

# Productivity Challenges: A Case of Indian Railways

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## **Abstract**

*In the evolutionary process, as the species called Homo sapiens (which is man's biological name) evolved from the primates and developed a sense of reasoning, his needs also increased corresponding to his increased awareness. Before man came into being the lesser creatures before him needed only food and to some extent shelter. As man emerged and started evolving gradually, apart from food every day to replace energy used in living and working, he also needed clothing to permit bodily cleanliness and afford protection from weather, housing of a standard to give protection from weather conditions and later on hygiene to give protection against disease and treatment in illness. As he further evolved and man became greedy he also needed protection against robbery and violence, against the loss of the opportunity to work, against poverty, due to illness or old age. The above are generally considered requirements for minimum satisfactory standard of living and of these food, clothing and housing are things which a man has to obtain for himself. In order to get them he must pay for them either in money or work. Hygiene, security and education are generally matters, for governments and other public bodies to provide. Even then the services of public authorities have to be paid for by the citizens. So each man must earn enough to pay his contribution to the common services as well as to support himself.*

**Key Words:** Productivity, Standardisation, Specialization, Synchronisation, Concentration, Maximization, Centralization.

## **Introduction**

Productivity would mean that more is produced with the same expenditure of resources i.e. at the same cost in terms of land, materials and labour or the same amount is produced at less cost in terms of land, materials, machines, time or labour used, thus releasing some of these resources saved for the production of other things.

The big boost to productivity was given during the time of the Industrial Revolution or as Alvin Toffler calls the Agricultural age (wave). During the agricultural era when man lived in small communities, all his needs were met by what is produced within the community from food to clothing to shelter. In other words all the things that man produced were endemic to his own community. With the advent of Industrial Revolution, when more and more machines were invented and mechanised transportation gave man the ability to travel longer distances faster the consumer and producer were not necessarily at the same place. As man's needs became more and the luxuries increased there was a trans-national and even trans-continental movement of goods across the globe.

Though industrial revolution and invention of new machines enhanced productivity to a large extent what really triggered and sustained production at a frenetic pitch are the practice of 6 principles brilliantly brought out by Alvin Toffler in his well-researched best-seller "The Third Wave". These 6 principles were thought of and given effect to, only in the beginning of this century.

They, according to Toffler are:

### **1. Standardisation**

As management and production experts know, the first person to grasp the importance of this idea was Theodore Vail who started off as a humble Railway postal Clerk in late sixties of the last century who rose to become virtual owner of the Telecom giant AT & T (American Telephone and Telegraph Company). What began as standard routing of postal letters and parcels paved the way for standardization of everything from coke bottles to soda bottle caps, telephone instruments, plug points and pins. This resulted in 'uniform manufacturing procedures' and ended in business becoming global giving a boost to productivity.

### **2. Specialization**

Specialisation which is the 'key word' in all industry and business right now, had its beginning in "Division of labour" as early as 1720's. Toffler quotes that the British and spoken about specialisation "which can get jobs done with less of time and labour". To bring home his point he had cited the example of a single old-style individual making only 20 pins or none in a day, whereas 10 specialised workmen in a factory each performing a single small step in the manufacture of pins together making 48,000 pins a day which would mean 4,800 pins per worker. This pin story is repeated again and again in all kinds of manufacture of goods all over the world. Though it de-humanised the worker, as only small steps were to be taken by each worker in the process of manufacturing, the good aspect was that, even handicapped individuals could get gainful employment.

### 3. Synchronisation

As said earlier ever since the split took place between production and consumption centres, the activities required in manufacturing or producing things required greater synchronisation. Typical of this is the manufacture of a product like cement. Raw materials like limestone, coal, ore etc. which are sourced from different areas are mined and transported to the cement plant in such a synchronised way that the expensive machinery like grinding units and kilns and packers etc. are not allowed to remain idle. In other words, activities which in the earlier days were performed 'consecutively' began to be performed 'concurrently' and from this emerged various management techniques like Programme Evaluation Review Techniques, critical path method operations research etc. which gave further fillip to productivity.

### 4. Concentration

The fourth principle which gave rise to increased productivity is 'concentration'. Large groups of people to meet the industrial needs were concentrated in urban areas uprooting them from their rural moorings, to produce things faster and faster. As giant manufacturing facilities started coming up under one roof the rural concentration become thinner and thinner. In order that the mentally and bodily sound and the good people produced more and more, I quote, "criminals were rounded up and concentrated in prisons, the mentally ill rounded up and concentrated in asylums, the children were rounded up and concentrated in schools even as workers were concentrated in factories" - Toffler.

### 5. Maximization

The above four principles and their application for production naturally gave rise to maximisation where the saying "the more the merrier became a credo". In order to produce more and more at lower costs there was an obsessive infatuation with maximisation. The mega cities that we see now with their skyscrapers, giant manufacturing facilities multi-storied condominiums are examples of this obsession. This obsession is not only reflected in industry but also in nations where, by totting up the value of goods and services and converting them into different kinds of statistical data "Gross National Product" is measured which represents the scale of growth of each country.

### 6. Centralization

In order to co-ordinate such vast activities in the last century of this millennium power - both economic and political which was hitherto totally decentralized came to be concentrated at one point, as otherwise it would have been impossible to control such vast industrial economic and political empires. Running of the Indian Railways is a typical example of such concentration which started off as various small fragmented railway companies during the British regime got amalgamated into one giant - the Indian Railways. Even though for purpose

of administrative and functional convenience it is divided into Zones the corporate objectives and its implementation including day to day activities are controlled by a central body i.e. Railway Board. This has resulted in standardised technologies and fares, freight and schedules and synchronised the operations spread over thousands of kilometres across the length and breadth of the country. As in other countries, in India the employees were divided into "line" and "staff, daily reports are initiated to provide data on punctuality, wagon movements, loading, sickness of wagons/coaches, freight loss, engine kilometers etc. All this information flowed up as a centralised chain of command until it reached the top man of operations who made the decisions and sent orders down the line. Thus the rail roads all over the world became a model for other large organisations and centralised management came to be regarded as an advanced sophisticated tool, with a view to achieving better productivity.

### **Productivity in Indian Railways**

Here the aspect of productivity with particular reference to the Indian Railways is described. The physical dimension of the Indian Railways and the massive scale of operations carried out are also described here under.

Indian Railways has a total route kilometreage of 62,729 and track kilometreage of 1,07,360 (13,517 Kms is electrified). With 6,967 locomotives (4,363 Diesel, 2,519 Electric and 85 Steam) and a wagon fleet of 2,72,127 and passenger coaches numbering 33,849, and 6,984 Railway stations and regular workforce 15,83,600, it is the second largest Railway network in the world under a single management (A prime example of concentration and maximization as said earlier).

It operates 11,000 trains including 7,500 passenger trains, carries 11 million passengers, and 1.2 million tonnes of freight traffic daily. The annual earnings of Indian Railways is Rs.24,319 Crores of which Rs.6,633 Crores are from passenger business. Of this earning, the highest expenditure is towards staff costs at Rs. 10,514 Crores which constitutes 43.2per cent of the total earning. With such stupendous dimensions and scale of operations, it is natural that the Railway is divided into 9 administrative zones (more are on the way) with a General Manager as the head of each zone.

He is assisted by 9 departmental heads in running this vast organisation. They are-

1. The Chief Engineer
2. The Chief Mechanical Engineer
3. The Chief Operations Manager
4. The Chief Electrical Engineer
5. The Chief Commercial Manager

6. The Chief Signal & Telecommunication Engineer
7. The Financial Adviser & Chief Accounts Officer
8. The Controller of Stores
9. The Chief Security Commissioner

The productivity norms are fixed differently for different departments. Since the Operating department is the functional department who avails the services of other departments to produce transportation, stringent productivity norms are fixed. Productivity of each input producing transportation is made out and analysed, daily, monthly, quarterly and annually and remedial action taken wherever there is deterioration. In order to assess the productivity of the various assets at the disposal of Railways to produce transportation in the most economic way, the functions of each asset is calculated and analysed. These are analysed on individual basis as also in combination with each other so that the transportation produced vis-a-vis the total asset utilisation also available. For example, engine utilisation is assessed everyday totaling up the kilometreage earned by each engine in a calendar day from midnight. This in Railway jargon is called "Engine kilometre per engine day in use". This is calculated for Diesel Engines and Electric Engines separately as the hauling capabilities are different for the two. For this purpose, only those engines which are in use are taken into account and not those which are unfit and are inside sheds for maintenance.

Most important usage parameter of this asset is called the "Wagon Turn Round" which means the time interval in days between 2 successive loadings of a wagon. The less this figure the more is the 'productivity' of a wagon. On the Indian Railways, the wagon turn round which was in the region of 11.5 days in 2001 has now come down to 8.5 days in 2006-07, and has further improved to 6.9 days in 2007-08. This would mean a 40 per cent improvement in the productivity of wagons in 2007-08 over 2006-07. This is no mean achievement and is achieved by effective and constant monitoring, faster running of trains and reduction in the detention to this asset at the terminals. On the South Central Railway, the "wagon turn round" which was 5.50 days in 1996-97, has improved to 5.20 days in 2006-07, and all time low of 4.60 days in 2007-08.

While the wagon usage index mentioned above points only to the speedy movement of wagon it does not say anything about the earning potential of this asset vis-a-vis their total availability on the Railways. In order to assess this another efficiency or "productivity index" is worked out which shows the tonnes carried by a wagon and the distance it travelled during a given period and the figure divided by the total number of wagons available on the books of the Railways (both effective and ineffective) and this is called "Net Tonne Kilometres per wagon day on line".

Since transportation produced is a function of both engines and wagons, the efficiency of these inputs is reckoned by working out the net tonne kilometres earned by the Railways dividing the same by the total engine hours utilised to earn the same. In other words, this productivity index shows the transportation produced vis-a-vis the energy used. This efficiency index is called "Net Tonne Kilometre per Engine Hour". This is worked on monthly and early basis.

Apart from this, the speed at which our goods trains run is also calculated. By speeds of goods trains we mean the overall time taken by a goods train from a train starting point to a terminating point which is pre-reckoned. This includes the time involved for crossing and precedence enroute. This is akin to the commercial speed of a Passenger or Express trains. Productivity would mean producing more products with same inputs or producing the same output with less input. In the Indian Railways, though we have a severe resource crunch, by innovations and modernisation, productivity increased year by year by producing more and more transportation with less and less inputs.

It would be seen that we have increased our loading by 72 per cent with wagon availability increasing only by 49.6 per cent. This is on account of the improvement in wagon turn round. Another factor which contributed to this kind of increased productivity is the heavy haul and long-haul trains which were introduced in the last decade. Earlier, while the unit of transportation was a wagon, as of now, the unit of transportation is full train with the pay load ranging from 1,600 tonnes per train to 3,300 tonnes. These trains are also run point to point and siding to siding. By this the wagons and engines skip many intermediary yards. Hence, marshalling is avoided leading to increased availability of wagons for further loading.

A spin-off of this is that many marshalling yards have been closed down and railway tracks pulled out and sold. This has also resulted in substantial saving of manpower as the shunting staff used for marshalling of trains, yard masters, carriage and wagon staff and permanent way maintenance staff have been consequently reduced. The regular staff strength on the Indian Railways which was at 1.654 million in 2001-02 has come down to 1.583 million in 1996-97 - a reduction almost 4.3 per cent over a period of 7 years. On the South Central Railway, the reduction for the same period had been from 1,27,870 in 1991-92 to 1,25,630 in 2005-06. The percentage of reduction is 1.75 per cent.

Another aspect which has increased productivity of the Railways is 'modernisation', both in track as well as in the Signal & Telecommunications equipments. As it is aware that the tracks have been progressively changed from the ordinary wooden/steel sleepers to pre-stressed concrete sleepers and the rails have also been strengthened from 75 Lbs. Earlier to 52 Kg. to 60 Kilo grams. as of now. As a corollary to this track maintenance is being undertaken by Plasser's Quick Relaying Machines, Ballast Cleaning Machine, Tie Tamping Machines and Multipurpose

Duomatic Machines which has resulted in improved maintenance of tracks at higher speeds. Maximum permissible speed which was permitted on the Indian Railway which was languishing at 100 Kmph over the last 4 decades has been improved to 110, 120 and even 140 Kmph on selected routes. Similarly, on the Signal & Telecommunication front we have come a long way from manual operations of points and signals to remote operations of points and signals by way of 'Panel Interlocking' where the factor of human error is reduced to minimum. We have also introduced sophisticated Route Relay Interlocking at many stations wherein by 'push buttons' the points are set and signals cleared for the entire route within seconds. On this Railway, this system has been introduced at Vijayawada, Krishna Canal, Kazipet and Secunderabad. The panel interlocking and route relay interlocking has totally reduced, need for Cabins and Cabin men at the wayside stations also multiplicity of cabins at bigger stations by centralising all points and signal operation from a single location. This has also reduced man power substantially.

While productivity/efficiency indices mentioned above gives the idea of the efficiency utilisation of individual assets or a combination of assets to produce transportation, the true productivity of the Railways in terms of ratio between the input and output is reckoned by one single productivity index which represents the percentage of total working expenses to the total revenue earnings of the Railways.

The productivity/efficiency indices help the management to study and improve productivity from operational point of view. On the day to day, monthly, and yearly basis, productivity studies are also undertaken with reference to major projects involving heavy capital expenditure. After each project like a new line, gauge conversion and electrification is completed, within 3 to 5 years, productivity test is conducted and the results obtained by way of "Rate of Return". It is studied vis-a-vis the original "Rate of Return" projected at the time of sanctioning of the project. Apart from the above, major projects which are sanctioned by the Central Government, the smaller works sanctioned by the General Manager are also subjected to such productivity tests and results evaluated. For example, in the recent past for increasing line capacity on Guntakal-Hospet single line section, two new crossing stations were sanctioned under the General Manger's powers at Rs.30 lakhs each. The anticipated rate of return was 25% whereas when the work was completed and the results subjected to productivity test, it was seen that actual rate of return worked out to 55per cent.

In order to increase productivity and find out areas of wastage, Railways have introduced a Work Study Centre working under the General Manager which is directed to study the problem-ridden areas and recommend ways and means of avoiding waste and increasing productivity. These are specially trained staff under the guidance of an administrative Officer who employs methods of work study, time and motion study etc. If it is felt that excess staff is involved, job analysis is also conducted by appropriate teams to

suggest reduction and where work involvement is more and becomes unmanageable, for increasing number of staff according of HOER (Hours of Employment and Regulation)

## Conclusion

Productivity of Indian Railways could have been much more than what it is now but for the fact that they are required to strike a balance between their dual role of a commercial enterprise and public utility in the context of reducing capital support from the general exchequer, declining market share, the aspirations of the people for increased and improved railway services and for new lines and gauge conversion to name only a few. While the Indian Railways now get zero budgetary support, it is pertinent to point out that many foreign railways get massive subsidies from their Governments. Such subsidies account for 35.4per cent of their revenue in case of Swiss Federal Railway, 35.65per cent in the case of German Railways, and 30per cent in the case of French National Railway.

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