Optimising manpower and compensation – an empirical study on selected major ports of India

Toorban Mitra[1]

Abstract

Ports of any country play a vital role in international trade. India being a maritime country operates through its 13 major ports and many minor and private ports. The present study is conducted on 7 major ports of India and attempts to find out their relative efficiency considering factors 'Employee Strength', 'Cost per Employee' as inputs and 'Labour Productivity' as output. Purpose of the study is to find out the level of efficiency of the ports and to find out (i) optimum employee strength and (ii) optimum cost per employee for each port. The above mentioned 7 ports are clustered in four groups based on the cargo they handle most. The ports in each cluster are then analysed using Data Envelopment Analysis (DEA) method to find out efficiency levels of the ports and to determine whether the two factors (employee strength and cost per employee) contributing towards labour productivity are just right or not. DEA reveals that (i) Visakhapatnam Port Trust and Kandla Port Trust are inefficient in handling dry bulk cargo, (ii) Mumbai Port and Kandla Port are inefficient in handling liquid cargo, (iii) Chennai Port and Mumbai Port are inefficient in handling break bulk cargo and (iv) Chennai Port is inefficient in container cargo. It is also reveals that there is a scope for optimization of manpower and cost per employee in the above cases (considering the efficient ports as benchmarks). The present study is expected to throw some light to the major port authorities in human resource planning and compensation management.

Introduction

Ports of a country play the major role in its foreign trade. It is the gateway through which majority of imports and exports of a country are done. Importers and exporters prefer to operate through those ports having sound performance, which among others also include labour productivity and cost of import/export through the said port.

Like other countries, India also performs majority of its exports and imports through its 13 major ports (including Port Blair Port Trust) and around 200 non major ports.

1. Indian Maritime University
Kolkata Campus

Out of the total cargo traffic handled through Indian Ports in the year 20011-12, 58.45% was handled by the major ports while the remaining by the non major ports.

Section 3(8) of Indian Ports Act, 1908 defines major port as; "major port" means any port which the Central Government may by notification in the Official Gazette declare, or may under any law for the time being in force have declared, to be a major port. The major ports of India are Kolkata Port Trust (Kolkata Dock System and Haldia Dock Complex), Paradip Port Trust, Visakhapatnam Port Trust, Chennai Port Trust, Ennore Port Ltd., Cochin Port Trust, Tuticorin Port Trust, New Mangalore Port Trust, Murmagao Port Trust, Mumbai Port Trust, Jawharlal Nehru Port Trust, Kandla Port Trust and Port Blair Port Trust. Ennore Port Ltd. is the first Corporate Major Port of India. The remaining 12 major ports above are under the regulatory control of Govt. of India.

The Present Study

The present study is conducted on 7 major ports of India and attempts to find out their relative efficiency considering two factors viz., 'Employee Strength', 'Cost per Employee' as inputs and one factor viz., 'Labour Productivity' as output. The major ports considered for the present study are Kolkata Port Trust (Kolkata Dock System and Haldia Dock Complex), Paradip Port Trust, Visakhapatnam Port Trust, Chennai Port Trust, New Mangalore Port Trust, Mumbai Port Trust, Kandla Port Trust.

The present study attempts to find out the benchmark port in each category of cargo handled and accordingly, find out optimum number of employee required and optimum cost per employee.

Methodology

Clustering of Ports

Major ports of India handle different types of cargo, viz., dry bulk cargo, break bulk cargo, liquid bulk cargo and container cargo. Though most of the ports generally handle all types of cargo, but the proportion of a specific type of cargo to total cargo varies from port to port.

It is to be mentioned that each type of cargo requires different level of efficiencies and time. Therefore, time to handle cargo, efficiency level, etc., of a port also varies depending upon type of cargo it handles most. Accordingly, the above mentioned seven ports are clustered based on majority of the cargo they handle.

Ports, handle a specific type of cargo more than that of average handled through all seven major ports mentioned above are clustered in one category. Accordingly, four categories of ports have emerged, say,

'Dry Bulk Ports' — ports handle Dry Bulk cargo more than all India average,

'Container Ports' — ports handle Container cargo more than all India average,

'Break Bulk Ports' — ports handle Break Bulk cargo more than all India average, and

'Liquid Bulk Ports' — ports handle Liquid Bulk cargo more than all India average.

Data Collection

The study is purely based on the secondary data published in 'Major Ports of India, a profile: 2012-13', by the Indian Ports Association. For the present study, data for the year 2012-13 are used. Cargo traffic handled through the above 7 major ports in 2012-13 are shown in table 1.

Table 1

Table showing total cargo handled through 7 major Port Trusts (in 000 Tonnes) in 2012-13

Name of the Port Trust	Total Cargo Handled	Dry Bulk cargo	Liquid Bulk cargo	Break Bulk cargo	Container
Kolkata Port Trust	39928	15660	10839	3600	9829
Paradip Port Trust	56552	38104	18119	158	171
Visakhapatnam Port Trust	59040	36910	16306	1270	4554
Chennai Port Trust	53404	6243	14687	2766	29708
New Mangalore Port Trust	37036	10742	25308	294	692
Mumbai Port Trust	58038	13789	36781	6639	829
Kandla Port Trust	93619	22952	61849	6883	1935
All India Average	—	14440	18388.9	2161	4771.8

Based on method of clustering mentioned in para 3.1, the 7 major ports are clustered and shown in Table 2:

Table 2

Table showing clustering of Port Trusts as per cargo handled by them most

Dry Bulk Ports	Container Ports	Break Bulk Ports	Liquid Bulk Ports
Kolkata Port Trust	Kolkata Port Trust	Kolkata Port Trust	New Mangalore Port Trust
Paradip Port Trust	Chennai Port Trust	Chennai Port Trust	Mumbai Port Trust
Visakhapatnam Port Trust		Mumbai Port Trust	Kandla Port Trust
Kandla Port Trust		Kandla Port Trust	

Employee strength, cost per employee and labour productivity of the above 4 Port Trusts under 'Dry Bulk Port' category are shown in Table 3.

Table 3

Table showing employee strength, cost per employee and labour productivity of 'Dry Bulk Ports'

Name of the Port Trust	Employee Strength (number)	Cost per Employee Per annum (in lakhs)	Labour Productivity (in tonnes)
Kolkata	7534	5.28	1326
Paradip	2234	5.13	1150
Visakhapatnam	5029	4.30	629
Kandla	3521	5.92	722

Employee strength, cost per employee and labour productivity of those Port Trusts under 'Container Port' category are shown in Table 4.

Table 4

Table showing employee strength, cost per employee and labour productivity of 'Container Ports'

Name of the Port Trust	Employee Strength (number)	Cost per Employee Per annum (in tonnes)	Labour Productivity (in lakhs)
Kolkata	7534	5.28	1326
Chennai	6482	5.80	521

Employee strength, cost per employee and labour productivity of those Port Trusts under 'Break Bulk Port' category are shown in Table 5.

Table 5

Table showing employee strength, cost per employee and labour productivity of 'Break Bulk Ports'

Name of the Port Trust	Employee Strength (number)	Cost per Employee Per annum (in lakhs)	Labour Productivity (in tonnes)
Kolkata	7534	5.28	1326
Chennai	6482	5.80	521
Mumbai	15631	5.62	378
Kandla	3521	5.92	722

Employee strength, cost per employee and labour productivity of those Port Trusts under 'Liquid Bulk Port' category are shown in Table 6.

Table 6

Table showing employee strength, cost per employee and labour productivity of 'Liquid Bulk Ports'

Name of the Port Trust	Employee Strength (number)	Cost per Employee Per annum (in lakhs)	Labour Productivity (in tonnes)
New Mangalore	1437	5.58	1551
Mumbai	15631	5.62	378
Kandla	3521	5.92	722

Analysis of Data

Data collected as above were being analysed using Data Envelopment Analysis (DEA)-Constant Return to Scale (CRS) Model and Input Oriented Measure. DEA is a nonparametric method in operations research and economics for the estimation of production frontiers. It is used to empirically measure productive efficiency of Decision Making Units (DMUs). DEA can be viewed as a multiple-criteria evaluation methodology where DMUs are alternatives, and DEA inputs and outputs are two sets of performance

criteria where one set (inputs) is to be minimized and the other (outputs) is to be maximized.

Here DMU refers to each of the above mentioned 7 Port Trust. CRS and Input Oriented Measure are used to identify:

(i) benchmark Port Trust in each of the above mentioned four clusters of Ports and;

(ii) keeping the labour productivity as it is, determining optimum number of employees and optimum cost per employee, comparing the benchmark Port Trust(s).

Data collected for above mentioned 7 Port Trusts were analysed using DEA, CRS Model and Input Oriented Measure. DEA Efficiency Scores shown below are relative index of the Port Trusts, based on particular input and output factors which are considered to determine relative efficiency of the DMUs.

Analysis of data on 'Dry Bulk Port'

Data on 'Dry Bulk Port' were analysed and shown in Table 7.

Table 7

Table showing efficiency level of the 'Dry Bulk Ports'

Name of the Port Trust (DMU)	Efficiency Score	Projected Employee Strength (number)	Projected Cost per Employee per annum (in lakhs)	Labour Productivity (in tonnes)
Kolkata Port Trust	1.00	7534	5.28	1326
Paradip Port Trust	1.00	2234	5.13	1150
Visakhapatnam Port Trust	0.59	3013	2.58	629
Kandla Port Trust	0.53	1879	3.16	722

Table 7 shows, Kolkata Port Trust and Paradip Port Trust are having an efficiency score of 1 in handling Dry Bulk Cargo. Kandla Port Trust is least efficient while Visakhapatnam Port Trust is in between. Therefore, Kolkata Port Trust and Paradip Port Trust are the benchmark Ports in handling Dry Bulk Cargo.

Considering the benchmark Ports, table 7 also projects optimum employee strength of 3013 and cost per employee of Rs. 2.58 lakhs for Visakhapatnam Port Trust while projection for Kandla Port Trust is 1879 employees and 3.16 lakhs as cost per employee.

Analysis of data on 'Container Port'

Data on 'Container Port' were analysed and shown in Table 8.

Table 8

Table showing efficiency level of the 'Container Ports'

Name of the Port Trust (DMU)	Efficiency Score	Projected Employee Strength (number)	Projected Cost per Employee per annum (in lakhs)	Labour Productivity (in tonnes)
Kolkata Port Trust	1.00	7534	5.28	1326
Chennai Port Trust	0.46	2960	2.07	521

Table 8 shows, efficiency score of Kolkata Port Trust is 1 in handling Container Cargo. Chennai Port Trust stood second with efficiency score of 0.46. Therefore, Kolkata Port is considered to be the benchmark Port in handling Container Cargo.

Considering Kolkata Port Trust as benchmark Port, table 8 also projects employee strength of 2960 and cost per employee of Rs. 2.07 lakhs for Chennai Port Trust.

Analysis of data on 'Break Bulk Port'

Data on 'Break Bulk Port' were analysed and shown in Table 9.

Table 9

Table showing efficiency level of the 'Break Bulk Ports'

Name of the Port Trust (DMU)	Efficiency Score	Projected Employee Strength (number)	Projected Cost per Employee per annum (in lakhs)	Labour Productivity (in tonnes)
Kolkata	1.00	7534	5.28	1326
Kandla	1.00	3521	5.92	722
Chennai	0.44	2867	2.56	521
Mumbai	0.27	2148	1.51	378

Table 9 shows, each Kolkata Port Trust and Kandla Port Trust score of 1 in handling Break Bulk Cargo. Mumbai Port Trust is least efficient having efficiency score of 0.27 while Chennai Port Trust is in between having efficiency score of 0.44. Kolkata Port Trust and Kandla Port Trust are the benchmark Ports in handling Break Bulk Cargo.

Considering the benchmark Ports, table 9 projects optimum employee strength of 2867 and cost per employee of Rs. 2.56 lakhs for Chennai Port Trust while optimum employee strength for Mumbai Port Trust is 2148 with a cost per employee of Rs. 1.51 lakhs per annum.

Analysis of data on 'Liquid Bulk Port'

Data on 'Liquid Bulk Port' were analysed and shown in Table 10.

Table 10

Table showing efficiency level of the 'Liquid Bulk Ports'

Name of the Port Trust (DMU)	Efficiency Score	Projected Employee Strength (number)	Projected Cost per Employee per annum (in lakhs)	Labour Productivity (in tonnes)
New Mangalore Port Trust	1.00	1437	5.58	1551
Kandla Port Trust	0.44	669	2.60	722
Mumbai Port Trust	0.24	350	1.40	378

Table 10 shows, efficiency score of New Mangalore Port Trust is 1 in handling Liquid Bulk Cargo. Kandla Port Trust stood second with efficiency score of 0.44. Mumbai Port Trust is least efficient with efficiency score of 0.24. Therefore, New Mangalore Port Trust sets the benchmark in handling Liquid Bulk Cargo.

Table 10 also projects employee strength of 669 and cost per employee of Rs. 2.60 lakhs for Kandla Port Trust while, 350 employees and 1.40 lakhs as cost per employee for Mumbai Port Trust.

Major Findings

i. Kolkata Port Trust and Paradip Port Trust have come out as benchmark port in handling Dry Bulk cargo traffic. Visakhapatnam Port Trust stood next to them and Kandla Port Trust is least efficient in handling Dry Bulk cargo.

ii. Chennai Port Trust is lagging behind to Kolkata Port Trust in terms of efficiency in handling Container cargo traffic.

iii. In handling Break Bulk cargo, Mumbai Port Trust is least efficient, next to Chennai Port Trust. Kolkata Port Trust and Kandla Port Trust set the benchmark efficiency in handing Break Bulk cargo.

iv. New Mangalore Port Trust is most efficient in handling Liquid Bulk cargo. Mumbai Port Trust is least efficient and Kandla Port Trust is lying in between.

v. Considering handling of Dry Bulk cargo, manpower and cost per employee can be optimized for Visakhapatnam Port Trust and Kandla Port Trust.

vi. Manpower and cost per employee can be optimized in Chennai Port Trust in case of Container cargo handling.

vii. There is a scope of optimization of manpower and cost per employee in Mumbai Port Trust and Chennai Port Trust, considering efficiency level of benchmark port in handling Break Bulk cargo.

viii. In case of handling Liquid Bulk cargo, manpower and cost per employee of Kandla Port Trust and Mumbai Port Trust can be optimized.

Limitations of the present study and scope for further study

The present study is purely based on secondary data published in 'Major Ports of India, a Profile: 2012-13. Therefore, situations mentioned below are not considered in the present study,

i. draft of the ports which is responsible in handling higher Deadweight Tonnage (DWT)/ Gross Register Tonnage (GRT) ships,

ii. demand for specific type of cargo through each of the above ports,

iii. handling of cargo through Public Private Partnership (PPP) model,

iv. proportion of Officers, staffs and workers,

v. industrial relations problems in the ports.

The present study may further be proceeded by addressing the above factors.

References

1. Monie, G. De. 1987. UNCTAD monograph on port management, Measuring and evaluating port performance and productivity. United Nations publication.

2. Chakrabarty S.N. July 2005. Index for Port Services. Indian Ports, Vol 37 No. 1. Indian Ports Association publication.

3. Dr. De R.N. 2005. Renewing Human Assets in Indian Ports: issues and strategies for improving performance. Sage publication.

4. Coelli, Tim. 1996. A guide to DEAP version 2.1: Data Envelopment Analysis (Computer) Programme. The University of England.

5. Indian Ports Association. Major Ports of India A Profile: 2009-10. 2010. Indian Ports Association publication.