Chapter-2

OBJECTIVE OF RESEARCH AND DATA BASE

Rail Transport could be compared with an iceberg in that for every tip (passenger service) you see above the surface, there is a huge mountain of submerged and concealed freight traffic. This freight traffic not only earns the Railways their own bread and butter, but also sustains the economy of the nation. By nature, everyone looks at and appreciates the visible crest (coaches and locomotives) and seldom attention is diverted towards the foundation (freight wagons). Contribution of the wagons towards vastness and prosperity of our Railway System can be best judged by the following Table.

TABLE-2.1

REVENUE EARNINGS OF FREIGHT TRAFFIC

Year	Freight Traffic Revenue in crores
1950-51	139.30
1960-61	280.50
1970-71	600.70
1980-81	1,550.90
1985-86	4,232.19

Source:- Indian Railways Year Book

But we know for certain that the existance of crest is dependent on the soundness of the invisible foundation. The chronic inability of carrying coal, ore, cement and other essntial goods indicates that the basic foundation (wagon) of Indian Railways needs thorough diagnostic study.

One of the main argument advanced by railways for its inability to lift requisite freight traffic is the shortage of wagons. One always thinks of buying more wagons as the solution to this problem. But the pertinant question is -- Will the loading increase with the mere increase in number of wagons? The following table indicates the details of capacity variation over the years along with freight traffic carried.

TABLE-2.2

DETAILS OF INCREASE OF WAGON CAPACITY AND DETAILS OF FREIHT TRAFFIC CARRIED

YEAR	NUMBER OF WAGONS '000	CAPACITY OF WAGONS million.t	* PERCENTAGE INCREASE IN CAPACITY	REVENUE EARNING TRAFFIC ORIGINATING TONNAGE	*PERCENTAGE INCREASE IN ORG.TON.
1950-51	195	4.14		73.0	
			46.95		57.78
1960-61	295	6.30		119.8	
			35.30		35.50
1965-66	354	8.50		162.0	
			12.00		3.60
1970-71	360	8.85		167.9	
			19.30		17.20
1975-76	382	10.50		196.8	
			6.0		-0.30
1980-81	387	11.14		195.9	
			-VE		31.50
1985-86		10.96		285.5	

* Percentage increase as compared to last entry.

Source:- Computed from the data of Indian Railway YearBook

Table 2.2 did not confirm that adding more wagons will guarantee the ability to cary more traffic.

The traffic projections as given by National Transport Policy Committee, Rail Tariff Enquiry Committee and Indian Railway Corporate Plan are shown in TABLE 2.3:

TABLE-2.3

FREIGHT FORCASTS OF 2000 AD

	FORCAST OF		
	N.T.P.C	R.T.E.C	R.R.C
Originating Tonnage in million Tonne.	-	672	635
Net Tonne Kms.in Billion Tonne Km.	468	406	375

For a planner, to be able to meet the anticipated capacity requirement, it is necessary to foresee the demand for transport and to have a detailed knowledge about the

various system parameters which influence the rail transport capacity. This study concentrates on the wagon utilisation to carry the anticipated traffic in 1999-2000. The objective of this study is to prepare a strategic investment and operating plan to optimise wagon utilisation.

For the analysis purpose the Railroad freight operations are visualised as given in Fig.1.

The tonnage that can be lifted will depend upon the lead of traffic and rolling stock holding (Locomotive and Freight wagons) and its utilisation. The importance attached to the intensive utilisation of rolling stock (Freight wagon and Locomotives) will mainly depend on the technological and economic environment in which the railways system is operating. The tradition of intensive utilisation of rolling stock in USSR and China has been developed in an environment of scarcity of capital equipment and material. On the other hand, in countries like USA/Canada where sophisticated capital equipment is more abundent and cheaper, where labour rates are very high, and time & convenience of transport user becomes the over riding consideration and provision of capital equipment and material is more generous, the objective of intensive utilisation of assets is secondary.

TABLE-2.4

COMPARISION OF ROLLING STOCK UTILISATION ON CHINESE & INDIAN RAILWAYS

UTILISATION INDEX FOR 1980-81	INDIA	CHINA
Wagon Kms. per wagon day.(BG)	80	200
No. of hours of wagon on move	4	6
Detention of wagons in marshalling yards	25/30 Hrs.	6/8 Hrs
Detention of wagons at loading terminals	24 Hrs.	4/6 Hrs
Detention of wagons at unloading terminals	24 Hours	5/6 Hrs
Average speed of goods train(Kms./Hr)	22 Disel/Electric	29

Sourse: Enclosure to tour notes of Chairman- Indian Railway Board

In India, the present situation is similar to what USSR and China has passed through and the primary attention has to be focussed on optimal utilisation of available capital equipment and material, in order to lessen the strain on limited National Resources for capital, reduce operating costs and, not the least, meet the growing demand in real time. It may be pointed out that benefits of optimisation

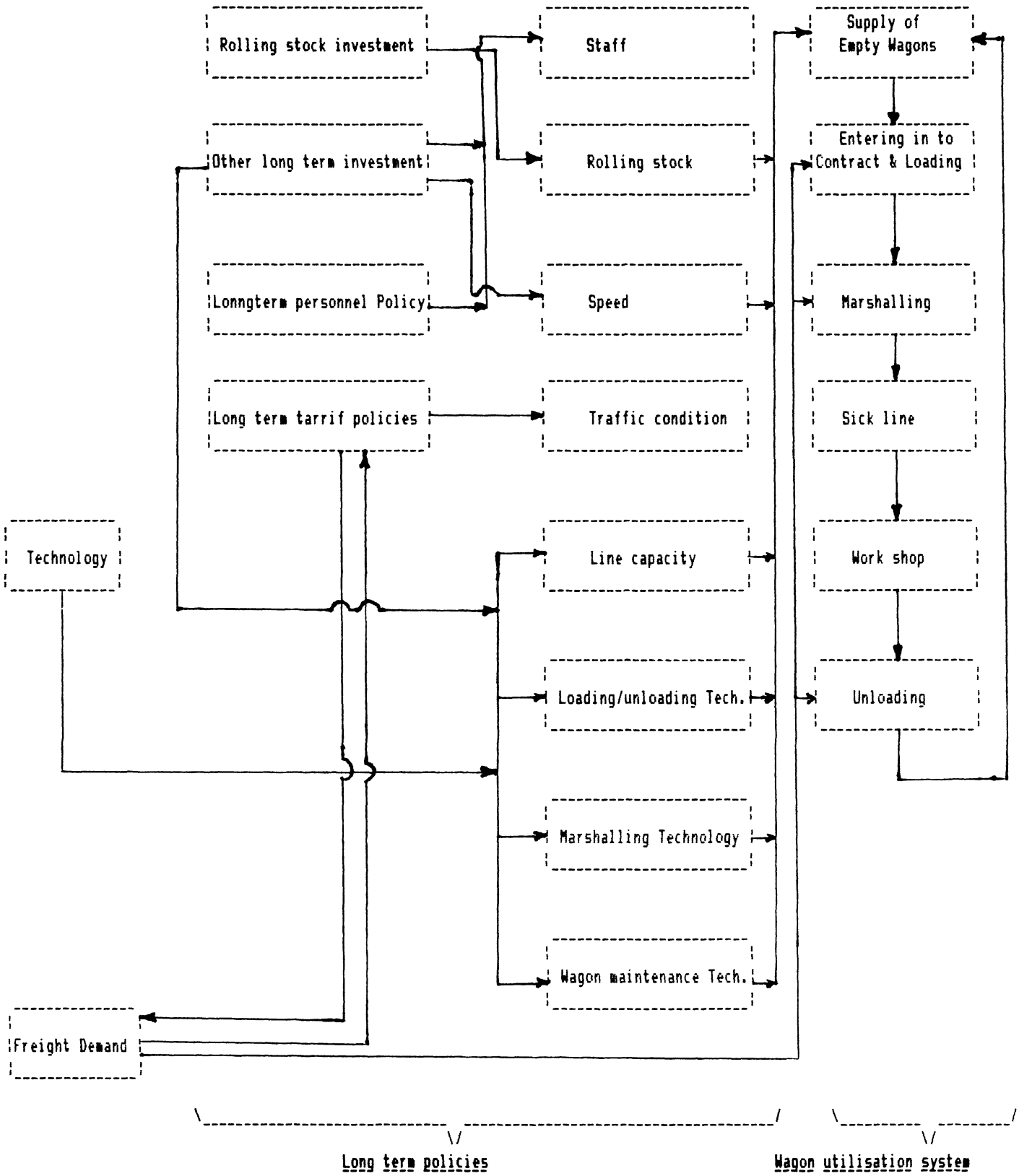
Rolling stock investment
Other long term investment
Lonngterm personnel Policy
Long term tarrif policies
Technology
Freight Demand
Staff
Rolling stock
Speed
Traffic condition
Line capacity
Loading/unloading Tech.
Marshalling Technology
Wagon maintenance Tech.
Supply of Empty Wagons
Entering in to Contract & Loading
Marshalling
Sick line
Work shop
Unloading
Long term policies
Wagon utilisation system

FIGURE - 1.

are recurring and their quanta would increase with growth of traffic.

The TABLE-2.4 gives the comparison of important wagon utilisation indicators of Chinese Railways and Indian Railways.

The above comparison would indicate that the potential for better utilisation of rolling stock on Indian Railways is quite large. The real need is the scientific analysis of the railway freight system as a whole and identify the areas where balancing inputs are needed. These inputs, which would be of diverse nature, would then have to be provided in well integrated phases. Another important factor which has to be considered is the investment pattern of existing inputs. Naturally the assets, for which the higher percentage of investments has already been made, are chosen first for study to arrive at various policies for optimal utilisation of that asset. Since more than 50 percent investment in rolling stock is in wagons and hence this research aims at analysing the total wagon management activity with an emphasis on wagon utilisation, to identify the balancing inputs needed for optimising wagon utilisation. Towards this end the study is conducted in the following phases:

(a) Study of historical freight traffic flow to understand the freight management problems.

(b) Literature Survey;

(c) Developing a statistical model to understand the relation between various investment centres and wagon utilisation, to identify balancing input when efficiencies are at average and above average;

(d) Conducting a study to make use of institutional knowledge and expertise to choose alternative policy options.

For the above analysis only data of Broad Gauge System of Indian Railways is considered as it carries more than 88 per cent of tonne-kilometer of freight traffic.

DATA BASE

The rail transport system, its input-output process, its functioning is quite a complex process. It is an information intensive activity, where data collection has to be made in an dynamic environment. The input-output analysis of railway organisation shows that railway transport is a logistic process with an input of "men, material, money and technology" being transformed in to mobility of goods and passangers" through operating decisions that use the reports and information. The logistic information system and process emphasises the movement of passengers and goods, whereas the management information system uses reports and other informations to analyse the historical data for planning, investment and technological decisions to ensure a required level of continues service.

The analysis of data base in Indian Railways indicates that it is mainly directed towards collecting logistic information or process oriented information grouped as follows:

* Economic and Financial Statistics.
* Operating Statistics.
* Commercial Statistics.
* Rolling Stock and Workshop Reports.
* Administrative Statistics.
* Annual Reports (Consolidated).

The data are compiled from various initial documents sent by divisions, stations, yards, sicklines and workshops etc. to the Central Statistical Office of Zonal Railway headquarters. The programme of receipt of initial documents in various stages and details of methods employed in compilation of data are laid down in the Manual of Statistical Data issued by Railway Board for guidance.

Data and reports received from different Railways in accordance with these instructions are consolidated and processed further for gauge-wise total and averages and for grand total for all Railways. These are finally compiled into different publications (monthly, half-yearly, annual) of Railway Board: Domestic Statistics of Railways, General Managers' and Railway Board's Annual Reports.

A brief outline of data used, their sources and other details can be seen from following Table 2.5.

TABLE -2.5
DATA BASE

SUB SYSTEM	DATA AVAILABILITY OF	DATA UNIT	DATA SOURCE	PERIODICITY	REMARKS
Marshalling System	Average detention to all wagons and number of wagons dealt which includes 1. Wagons on originating trains. 2. Wagons on terminating trains. 3. All loaded wagons. 4. All empty wagons.	Detention/ Wagon in hrs. and number of wagons.	Operating Statistics of Marshalling yards,Terminal stations and Break of gauge points (published by Railway Board).	Half-yearly publication (Monthly data is available.)	Covers all 1. Major marshalling yards dealing with 15000 wagons per month. 2. Since data is available for individual yards. The total detention to be computed.
Transhipment System.	Average detention to all wagons and number of wagons which include 1. Loaded wagons 2. Empty wagons.	-do-	-do-	-do-	1. Covers all transhipment-yards. 2. Since data is available for individual tran shipment yards. Total detention is to be computed.
Demand System	1. Originating tonnage	'000 tonne	Invoices	Monthly	For major Commodities covering 80% of goods Traffic.
	2. Net Tonne Kms.	tonne Km.	- do-		
	3. Lead.	Kms.	Published in stastictics of Passanger and goods traffic.		
	4. Lead	Kms.			To be computed.
	5. No.of wagons back loaded	Nos.	Operating Statistics of terminal Stations.	Half Yearly -Monthly data	
Terminal	Number & Detention to all wagons	Detention	Operating Statistics of terminal stations.	Half Yearly -Monthly data	
Wagon Design System	Total capacity of wagons	in tonnes	Annual Report of Railway-Board.	Yearly	
Maintenance System	1. Average No. of wagons daily in work shops 2. Average No. of wagons daily in sick lines.	Nos.	Monthly Railway Statistics		
Operating System	1. Wagon Kms. 2. Average Speed of goods train	'000 Kms. Kms.	-	do -	