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OVERHEAD PRODUCTIVITY ANALYSIS OF METALS SECTOR COMPANIES INCLUDED IN NIFTY 50

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Abstract *In the world of competitive environment, productivity is an essential booster for the progress of an organisation. The ratio of output to input is termed as productivity. Higher productivity ratio indicates more optimum use of the resources. This research paper depicts the analysis of overhead productivity of metals sector companies from 2010-11 to 2017-18 i.e. for eight years. The research analysed the intra-company as well as inter-company overhead productivity which has been calculated by applying the chi-square and kruskal wallis one way analysis of variance test. It is found that the average overhead productivity ratio is the best of Coal India Ltd. with 38.3249 which is followed by Hindalco Ltd., Vedanta Ltd. and Tata Steel Ltd. It is suggested that if the company utilises its resources optimally then it can save the amount which has been calculated as possible savings. Possible savings is the excess of actual over standard overhead input. It is the total possible savings in overhead input for a period of eight years, ₹ 680 crore of Coal India Ltd., ₹ 10002 crore of Vedanta Ltd., ₹ 17118 crore of Hindalco Ltd. and ₹ 26463 crore of Tata Steel Ltd. It has also been suggested that overhead productivity can be improved by reducing the expenses in overhead cost which can only be possible by having a check on the overhead expenses incurred by the companies. The metal sector companies can make a committee which closely monitors the expenses incurred on overheads and find out the ways through which savings can be achieved.*

Keywords: *Productivity, Overhead Productivity Ratio, Chi-Square, Kruskal Wallis One-Way Analysis of Variance, Possible Savings*

INTRODUCTION

An organisation can be benefitted from the opportunities being offered by the contemporary world that can assist in enhancement of its productivity. The productivity now has become the necessity not only for the development of an organisation, but also for the survival in the competitive world.

As quoted by Maheshwari (6), in the words of C. B. Gupta, "Productivity refers to the physical relationship between the quantity produced (Output) and quantity of resources used in the course of production (Input). It is the ratio between the output of goods and services and the inputs of resources consumed in the process of production."

Productivity can be measured wholly or partially. Productivity as a whole constitutes all the elements of partial productivity while partial productivity can be measured in terms of an element such as material productivity, labour productivity, overhead productivity, capital productivity, etc.

According to CIMA London, "Overhead is the aggregate of indirect material cost, indirect wages (indirect labour cost) and indirect expenses." This means that the sum of all other expenses excluding the direct material, direct labour constitutes the overhead.

Overhead plays a vital role in the production process. Therefore, without measurement of overhead productivity, one cannot jump to conclusions whether the organisation is productive or not. Overhead productivity indicates how much is being produced as output by the overhead input. It measures effective utilisation of overhead input.

$$\text{Overhead Productivity} = \frac{\text{Total Output}}{\text{Overhead Input}}$$

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REVIEW OF LITERATURE

There are many studies carried out on productivity in India and abroad; few studies are being summarised as below:

Productivity measurement is based on many factors. Islam (1990) measured and analysed the productivity of Cotton Textile Industry, which is based on the secondary data. Peslak (2004) compared the information technology spending with the data set obtained from the European publish source and measured productivity using market and financial based measures. Chalermthanakom and Ueta (2011) analysed the impact of environmental regulation on productivity by applying regression analysis on the selected industries in Japan. Partial productivity trends have also been observed in the selected companies of India, especially in cement sector stated by Reddy and Naidu (2013). Hooda (2015) analysed in his paper the region-wise productivity of state co-operative banks in India. Hema (2017) analysed the productivity of Indian banks and compared the productivity with the profitability of the banks.

Research Gap: As per the above reviews and many more studies reviewed related to the topic, there is no study on overhead productivity of metals sector companies included in Nifty 50. So in this present research, an attempt has been made to measure the overhead productivity of selected metals sector companies included in Nifty 50.

OBJECTIVES OF THE RESEARCH

The present study analyses the overhead productivity of metals sector companies included in Nifty 50 from 2010-11 to 2017-18, i.e. for eight years. The main objectives are:

- To measure and analyse the overhead productivity of the metals sector companies included in Nifty 50.
- To compare the intra-company and inter-company overhead productivity for the study period.
- To recommend methods for the improvement in overhead productivity.

RESEARCH METHODOLOGY

Data Collection

The secondary data forms the basis of this research work. The data and information regarding output, overhead input and all other financial variables have been obtained from the annual reports of the respective companies i.e. Coal India Ltd., Hindalco Ltd., Tata Steel Ltd. and Vedanta Ltd. These companies are selected according to the higher market capitalization of the company. The annual reports are available on the website of these companies and the data related to index numbers have been collected from various bulletins published by Reserve Bank of India on its website.

Selection of Base Year

The revaluation of output and input has been done on the basis of 2010-11 as base year.

Model Used

The present research focuses on the Productivity Accounting Model propagated by H. S. Davis as it considers all the elements of output and input, ignoring the effect of inflation. This study is based on only one element of productivity i.e. overhead.

Hypotheses

Following hypotheses have been developed and will be tested to obtain the objectives of this research.

Intra-company Hypothesis: Tested through chi-square test.

Null Hypothesis (H_0): There is no significant difference in the overhead productivity indices of the sampled company for the study period and can be represented by a straight-line trend or line of best fit.

Alternative Hypothesis (H_1): There is a significant difference in the overhead productivity indices of the sampled company for the study period and cannot be represented by the straight-line trend or line of best fit.

The acceptance of null hypothesis would reveal that the overhead productivity indices of the sampled company for the study period are approximately equal.

Inter-company Hypothesis: Tested through Kruskal Wallis one-way analysis of variance test.

Null Hypothesis (H_0): There is no significant difference in the overhead productivity ratios of sampled companies.

Alternative Hypothesis (H_1): There is a significant difference in the overhead productivity ratios for sampled companies.

The acceptance of null hypothesis would present that the overhead productivity ratios of sampled companies are approximately equal.

Index Numbers and Conversion Factors

Index numbers and conversion factors have been used for revaluation of data as per the base year prices. Here, the base year is 2010-11. Index number of the base year has been taken as numerator while index number for the current year has been taken as denominator to calculate conversion factors.

Table 1: Index Numbers and Conversion Factors for Revaluation of Data

Year	Wholesale Price Index Base year 2011-12 = 100	Conversion Factors	Fuel and Power Index Base Year 2011-12 = 100	Conversion Factors
2010-11	91.80	1.000	87.75	1.000
2011-12	100.00	0.918	100.00	0.878
2012-13	106.90	0.859	107.10	0.819
2013-14	112.50	0.816	114.70	0.765
2014-15	113.90	0.806	107.70	0.815
2015-16	109.70	0.837	86.50	1.014
2016-17	111.60	0.823	86.30	1.017
2017-18	114.90	0.799	93.30	0.941

Source: Authors' Calculation with the help of RBI Bulletin.

Backward splicing technique has been used for calculating the index numbers of 2010-11. Formula for splicing the index number of 2010-11 is as follows:

$$\frac{\text{Current year's Old Index Number}}{\text{Old Index Number of New base year}} \times 100$$

OUTPUT REVALUATION

The output is revalued by multiplying the output values with the conversion factors of wholesale price index. Output includes revenue from operations, other income and change in the inventories of finished goods, work in progress and traded goods. Revaluation of output of the companies from 2010-11 to 2017-18 has been shown in Appendixes 1 to 4, respectively.

INPUT REVALUATION

All the overhead inputs have been revalued with the different index numbers according to the nature of overheads. Power and Fuel input has been revalued by fuel and power index, Repairs and Maintenance and Business Service Input has been revalued with the wholesale price index while Depreciation and Amortisation input has not been revalued at all. Revaluation of overhead input of the companies from 2010-11 to 2017-18 has been shown in Appendix 5 to 8, respectively.

OVERHEAD PRODUCTIVITY

Overhead productivity of metals sector companies has been shown from Tables 2 to 5 from 2010-11 to 2017-18 taking 2010-11 as a base year for revaluation.

Table 2: Overhead Productivity of Coal India Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1	Output (₹ in Crore)	5473.42	8752.79	9829.37	13365.32	11696.91	14394.79	12656.19	7972.12
2	Power and Fuel (₹ in Crore)	6.20	4.79	5.59	5.26	6.54	11.04	11.70	11.40
3	Power and Fuel (Input Output Ratio)	0.0011	0.0005	0.0006	0.0004	0.0006	0.0008	0.0009	0.0014
4	Depreciation and Amortisation (₹ in Crore)	6.08	6.96	4.96	6.41	7.17	15.13	17.52	18.14
5	Depreciation and Amortisation (Input Output Ratio)	0.0011	0.0008	0.0005	0.0005	0.0006	0.0011	0.0014	0.0023
6	Repairs and Maintenance (₹ in Crore)	7.06	8.70	8.64	6.02	6.23	8.02	11.32	18.88
7	Repairs and Maintenance (Input Output Ratio)	0.0013	0.0010	0.0009	0.0005	0.0005	0.0006	0.0009	0.0024
8	Business Service Input (₹ in Crore)	282.80	166.78	295.34	295.47	198.18	283.16	303.74	200.25
9	Business Service Input (Input Output Ratio)	0.0517	0.0191	0.0300	0.0221	0.0169	0.0197	0.0240	0.0251
10	Total Overhead Input (₹ in Crore)	302.14	187.23	314.54	313.16	218.12	317.35	344.28	248.66
11	Total Overhead (Input Output Ratio)	0.0552	0.0214	0.0320	0.0234	0.0186	0.0220	0.0272	0.0312
12	Overhead Productivity Ratio	18.1155	46.7489	31.2503	42.6788	53.6250	45.3596	36.7608	32.0602
13	Overhead Productivity Indices /Observed Indices (O)	100.00	258.06	172.51	235.59	296.02	250.39	202.92	176.98
14	Computed Value /Expected Values (E)	188.34	194.97	201.61	208.24	214.88	221.51	228.14	234.78
15	Chi-Square $(O-E)^2/E$	41.4356	20.4122	4.2009	3.5924	30.6409	3.7659	2.7875	14.2301

Source: Authors' calculation based on the Annual Reports of Coal India Ltd.

Average Overhead Productivity Indices = 211.56, a = 211.56, b = 3.32, χ^2 = 121.065, S.D. = 57.69, C.V. = 27.27%.

ANALYSIS AND INTERPRETATION

Output: The output of Coal India Ltd. depicts a changing trend. It is the lowest ₹ 5473.42 crore in 2010-11 and it is the highest ₹ 14394.79 crore in 2015-16.

Power and Fuel: It is ₹ 6.20 crore in 2010-11 and reached up to ₹ 11.40 crore in 2017-18. Its input-output ratio is as high as 0.0014 in 2017-18 while it is as low as 0.0004 in 2013-14.

Depreciation and Amortisation: It is the highest ₹ 18.14 crore in 2017-18 while it is the lowest ₹ 4.96 crore in 2012-13. Its input-output ratio lies between the lowest 0.0005 in 2012-13 and 2013-14 and the highest 0.0023 in 2017-18.

Repairs and Maintenance: Its range starts from ₹ 6.02 crore to ₹ 18.88 crore. Input-output ratio of repairs and maintenance is the lowest 0.0005 during 2013-14 and 2014-15, which indicates optimum utilisation of repairs and maintenance element of overhead input.

Business Service Input: It is the highest ₹ 303.74 crore in 2016-17 while it is the lowest ₹ 166.78 crore in 2011-12. Its input-output ratio is the lowest 0.0169 in 2014-15 as compared to the highest 0.0517 in 2010-11.

Total Overhead: Total overhead input is ₹ 302.14 crore in 2010-11 and after facing many fluctuation during the period of eight years reached up to ₹ 248.66 crore in 2017-18. Its input-output ratio is the highest 0.552 in 2010-11 while it is the lowest 0.0186 in 2014-15. The lowest overhead input-output ratio means overhead input has been best utilized in the year 2014-15.

Overhead Productivity Ratio: There is a fluctuating trend in the overhead productivity ratio of Coal India Ltd. It is the lowest 18.1155 in 2010-11 while the highest 53.6250 in 2014-15. The highest ratio indicates efficiency and effectiveness while the lowest ratio indicates that the overhead input has not been utilised efficiently. Average overhead productivity indices worked out to 211.56, which is higher than the base year index of 100 indicates improvement in overhead efficiency.

Testing Hypothesis and Interpretation: In Coal India Ltd., the standard deviation calculated is 57.69 and coefficient of variation is 27.27% indicates variability. The computed value of chi-square is 121.065 while the table value of chi-square at 5% level of significance with (8-1) = 7 degree of freedom is 14.067. As the calculated value of chi-square is more as compared to the table value, null hypothesis is rejected and alternative hypothesis is accepted. This indicates that the overhead productivity indices of the company for the study period are not same and cannot be represented by the straight-line trend.

Table 3: Overhead Productivity of Hindalco Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1	Output (₹ in Crore)	23812.03	24607.23	23337.28	23092.10	28592.89	29776.75	30320.65	34617.98
2	Power and Fuel (₹ in Crore)	2221.48	2520.45	2516.82	2721.57	4238.63	6599.17	5998.95	5646.11
3	Power and Fuel (Input Output Ratio)	0.0933	0.1024	0.1078	0.1179	0.1482	0.2216	0.1979	0.1631
4	Depreciation and Amortisation (₹ in Crore)	687.48	689.97	704.20	823.29	837.03	1277.00	1427.97	1617.31
5	Depreciation and Amortisation (Input Output Ratio)	0.0289	0.0280	0.0302	0.0357	0.0293	0.0429	0.0471	0.0467
6	Repairs and Maintenance (₹ in Crore)	286.10	235.87	253.89	361.11	425.02	443.69	447.06	495.67
7	Repairs and Maintenance (Input Output Ratio)	0.0120	0.0096	0.0109	0.0156	0.0149	0.0149	0.0147	0.0143
8	Business Service Input (₹ in Crore)	1115.49	1011.01	1229.98	1134.53	1636.36	1821.09	2562.16	2619.31
9	Business Service Input (Input Output Ratio)	0.0468	0.0411	0.0527	0.0491	0.0572	0.0612	0.0845	0.0757
10	Total Overhead Input (₹ in Crore)	4310.55	4457.30	4704.89	5040.50	7137.03	10140.95	10436.14	10378.40
11	Total Overhead (Input Output Ratio)	0.1810	0.1811	0.2016	0.2183	0.2496	0.3406	0.3442	0.2998
12	Overhead Productivity Ratio	5.5241	5.5207	4.9602	4.5813	4.0063	2.9363	2.9054	3.3356
13	Overhead Productivity Indices /Observed Indices (O)	100.00	99.94	89.79	82.93	72.52	53.15	52.59	60.38
14	Computed Value /Expected Values (E)	102.85	95.29	87.74	80.19	72.64	65.09	57.53	49.98
15	Chi-Square $(O-E)^2/E$	0.0788	0.2262	0.0479	0.0938	0.0002	2.1876	0.4242	2.1638

Source: Authors' calculation based on the Annual Reports of Hindalco Ltd.
Average Overhead Productivity Indices = 76.41, a = 76.41, b = -3.78, χ^2 = 5.223, S.D. = 18.41, C.V. = 24.09%.

ANALYSIS AND INTERPRETATION

Output: The revalued output of Hindalco Ltd. is ₹ 23812.03 crore in 2010-11 and reached up to ₹ 34617.98 crore in 2017-18.

Power and Fuel: It constitutes the main component in the overheads of the company. It is the highest ₹ 6599.17 crore in 2015-16 and the lowest ₹ 2221.48 crore in 2010-11. Its input-output ratio is the maximum 0.2216 in 2015-16 while it is the minimum 0.0933 in 2010-11.

Depreciation and Amortisation: It is ₹ 687.48 crore in 2010-11 while ₹ 1617.31 crore in 2017-18. Input-output ratio of depreciation and amortisation is as low as 0.0280 in 2011-12 as compared to the others.

Repairs and Maintenance: It is the lowest ₹ 235.87 crore in 2011-12 as compared to the highest ₹ 495.67 crore in 2017-18. Input-output ratio of repairs and maintenance is the lowest 0.0096 in 2011-12 indicating that less has been expended on repairs and maintenance element of overhead input.

Business Service Input: It is the highest ₹ 2619.31 crore in 2017-18 and the lowest ₹ 1011.01 crore in 2011-12. Its input-output ratio speeds up to the maximum 0.0845 in 2016-17 while speeds down to the minimum 0.0411 in 2011-12.

Total Overhead: Total overhead input consumption of Hindalco Ltd. is ₹ 4310.55 crore in 2010-11; it is increased and reached up to ₹ 10436.14 crore in 2016-17, and then it decreased and reached up to ₹ 10378.40 crore in 2017-18. Total overhead input-output ratio is the lowest 0.1810 in 2010-11 as compared to the highest 0.3442 in 2016-17.

Overhead Productivity Ratio: Overhead productivity ratio is the lowest 2.9054 in 2016-17 while it is the highest 5.5241 in 2010-11. The highest ratio is regarded as the best. Overhead efficiency can also be observed from the average of overhead indices, which worked out to 76.41 as compared to the base year index of 100.

Testing Hypothesis and Interpretation: Standard deviation of Hindalco Ltd. is 18.41 while its coefficient of variation is 24.09 %. The calculated value of chi-square is 5.223 as compared to the table value 14.067. Thus, null hypothesis is accepted which indicates the overhead productivity indices can be represented by the straight-line trend.

Table 4: Overhead Productivity of Tata Steel Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1	Output (₹ in Crore)	29751.06	31762.04	33240.61	34552.29	33571.38	35358.24	43080.57	49400.88
2	Power and Fuel (₹ in Crore)	1146.19	1010.96	1343.47	1475.46	1628.04	1960.17	3601.76	3507.54
3	Power and Fuel (Input Output Ratio)	0.0385	0.0318	0.0404	0.0427	0.0485	0.0554	0.0836	0.0710
4	Depreciation and Amortisation (₹ in Crore)	1558.49	1990.16	2510.17	2772.31	2704.42	2881.17	2880.92	2925.20
5	Depreciation and Amortisation (Input Output Ratio)	0.0524	0.0627	0.0755	0.0802	0.0806	0.0815	0.0669	0.0592
6	Repairs and Maintenance (₹ in Crore)	1104.10	1123.66	1259.72	1475.64	1564.41	1743.23	1936.21	2136.85
7	Repairs and Maintenance (Input Output Ratio)	0.0371	0.0354	0.0379	0.0427	0.0466	0.0493	0.0449	0.0433
8	Business Service Input (₹ in Crore)	4746.19	5910.63	6422.93	6653.64	6909.40	7072.80	13782.14	10335.31
9	Business Service Input (Input Output Ratio)	0.1595	0.1861	0.1932	0.1926	0.2058	0.2000	0.3199	0.2092
10	Total Overhead Input (₹ in Crore)	8554.97	10035.41	11536.30	12377.04	12806.26	13657.37	22201.02	18904.90
11	Total Overhead (Input Output Ratio)	0.2876	0.3160	0.3471	0.3582	0.3815	0.3863	0.5153	0.3827
12	Overhead Productivity Ratio	3.4776	3.1650	2.8814	2.7916	2.6215	2.5889	1.9405	2.6131
13	Overhead Productivity Indices /Observed Indices (O)	100.00	91.01	82.85	80.27	75.38	74.45	55.80	75.14
14	Computed Value /Expected Values (E)	95.20	90.68	86.15	81.63	77.10	72.57	68.05	63.52
15	Chi-Square $(O-E)^2/E$	0.2416	0.0012	0.1262	0.0224	0.0383	0.0483	2.2050	2.1253

Source: Authors' calculation based on the Annual Reports of Tata Steel Ltd.
Average Overhead Productivity Indices = 79.36, a = 79.36, b = -2.26, χ^2 = 4.808, S.D. = 12.18, C.V. = 15.35 %.

ANALYSIS AND INTERPRETATION

Output: The output of Tata Steel Ltd. is ₹ 29751.06 crore in 2010-11, then it increased and reached up to ₹ 34552.29 crore in 2013-14 and then it deceased in the year 2014-15 then again it increased and reached up to ₹ 49400.88 crore in 2017-18.

Power and Fuel: It is ₹ 1146.19 crore in 2010-11 and reached up to ₹ 3507.54 crore in 2017-18. Its input-output ratio is the maximum 0.0836 in 2016-17 while it is the minimum 0.0318 in 2011-12. The lowest power and fuel input-output ratio indicates optimum utilisation of power and fuel element of overhead input in this year.

Depreciation and Amortisation: Depreciation and amortisation consumption is the highest ₹ 2925.20 crore in 2017-18 while it is the lowest ₹ 1558.49 crore in 2010-11. Its input-output ratio is the lowest 0.0524 in 2010-11 as compared to the highest 0.0815 in 2015-16.

Repairs and Maintenance: It is showing an increasing trend with the highest ₹ 2136.85 crore in 2017-18 while it is the lowest ₹ 1104.10 crore in 2010-11. Its input-output ratio is the lowest 0.0354 in 2011-12 while it is the highest 0.0493 in 2015-16.

Business Service Input: It is ₹ 4746.19 crore in 2010-11, then it increased and reached up to ₹ 13782.14 crore in 2016-17 and then it deceased in the year 2017-18 and reached up to ₹ 10335.31 crore. Its input-output ratio is the lowest 0.1595 in 2010-11.

Total Overhead: Total overhead input of Tata Steel Ltd. ranges between ₹ 8554.97 crore to ₹ 22201.02 crore. It is the highest in 2016-17 while lowest in 2010-11. Total overhead input-output ratio lies between 0.5153 and 0.2876.

Overhead Productivity Ratio: Overhead productivity ratio of Tata Steel Ltd. is the lowest 1.9405 in 2016-17 and the highest 3.4776 in 2010-11. There is no improvement in overhead efficiency as its average indices is 79.36 as compared to the base year index of 100.

Testing Hypothesis and Interpretation: The standard deviation of Tata Steel Ltd. is 12.18 with 15.35% of variability. The computed value of chi-square is 4.808 as compared to the table value 14.067. According to the analysis, computed value is less as compared to table value hence null hypothesis is accepted.

Table 5: Overhead Productivity of Vedanta Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1	Output (₹ in Crore)	7996.15	6378.58	2133.63	24314.13	28028.71	32447.13	37817.67	39453.82
2	Power and Fuel (₹ in Crore)	14.97	13.32	456.58	3575.36	3612.94	4422.48	4659.89	6251.06
3	Power and Fuel (Input Output Ratio)	0.0019	0.0021	0.2140	0.1470	0.1289	0.1363	0.1232	0.1584
4	Depreciation and Amortisation (₹ in Crore)	83.13	83.85	147.91	1504.79	1011.67	1217.97	2986.00	2842.00
5	Depreciation and Amortisation (Input Output Ratio)	0.0104	0.0131	0.0693	0.0619	0.0361	0.0375	0.0790	0.0720
6	Repairs and Maintenance (₹ in Crore)	23.15	19.51	27.55	216.03	298.13	274.75	405.74	448.24
7	Repairs and Maintenance (Input Output Ratio)	0.0029	0.0031	0.0129	0.0089	0.0106	0.0085	0.0107	0.0114
8	Business Service Input (₹ in Crore)	2099.81	2215.39	813.52	1757.61	1372.70	1447.01	2868.16	2937.92
9	Business Service Input (Input Output Ratio)	0.2626	0.3473	0.3813	0.0723	0.0490	0.0446	0.0758	0.0745
10	Total Overhead Input (₹ in Crore)	2221.06	2332.07	1445.55	7053.78	6295.44	7362.21	10919.79	12479.23
11	Total Overhead (Input Output Ratio)	0.2778	0.3656	0.6775	0.2901	0.2246	0.2269	0.2887	0.3163
12	Overhead Productivity Ratio	3.6002	2.7352	1.4760	3.4470	4.4522	4.4073	3.4632	3.1616
13	Overhead Productivity Indices /Observed Indices (O)	100.00	75.97	41.00	95.74	123.67	122.42	96.20	87.82
14	Computed Value /Expected Values (E)	80.85	84.28	87.71	91.14	94.57	98.00	101.42	104.85
15	Chi-Square $(O-E)^2/E$	4.5352	0.8187	24.8765	0.2329	8.9554	6.0870	0.2694	2.7678

Source: Authors' calculation based on the Annual Reports of Vedanta Ltd.
Average Overhead Productivity Indices = 92.85, a = 92.85, b = 1.71, χ^2 = 48.543, S.D. = 24.73, C.V. = 26.64%.

ANALYSIS AND INTERPRETATION

Output: The output of Vedanta Ltd. is the highest ₹ 39453.82 crore in 2017-18 while it is the lowest ₹ 2133.63 crore in 2012-13.

Power and Fuel: It is the highest ₹ 6251.06 crore in 2017-18 and the lowest ₹ 14.97 crore in 2010-11. The consumption of power and fuel element is minimum in the year 2010-11 and 2011-12 as compared to the other years. Its input-output ratio is the maximum 0.2140 in 2012-13 while it is the minimum 0.0019 in 2010-11.

Depreciation and Amortisation: Its consumption is the highest ₹ 2986.00 crore in 2016-17 while it is the lowest ₹ 83.13 crore in 2010-11. Its input-output ratio is the 0.0104 in 2010-11 indicates optimum utilisation.

Repairs and Maintenance: It is the lowest ₹ 19.51 crore in 2011-12 as compared to the highest ₹ 448.24 crore in 2017-18. Its input-output ratio is the lowest 0.0029 in 2010-11 indicates less has been expended on repairs and maintenance. It is the highest 0.0129 in 2012-13.

Business Service Input: It is the minimum ₹ 813.52 crore in 2012-13 as compared to the maximum ₹ 2937.92 crore in 2017-18. Its input-output ratio is the minimum 0.0446 in 2015-16 while it is the maximum 0.3813 in 2012-13.

Total Overhead: Total overhead input consumption of Vedanta Ltd. is ₹ 2221.06 crore in 2010-11 then after facing a lot of fluctuation during the period of eight years, it ultimately reached up to ₹ 12479.23 crore in 2017-18. Total overhead input-output ratio is the highest 0.6775 in 2012-13 while it is the lowest 0.2246 in 2014-15.

Overhead Productivity Ratio: Overhead productivity ratio of Vedanta Ltd. is 3.6002 in 2010-11 and reached up to 3.1616 in 2017-18. Overhead productivity ratio is the lowest 1.4760 in 2012-13 while it is the highest 4.4522 in 2014-15. Overhead efficiency is 92.85, which is less than the base year index of 100.

Testing Hypothesis and Interpretation: The standard deviation of Vedanta Ltd. is 24.73 with coefficient of variation 26.64%. The computed value of chi-square is 48.543 and table value is 14.067. As the calculated value of chi-square is more as compared to the table value, null hypothesis is rejected indicating that the overhead productivity indices are not same and cannot be represented by the straight-line trend.

Kruskal Wallis One-Way Analysis of Variance Test

The overhead productivity of all the samples has been combined, arranged and given a rank number. The sum of ranks of the sample has been calculated which has been shown in Table 6.

Table 6: Overhead Productivity Ratios from 2010-11 to 2017-18 of Metals Sector Companies and Kruskal Wallis One Way Analysis of Variance Test

Base Year 2010-11

	Coal India Ltd.		Hindalco Ltd.		Tata Steel Ltd.		Vedanta Ltd.	
Year	Ratio	Rank 1	Ratio	Rank 2	Ratio	Rank 3	Ratio	Rank 4
2010-11	18.1155	25	5.5241	24	3.4776	16	3.6002	17
2011-12	46.7489	31	5.5207	23	3.1650	12	2.7352	6
2012-13	31.2503	26	4.9602	22	2.8814	8	1.4760	1
2013-14	42.6788	29	4.5813	21	2.7916	7	3.4470	14
2014-15	53.6250	32	4.0063	18	2.6215	5	4.4522	20
2015-16	45.3596	30	2.9363	10	2.5889	3	4.4073	19
2016-17	36.7608	28	2.9054	9	1.9405	2	3.4632	15
2017-18	32.0602	27	3.3356	13	2.6131	4	3.1616	11
Total		228		140		57		103

Value of H = 22.367

The calculated value of H is 22.367 and the table value is 7.815 at 5% level of significance with 4 - 1 = 3 degrees of freedom. As the calculated value is more than the table value, null hypothesis is rejected and alternative hypothesis is accepted. This means that there is a significant difference in the overhead productivity ratios of the metals sector companies.

POSSIBLE SAVINGS

Possible savings in overhead input have been calculated to analyse what would have been saved if the overhead input had been optimally utilized. Possible saving in overhead input is the difference between the actual overhead input and the standard overhead input.

Table 7: Possible Savings in Overhead Input

Amount in ₹ Crore

Companies		Coal India Ltd.	Hindalco Ltd.	Tata Steel Ltd.	Vedanta Ltd.
2010-11	Standard	102	4311	8555	1796
	Actual	302	4311	8555	2221
	Saving	**200**	**0**	**0**	**425**
2011-12	Standard	163	4454	9135	1433
	Actual	187	4457	10035	2332
	Saving	**24**	**3**	**900**	**899**
2012-13	Standard	183	4224	9560	479
	Actual	315	4705	11536	1446
	Saving	**132**	**481**	**1976**	**967**
2013-14	Standard	249	4180	9937	5461
	Actual	313	5040	12377	7054
	Saving	**64**	**860**	**2440**	**1593**
2014-15	Standard	218	5175	9655	6295
	Actual	218	7137	12806	6295
	Saving	**0**	**1962**	**3151**	**0**
2015-16	Standard	268	5390	10169	7288
	Actual	317	10141	13657	7362
	Saving	**49**	**4751**	**3488**	**74**
2016-17	Standard	235	5488	12390	8494
	Actual	344	10436	22201	10920
	Saving	**109**	**4948**	**9811**	**2426**
2017-18	Standard	148	6266	14208	8861
	Actual	249	10378	18905	12479
	Saving	**101**	**4112**	**4697**	**3618**
Total Savings		680	17118	26463	10002

Note: Amount has been rounded off to nearest ₹

Standard overhead input = minimum requirement of overhead input per unit of output X Actual output revalued according to the base year.

Table 7 suggests that total possible savings in overhead input for a period of eight years would have been ₹ 680 crore of Coal India Ltd., ₹ 10002 crore of Vedanta Ltd.,

₹ 17118 crore of Hindalco Ltd. and lastly ₹ 26463 crore of Tata Steel Ltd.

Possible savings in respect of the elements of overhead input are shown from Tables 8 to 11, which are as follows:

Table 8: Possible Savings in Power and Fuel

Amount in ₹ Crore

Companies		Coal India Ltd.	Hindalco Ltd.	Tata Steel Ltd.	Vedanta Ltd.
2010-11	Standard	2	2221	946	15
	Actual	6	2221	1146	15
	Saving	**4**	**0**	**200**	**0**
2011-12	Standard	4	2296	1011	12
	Actual	5	2520	1011	13
	Saving	**1**	**224**	**0**	**1**
2012-13	Standard	4	2177	1057	4
	Actual	6	2517	1343	457
	Saving	**2**	**340**	**286**	**453**
2013-14	Standard	5	2154	1099	46
	Actual	5	2722	1475	3575
	Saving	**0**	**568**	**376**	**3529**
2014-15	Standard	5	2668	1068	53
	Actual	7	4239	1628	3613
	Saving	**2**	**1571**	**560**	**3560**
2015-16	Standard	6	2778	1124	62
	Actual	11	6599	1960	4422
	Saving	**5**	**3821**	**836**	**4360**
2016-17	Standard	5	2829	1370	72
	Actual	12	5999	3602	4660
	Saving	**7**	**3170**	**2232**	**4588**
2017-18	Standard	3	3230	1571	75
	Actual	11	5646	3508	6251
	Saving	**8**	**2416**	**1937**	**6176**
Total Savings		29	12110	6427	22667

Note: Amount has been rounded off to nearest ₹

Table 9: Possible Savings in Depreciation and Amortisation

Amount in ₹ Crore

Companies		Coal India Ltd.	Hindalco Ltd.	Tata Steel Ltd.	Vedanta Ltd.
2010-11	Standard	3	667	1558	83
	Actual	6	687	1558	83
	Saving	**3**	**20**	**0**	**0**
2011-12	Standard	4	690	1664	66
	Actual	7	690	1990	84
	Saving	**3**	**0**	**326**	**18**
2012-13	Standard	5	653	1742	22
	Actual	5	704	2510	148
	Saving	**0**	**51**	**768**	**126**
2013-14	Standard	6	647	1811	253
	Actual	6	823	2772	1505
	Saving	**0**	**176**	**961**	**1252**
2014-15	Standard	6	801	1759	291
	Actual	7	837	2704	1012
	Saving	**1**	**36**	**945**	**721**
2015-16	Standard	7	834	1853	337
	Actual	15	1277	2881	1218
	Saving	**8**	**443**	**1028**	**881**
2016-17	Standard	6	849	2257	393
	Actual	18	1428	2881	2986
	Saving	**12**	**579**	**624**	**2593**
2017-18	Standard	4	969	2589	410
	Actual	18	1617	2925	2842
	Saving	**14**	**648**	**336**	**2432**
Total Savings		41	1954	4988	8021

Note: Amount has been rounded off to nearest ₹

Table 10: Possible Savings in Repairs and Maintenance

Amount in ₹ Crore

Companies		Coal India Ltd.	Hindalco Ltd.	Tata Steel Ltd.	Vedanta Ltd.
2010-11	Standard	3	229	1053	23
	Actual	7	286	1104	23
	Saving	**4**	**57**	**51**	**0**
2011-12	Standard	4	236	1124	18
	Actual	9	236	1124	20
	Saving	**5**	**0**	**0**	**2**
2012-13	Standard	5	224	1177	6
	Actual	9	254	1260	28
	Saving	**4**	**30**	**83**	**22**
2013-14	Standard	6	222	1223	71
	Actual	6	361	1476	216
	Saving	**0**	**139**	**253**	**145**
2014-15	Standard	6	274	1188	81
	Actual	6	425	1564	298
	Saving	**0**	**151**	**376**	**217**
2015-16	Standard	7	286	1252	94
	Actual	8	444	1743	275
	Saving	**1**	**158**	**491**	**181**
2016-17	Standard	6	291	1525	110
	Actual	11	447	1936	406
	Saving	**5**	**156**	**411**	**296**
2017-18	Standard	4	332	1749	114
	Actual	19	496	2137	448
	Saving	**15**	**164**	**388**	**334**
Total Savings		34	855	2053	1196

Note: Amount has been rounded off to nearest ₹

Table 11: Possible Savings in Business Service Input

Amount in ₹ Crore

Companies		Coal India Ltd.	Hindalco Ltd.	Tata Steel Ltd.	Vedanta Ltd.
2010-11	Standard	93	979	4746	357
	Actual	283	1115	4746	2100
	Saving	**190**	**136**	**0**	**1743**
2011-12	Standard	148	1011	5066	284
	Actual	167	1011	5911	2215
	Saving	**19**	**0**	**845**	**1931**
2012-13	Standard	166	959	5302	95
	Actual	295	1230	6423	814
	Saving	**129**	**271**	**1121**	**719**
2013-14	Standard	226	949	5511	1084
	Actual	295	1135	6654	1758
	Saving	**69**	**186**	**1143**	**674**
2014-15	Standard	198	1175	5355	1250
	Actual	198	1636	6909	1373
	Saving	**0**	**461**	**1554**	**123**
2015-16	Standard	243	1224	5640	1447
	Actual	283	1821	7073	1447
	Saving	**40**	**597**	**1433**	**0**
2016-17	Standard	214	1246	6871	1687
	Actual	304	2562	13782	2868
	Saving	**90**	**1316**	**6911**	**1181**
2017-18	Standard	135	1423	7879	1760
	Actual	200	2619	10335	2938
	Saving	**65**	**1196**	**2456**	**1178**
Total Savings		603	4163	15463	7549

Note: Amount has been rounded off to nearest ₹

The aforementioned tables depict that the possible savings is the highest in Business Service Input in Coal India Ltd. which is ₹ 603 crore as compared to the other elements of overhead input. If this could have saved, then Coal India Ltd. would have performed much better in terms of productivity. Hindalco Ltd. could have saved maximum in Power and Fuel element of overhead input so the company should focus more on this element. Tata Steel Ltd. could have saved the maximum in Business Service Input while Vedanta Ltd. in Power and Fuel.

COMPARATIVE ANALYSIS OF AVERAGE OVERHEAD PRODUCTIVITY RATIOS

Average performance for the study period is analysed between the companies of the metals sector.

Table 12: Comparative Analysis of Average Overhead Productivity Ratios of Metals Sector Companies from 2010-11 to 2017-18

Base Year 2010-11

Companies	Power and Fuel (Input Output Ratio)		Depreciation and Amortisation (Input Output Ratio)		Repairs and Maintenance (Input Output Ratio)		Business Service Input (Input Output Ratio)		Total Overhead (Input Output Ratio)		Overhead Productivity Ratio		Chi Square Test	
	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Value	Rank
Coal India Ltd.	0.0008	1	0.0010	1	0.0010	1	0.0261	1	0.0289	1	38.3249	1	121.065	4
Hindalco Ltd.	0.1440	4	0.0361	2	0.0134	3	0.0585	2	0.2520	2	4.2212	2	5.223	2
Tata Steel Ltd.	0.0515	2	0.0699	4	0.0421	4	0.2083	4	0.3718	4	2.7600	4	4.808	1
Vedanta Ltd.	0.1140	3	0.0474	3	0.0086	2	0.1634	3	0.3334	3	3.3428	3	48.543	3

The power and fuel average input-output ratio is the best in Coal India Ltd., followed by Tata Steel Ltd., Vedanta Ltd. and lastly Hindalco Ltd. Depreciation and amortisation average input-output ratio is the best in Coal India Ltd. as compared to Hindalco Ltd., Vedanta Ltd. and Tata Steel Ltd. Repairs and maintenance average input-output ratio is 0.0010 of Coal India Ltd., 0.0086 of Vedanta Ltd., 0.0134 of Hindalco Ltd. and lastly 0.0421 of Tata Steel Ltd. Coal India Ltd. has been regarded as the best as compared to the other companies of the metals sector in respect of business service input average input-output ratio. The total overhead average input-output ratio is the best of Coal India Ltd. as compared to others.

Average overhead productivity ratio is the best of Coal India Ltd. with 38.3249, which means that for one ₹ of overhead input, the output produced is approximately ₹ 38. This is followed by Hindalco Ltd., Vedanta Ltd. and lastly Tata Steel Ltd. On analysing the chi-square values of the sampled companies, it has been observed that the null hypothesis based on the chi-square is accepted in case of Tata Steel Ltd. and Hindalco Ltd. while it is rejected in case of Vedanta Ltd. and Coal India Ltd.

Conclusion and Suggestions: It has been concluded from the above study that the output per rupee of overhead input has been found satisfactory for all metals sector companies. It has been observed that the overhead productivity ratio is the best for Coal India Ltd. as it has the highest output per rupee of overhead input. Its average overhead productivity ratio is 38.3249. This is followed by Hindalco Ltd., Vedanta Ltd., and lastly Tata Steel Ltd. It has been suggested that overhead productivity can be improved by reducing the expenses in overhead cost. Overhead cost such as electricity expenses can be reduced by avoiding its wastage. Management should take steps to reduce the selling and distribution cost so as to attain higher productivity. Overhead productivity can also be improved by reducing the sunk cost, which constitutes the major portion of overhead cost.

Scope for Further Research: Though this study has focused on the critical area (i.e. productivity) of an organisation to survive in this competitive world, this study is only based on the overhead element of total productivity of metals sector companies included in Nifty 50. Therefore, there is a scope for the researchers and analytics to conduct further study on other sectors of Nifty 50 companies and on companies of BSE and Nifty 100. It can also be calculated on the other factors such as material, labour, overall, capital, etc.

APPENDICES

Appendix 1 to 4: Revaluation of Output of Metals Sector Companies

Appendix 1: Revaluation of Output of Coal India Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

		2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
S.No.	Items	Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Revenue from Operations	409.46	415.86	381.76	352.25	302.58	314.25	256.43	387.12	312.02	165.53	138.55	289.88	238.57	364.50	291.24
2	Other Income	5072.50	9101.71	8355.37	11088.01	9524.60	16089.85	13129.32	14143.40	11399.58	17127.10	14335.38	15004.75	12348.91	9571.03	7647.25
3	Changes in Inventories of Finished Goods, Work in progress and Traded Goods	-8.54	17.06	15.66	2.54	2.18	-25.03	-20.42	-18.23	-14.69	-94.55	-79.14	83.49	68.71	42.09	33.63
	Total Output	5473.42	9534.63	8752.79	11442.80	9829.37	16379.07	13365.32	14512.29	11696.91	17198.08	14394.79	15378.12	12656.19	9977.62	7972.12

Appendix 2: Revaluation of Output of Hindalco Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

		2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
S.No.	Items	Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Revenue from Operations	23859.21	26596.78	24415.84	26056.93	22382.90	27850.93	22726.36	34525.03	27827.17	34317.66	28723.88	36936.61	30398.83	42798.04	34195.63
2	Other Income	347.49	615.79	565.30	983.09	844.47	1124.42	917.53	882.21	711.06	1066.21	892.42	1005.17	827.25	947.82	757.31
3	Changes in Inventories of Finished Goods, Work in progress and Traded Goods	-394.67	-407.31	-373.91	127.94	109.90	-676.21	-551.79	67.81	54.65	191.70	160.45	-1100.16	-905.43	-419.23	-334.96
	Total Output	23812.03	26805.26	24607.23	27167.96	23337.28	28299.14	23092.10	35475.05	28592.89	35575.57	29776.75	36841.62	30320.65	43326.63	34617.98

Appendix 3: Revaluation of Output of Tata Steel Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

		2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
S.No.	Items	Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Revenue from Operations	29396.35	33933.46	31150.92	38199.43	32813.31	41711.03	34036.20	41785.00	33678.71	38210.34	31982.05	53260.96	43833.77	60519.37	48354.98
2	Other Income	528.36	886.43	813.74	902.04	774.85	787.64	642.71	582.78	469.72	3890.70	3256.52	414.46	341.10	763.66	610.16
3	Changes in Inventories of Finished Goods, Work in progress and Traded Goods	-173.65	-220.72	-202.62	-404.60	-347.55	-155.18	-126.63	-715.94	-577.05	142.97	119.67	-1329.65	-1094.30	545.36	435.74
	Total Output	29751.06	34599.17	31762.04	38696.87	33240.61	42343.49	34552.29	41651.84	33571.38	42244.01	35358.24	52345.77	43080.57	61828.39	49400.88

Appendix 4: Revaluation of Output of Vedanta Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

		2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
S.No.	Items	Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Revenue from Operations	7493.08	6513.45	5979.35	2347.63	2016.61	28536.53	23285.81	32502.41	26196.94	29810.62	24951.49	36663.00	30173.65	45524.00	36373.68
2	Other Income	515.20	386.33	354.65	341.99	293.77	1817.06	1482.72	2008.86	1619.14	8823.82	7385.54	9705.00	7987.22	3866.00	3088.93
3	Changes in Inventories of Finished Goods, Work in progress and Traded Goods	-12.13	48.56	44.58	-205.77	-176.76	-556.86	-454.40	263.80	212.62	131.54	110.10	-417.00	-343.19	-11.00	-8.79
	Total Output	7996.15	6948.34	6378.58	2483.85	2133.63	29796.73	24314.13	34775.07	28028.71	38765.98	32447.13	45951.00	37817.67	49379.00	39453.82

Appendix 5 to 8: Revaluation of Overhead Input of Metals Sector Companies

Appendix 5: Revaluation of Overhead Input of Coal India Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
		Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Power and Fuel	6.20	5.45	4.79	6.83	5.59	6.88	5.26	8.03	6.54	10.89	11.04	11.50	11.70	12.11	11.40
2	Depreciation and Amortisation	6.08	6.96	6.96	4.96	4.96	6.41	6.41	7.17	7.17	15.13	15.13	17.52	17.52	18.14	18.14
3	Repairs and Maintenance	7.06	9.48	8.70	10.06	8.64	7.38	6.02	7.73	6.23	9.58	8.02	13.76	11.32	23.63	18.88
4	Business Service Input	282.80	181.68	166.78	343.82	295.34	362.09	295.47	245.88	198.18	338.30	283.16	369.07	303.74	250.62	200.25
	Total Overhead Input	302.14	203.57	187.23	365.67	314.54	382.76	313.16	268.81	218.12	373.90	317.35	411.85	344.28	304.50	248.66

Appendix 6: Revaluation of Overhead Input of Hindalco Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
		Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Power and Fuel	2221.48	2870.67	2520.45	3073.04	2516.82	3557.61	2721.57	5200.77	4238.63	6508.06	6599.17	5898.67	5998.95	6000.12	5646.11
2	Depreciation and Amortisation	687.48	689.97	689.97	704.20	704.20	823.29	823.29	837.03	837.03	1277.00	1277.00	1427.97	1427.97	1617.31	1617.31
3	Repairs and Maintenance	286.10	256.94	235.87	295.56	253.89	442.54	361.11	527.32	425.02	530.10	443.69	543.21	447.06	620.36	495.67
4	Business Service Input	1115.49	1101.32	1011.01	1431.88	1229.98	1390.35	1134.53	2030.22	1636.36	2175.73	1821.09	3113.20	2562.16	3278.24	2619.31
	Total Overhead Input	4310.55	4918.90	4457.30	5504.68	4704.89	6213.79	5040.50	8595.34	7137.03	10490.89	10140.95	10983.05	10436.14	11516.03	10378.40

Appendix 7: Revaluation of Overhead Input of Tata Steel Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
		Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Power and Fuel	1146.19	1151.44	1010.96	1640.38	1343.47	1928.70	1475.46	1997.59	1628.04	1933.11	1960.17	3541.55	3601.76	3727.46	3507.54
2	Depreciation and Amortisation	1558.49	1990.16	1990.16	2510.17	2510.17	2772.31	2772.31	2704.42	2704.42	2881.17	2881.17	2880.92	2880.92	2925.20	2925.20
3	Repairs and Maintenance	1104.10	1224.03	1123.66	1466.50	1259.72	1808.38	1475.64	1940.95	1564.41	2082.71	1743.23	2352.62	1936.21	2674.40	2136.85
4	Business Service Input	4746.19	6438.59	5910.63	7477.22	6422.93	8153.97	6653.64	8572.46	6909.40	8450.18	7072.80	16746.22	13782.14	12935.31	10335.31
	Total Overhead Input	8554.97	10804.22	10035.41	13094.27	11536.30	14663.36	12377.04	15215.42	12806.26	15347.17	13657.37	25521.31	22201.02	22262.37	18904.90

Appendix 8: Revaluation of Overhead Input of Vedanta Ltd. from 2010-11 to 2017-18

Base Year 2010-11 Amount in ₹ Crore

S.No.	Items	2010-11	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18	
		Actual	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued	Actual	Revalued
1	Power and Fuel	14.97	15.17	13.32	557.48	456.58	4673.67	3575.36	4433.05	3612.94	4361.42	4422.48	4582.00	4659.89	6643.00	6251.06
2	Depreciation and Amortisation	83.13	83.85	83.85	147.91	147.91	1504.79	1504.79	1011.67	1011.67	1217.97	1217.97	2986.00	2986.00	2842.00	2842.00
3	Repairs and Maintenance	23.15	21.25	19.51	32.07	27.55	264.74	216.03	369.89	298.13	328.25	274.75	493.00	405.74	561.00	448.24
4	Business Service Input	2099.81	2413.28	2215.39	947.05	813.52	2153.93	1757.61	1703.10	1372.70	1728.81	1447.01	3485.00	2868.16	3677.00	2937.92
	Total Overhead Input	2221.06	2533.55	2332.07	1684.51	1445.55	8597.13	7053.78	7517.71	6295.44	7636.45	7362.21	11546.00	10919.79	13723.00	12479.23

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