,206.32	13,431.09	(4,456.78)	0.75	1,404.89	1,125.57	8,266.25	3,740.4	7,664.94
YOY Growth		135%	32%	-67%	-100%	187219%	-20%	634%	-55%	105%

Source: Indian Railways Summary sheet 2014-15

Net revenue receipts has increased by 81% in 2006-07, 27% in 2007-08, -50% in 2008-09, -40% in 2009-10, 14% in 2010-11, 7% in 2011-12, 101% in 2012-13, -14% in 2013-14, 43% in 2014-15.

Percentage of net revenue receipts to the Capital-at-charge changed by 56% in 2006-07, 9% in 2007-08, -58% in 2008-09, -49% in 2009-10, -2% in 2010-11, -5% in 2011-12, 77% in 2012-13, -24% in 2013-14, 23% in 2014-15.

Operating revenue figures fluctuated to -6% in 2006-07, -3% in 2007-08, 19% in 2008-09, 5% in 2009-10, -1% in 2010-11, 0% in 2011-12, -5% in 2012-13, 4% in 2013-14, -3% in 2014-15.

Dividend to General Revenues and payment to States in lieu of tax on Passenger fares grown up by 16% in 2006-07, 15% in 2007-08, -4% in 2008-09, 18% in 2009-10, -11% in 2010-11, 14% in 2011-12, -5% in 2012-13, 50% in 2013-14 and 15% in 2014-15.

Table 2 Shows Comparative position of train accidents during the last five years:

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
Total	29	293	279	27	10	668	

Source: Indian Railway Summary Sheet 2014-15

Table 2 revealed over the last five years there have been 668 train accidents. Out of the 668 accidents, accidents due to derailments are the highest with 293 cases, followed by level crossing accidents in a close second place with 279 cases. Train collisions are in the third place with 29 cases, fire in trains are in the fourth place with 27 cases and miscellaneous accidents are in the last place with 10 cases. It is also heartening to note that no miscellaneous accidents were recorded in the year 2012-13.

Table 3 Casualties and Compensation: The number of passengers injured or killed in train accidents and compensation paid in the last five years are given below:-

Year	No. of Passengers Killed	Injured	Casualties per million* Passengers carried	Compensation paid # (in Lakhs)
2010-11	235	358	0.08	585.79
2011-12	100	586	0.08	498.00
2012-13	60	248	0.04	319.63
2013-14	42	94	0.02	149.22
2014-15	118	324	0.05	127.00
Total	543	1320		1679.64

Source: Indian Railway Summary Sheet 2014-15.

Table 3 reveals over the five years 543 passengers were killed due to train accidents and 1320 passengers were injured. The compensation paid to the injured and killed passengers was 1679.64 lakhs in Indian rupee.

According to Indian Railways (2015) the following administrative measures were taken to improve safety:

Administrative Measures

- Safety performance is invariably reviewed as a first item on agenda of Board Meeting at the apex level. All accidents are analysed in detail so that remedial measures can be initiated.
- Chairman and Board Members have conducted Safety Review meetings with General Managers and PHODs of Zonal Railways during their visits. Intensive footplate inspections including night inspections have been conducted at the level of SAG and Branch officers and supervisors in the field.
- Safety drives have been launched from time to time, covering the lessons learnt from recent train accidents so as to prevent similar accidents in the future.

Source: Adopted from Indian railways official website.

Major findings of the study are as follows

- There is a high degree of positive correlation (0.999) between capital at charge and total investment of Indian

railways and it is observed over the last 10 years that the capital at charge and total investment is on the rise and is growing at a consistent rate.

- Due to increase in the passengers, coaching stocks are also increasing consistently to accommodate all the passengers. Compound Annual Growth Rate for passenger coaching stocks is at 3.1%; this tells us that there is a need for more passenger coaching stock for the growth of Indian Railways.
- Due to the sixth pay commission, there were a lot of changes in the salary of Indian railways employees from Group A to Group D level. Even though the number of employees is decreasing regularly, the Wage Bill and Avg. Wage Bill is increasing at a rapid rate due to shuffles in allowances such as TA, DA and other allowances.
- It is very clear that there is an increase in the number of passengers, trains and kilometres run by train from 2005-06 to 2014-15. Wagon transportation of goods has increased over the years; however, wagon kilometres have decreased. It is found that there is a high degree of positive correlation (0.99) between the earnings from passengers and earnings from freight; Compound Annual Growth Rate is the supporting values for the last ten years. It is clear that Indian railways' earning is consistently increasing from passengers and freight carriage.
- Operating ratio was at peak in the years of 2009-10 (95.28 investments and earning 1 rupee, 2010-11 (94.59 investment and earning 1 rupee to 2011-12, (94.85 investments and earning 1 rupee). The earning margin on investment was very low in these years.
- Operating revenue has changed by -6% in the year 2006-07, -3% in the year 2007-08, 19% in the year 2008-09, 5% in the year 2009-10, -1% in the year 2010-11, 0% in the year 2011-12, -5% in the year 2012-13, 4% in the year 2013-14, -3% in the year 2014-15.
- Analysing the causes for train accidents the researchers realised that derailment cases are more with 293 numbers

followed by Level crossing accidents in a close second place with 279.

- From 2011-12 to 2013-14 there was a gradual decrease in the number of passengers killed by train accidents. In 2011-12, the number of passengers killed decreased by -57% and in the year 2012-13 it decreased by -40%, in the year 2013-14 it decreased further by -30% and in the year 2014-15 it increased by a huge margin at 181%.
- Indian railways are trying to reduce train accidents both manually and by using technology such as Technological aids of Automatic Train Protection System to drivers (loco pilots); Training facilities for drivers, guards and staff connected with train operation have also been upgraded. In terms of the coaches, Indian Railways now uses fire retardant furnishing material along with the introduction of automatic fire and smoke detection system. To prevent accidents at level crossings, Automatic Block Signalling has been implemented. The Train Management System (TMS) is also another advancement that addresses concerns towards train accidents. The officers of Indian Railways also undertake periodical inspection of electrical and LPG fittings in pantry cars.
- From the administrative view point, safety drives have been launched from time to time, covering the lessons learnt from recent train accidents so as to prevent similar accidents in future.

Suggestions and Conclusion

- Indian railways need to use the capital for the purpose of developing the infrastructure which is going to be useful for the employees.
- Indian railways need to have more and more manufacturing unit to produce passenger's coaches all over India due to an increase in passengers.
- Ministry of Railways should pay fair remuneration to Group C and Group D government employees and reduce the working hours of employees on night duty.

- Indian Railways should take proper measures to increase freight transportation, which is an important part of earning.
- Indian Railways need to make proper utilization of man power and available assets to prove its efficiency. Such a proper utilization may also decrease the operating ratio.
- Proper checking of locomotives and coaches should be made at regular time intervals and employees should communicate properly to avoid derailments. It is the duty of every citizen to have patience at the level crossings until a train passes. Indian railways should monitor all level crossings and employ employees for this purpose. However, it is noted in the above study that the number of employees has constantly been decreasing.
- Protective equipment should be provided to all class of passengers to take care of themselves at the time of train accident and CCTVs should be installed in all moving trains to monitor the movements of passengers and to collect evidence in case of a mishap.
- Appropriate punishment should be awarded to passengers who are responsible for causing fire in a train by either smoking or carrying explosive goods. If it is a railway employee who is found breaking the law in this regard, they should be liable for harsh punishment.

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