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MEASURING EFFICIENCY AND EFFECTIVENESS OF SUPPLY CHAIN: A CONTEXT TO INDIAN ORGANIZATIONS

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Abstract- Efficiency and effectiveness of the supply chain is a central standard of performance in an enterprise. Efficiency tests the work ratio of the company and the method incorporates common practices that optimize the resources available and effectiveness assesses the ability of an organization to attain its determined targets. Well-constructed supply chains increase profitability, promote productivity, and reduce running costs. Although it is a difficult challenge to determine the efficiency and effectiveness of the supply chain and it is also important that decision-makers make better choices about improving the supply chain. In this article, we measure the effectiveness and efficiency of supply chain using a traditional DEA-CCR (Charnes Cooper-Rhodes) model and helps to achieve the base to make the right and effective decisions through evaluating effectiveness. The research also shows the Importance of Supply Chain performance indicators that helps to determine the input and output factors that play a major role in determining the efficiency and effectiveness of the supply chain. Through analyzing Key Performance Indicators, the study reveals how to define the slack in the supply chain utilizing the Return to Scale concept of the CCR. Through evaluating the findings of an observational analysis of 10 Indian firms in the manufacturing sectors, the Study demonstrates an interconnected solution to the supply chain. The findings confirm our underlying process of strong financial efficiency for effective supply chains.

Keywords: Data Envelopment Analysis, Supply Chain, Effectiveness, Efficiency, Key performance Indicators, Input DMUs, Output DMUs.

1. INTRODUCTION

As the market and scholarly literature expand the philosophy of supply chain management, scholars and practitioners concentrate on defining the elements that shape an effective supply chain strategy. The definition of globalization is one field of that emphasis in the growth of the supply chain strategy. To addition to evaluate the productivity of the supply chain, administrators of the supply chains have a specific task to quantify the effect of globalization on the operation of large, diverse networks. Globalization allows businesses, irrespective of the position to calculate the quality of supply chain, to tackle bureaucratic, economic and technical barriers and work with what is called the right upstream and downstream suppliers. (Bozarth et al., 2007)

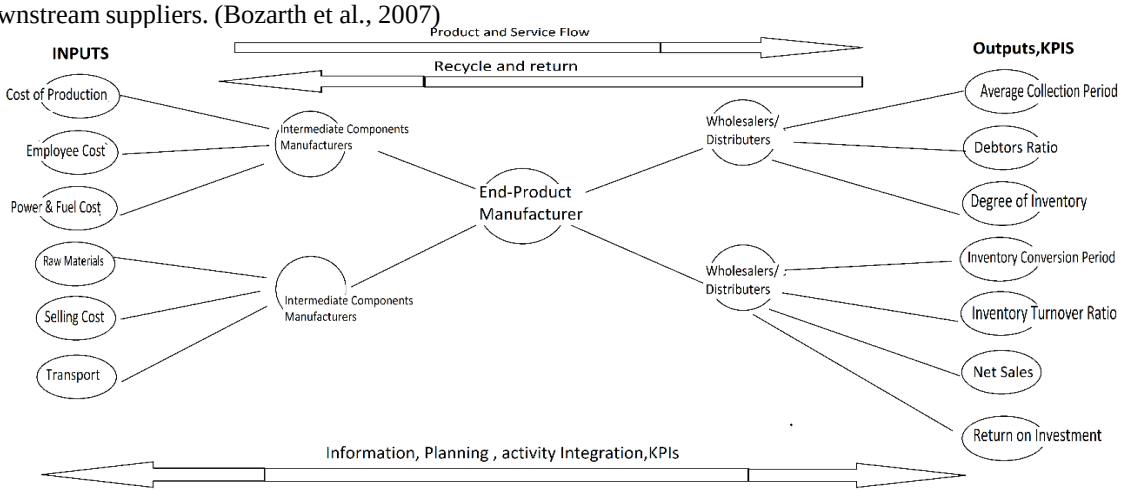

Fig. 1.1 Supply Chain

Consumers in the supply chain purchase goods based on cost, demand, quality and credibility considerations, and hope that the items they purchase match their needs and desires. The businesses who can produce all of these necessary items along with their supply chains would eventually thrive. Intermediate-finished and final consumers can have to refund goods in the supply chain, receive replacement replacements or dump and recycle items. This strategic reversal

process is indeed part of the supply chain**.** (FELEA & ALBĂSTROIU, 2009)**.** With this in mind, it is necessary to understand not only the core supporters of the chain but also its role in the overall effectiveness of the supply chain, given that supply chain management needs to enhance effectiveness and effectiveness of small and medium-sized businesses. (Sorak & Dragic, 2013). A supply chain is made up of all the relevant parties to satisfy a consumer order, explicitly or indirectly. The supply chain does not only include manufacturers and vendors but even transporters, distributors, dealers and also consumers. The purchasing department will also play a significant role in the productivity and profitability of a company, as supplier success leads to the achievement of SC goals in terms of expense, price, production and operation**.** (Tavassoli et al.,2014). The supply chain involves all activities associated with the reception and execution of a consumer request within a growing company, like a distributor**.** (FELEA & ALBĂSTROIU,2009)**.**

Nevertheless, it remains a complex problem that defines an effective supply chain. In a case study of 10 Indian firms, the present analysis would determine the performance of the supply chain utilizing DEA-CCR. Our debate is focused on a continuous flow of data supplied by the firms in the supply chain. The findings and debates will quickly be applied in supply chains such that the supply chain is successful. (Chen et al., 2006). The Dictionary of business defines the word effectiveness as follows: "the degrees to which objectives are achieved and the extent to which targeted problems are solved". The goal of this paper is to suggest a concept of performance, effectiveness and total output efficiency by SCM suppliers. A Mega Effectiveness Incorporated DEA (SIDEA) platform will be introduced to completely rank suppliers. (Tavassoli et al., 2014)

2. THE REQUIREMENT OF EFFICIENCY AND FFECTIVENESS MODEL FOR THE SUPPLY CHAIN

The major weakness in evaluating the supply chain is the lack of performance measurement instrumentation in the sense of effective supply chain management. Measuring each supplier 's effectiveness is as important as measuring efficiency. The effectiveness addresses how much a company can meet its pre-determined goals. The other methods based on consumer feedback fail to measure the effectiveness of the supply chain. In this paper, we define the effectiveness and efficiency of a given supplier as the ratio of the achieved goals to the pre-determined goals (Tavassoli et al., 2014)**.**

2.1 Effectiveness is: Achieved Target/Target

It needs an understanding of the output and not just of the output of the actual supply chain participants. Each part of the supply chain has a productivity strategy. The best for one participant, though, can not function for another. Often the ineffectiveness of one participant can be triggered by the productive functions of another due to the potential disputes between supply chain participants. For example, to boost its sales and achieve better efficiency, the provider may raise the price of raw materials. This rise in profits implies that the producer becomes more costly. The supplier may, therefore, become inefficient if its current operating strategy is not changed. Measuring the supply chain efficiency and effectiveness both is challenging, because of the need to communicate with and manage and organize the actions of the participants of the supply chain. (Liang et al., 2006)**.** (Khodakarami et al., 2014)**.** Thus the efficiency and effectiveness of the supply chain must be measured on a scale can be stated as a model. (Khodakarami et al., 2015)

2.2 Model used in Measuring Efficiency and Effectiveness

In the measurement of efficiency and effectiveness, the data-envelopment analysis (DEA) has demonstrated a strong methodology and in the evaluation of the relative efficacy of peer units when several success indicators are accessible. (Khodakarami et al., 2015)**.** Nevertheless, a fairly effective statistical modelling method contributes specifically to the question of estimation of supply chain efficiencies, as certain measurements ties with supply chain participants may be categorized simply as 'outputs' or 'inputs' of the chain. There are other contradictions in deciding the supply chain input and performance steps. Nonetheless, the analysis takes into consideration the input and output already defined primary performance indicators. (Liang et al., 2006)**.** DEA is typically used to measure relative efficiencies of DMUs when a mathematical programming technique consisting of several inputs and multiple outputs. Although the inputs and outputs are specific, this concept is sometimes taken as a matter of course by scholars, and little care is taken in ensuring that the variables selected are as accurately as possible the "process," when evaluated..(Cook et al., 2014)**.** In the case study, a model called integrated DEA-CCR model is used to measure efficiency and effectiveness.

2.3 CCR Model, Input and Output

It is named after its founder, Chames, Cooper and Rhodes (CCR), based on the concept of efficiency defined in the ratios. The CCR ratio calculates the total outputs of the year based on the different decision-making units (DMU) or already defined primary input/output success metrics, both with pure technical performance and scale production measurements. Measuring expenditure as input DMU can play an important role in an organization's efficiency and effectiveness because of the contribution of supplier performance on cost, quality, delivery, and service in achieving

the objectives of a Supply chain (Tavassoli et al., 2014). Cash flow is a key factor in assessing efficiency since the goal of the company is only fulfilled by meeting the goal (Walters, 2006).The result is shown in a proportion format and presents the real efficiency image together with the deficiency or over-investment to make better Supply chain decisions that now involve DEA CCR model category of efficiency and output measurement that is well recognized and used to make successful decisions that support the supply chain as well as the overall performance of the business. (Cooper, William W., Lawrence M. Seiford, 2000)

2.4 Efficiency and Effectiveness Jointly

There are different type of methods to access the Efficiency and the Effectiveness is DEA, Two Staged DEA, Integrated CCR and BCC Model. Simultaneous evaluation of efficiency and effectiveness (or performance of a two-stage network structure) is significant to identify overall performance of DMUs. However, the more important point is to answer the question of whether decision-maker(s) can improve both the efficiency and effectiveness of a Supplier. (Khodakarami et al., 2015)

DEA is a way of calculating performance against specific DMUs, as a non-parametric test. The DMUs are the uniform units and DMUs of the Ten separate companies in 10 Different specific manufacturing sectors (2009-2019) and analyse the efficiency of the supply chains. The efficiency value is the total weighted output number, separated by the total weighted input volume. The output of this model has been calculated by the weighted input factor. The output can be calculated by using the following mathematical formula to calculate how resourceful an organization uses its inputs:

$$\max h_0(u,v) = \frac{\sum_{r=1}^{s} v_r y_{r0}}{\sum_{i=1}^{m} u_i x_{i0}}$$

where

x_{ij} = the amount of input i utilized by the jth DMU

y_{rj} = the amount of output r utilized by the jth DMU

u_i = the weight given to input i.

Following previous researches (Onsarigo Miencha et al., 2017)(Adler et al., 2002)(Akçayaa et al., n.d.)(Cook et al., 2014)(Elsayed & Shabaan Khalil, 2017). In our plan, we have selected input and output. The Input used in Study for DEA analysis is Cost of Production, Employee Cost, Power & Fuel Cost, Raw Materials, Selling Cost, Transport (MEENAKUMARI, 2009)(Sharma, 2018) and the output used in the study areas they are the established performance indicators of the supply chain: Average Collection period (Kurien & Qureshi, 2011)(Farris & Hutchison, 2002), Debtors Ratio(Longinidis & Georgiadis, 2011), Degree of Inventory(P, 2017)(Longinidis & Georgiadis, 2011), Inventory Conversion Period(Banomyong & Supatn, 2011)(Chae, 2009), Inventory Turnover Ratio(Raob,2009) (Ruth Banomyong, 2005), Net Sales (Beamon, 1999)(Cooper, 1998), Return on Investment(Sambrani & Pol, 2017), Working Capital Turnover Ratio(Peng & Zhou,2019).Numerous researches explored numerous DEA risks. One pitfall is that the percentiles and/or amounts (e.g. income per employee, returns on investment) and actual details (e.g. sales, properties, staff, incomes, etc.) that miscalculate the efficiencies ranking. It is clearly stated with an example that In DEA model it is allowed to analyses the combination of ratio/percentile and raw data.(Cook et al., 2014)

3. ANALYSIS

In Table 1, we examine the performance of the supply chain of the VE Vehicles ltd from the Automobile sector using the CCR model. The performance demonstrates that the supply chain operates at its highest capacity and gives the optimal outcome from the supply chain over 10 years from 2010 to 2014 and in 2017. It was explicitly shown that the output ratios are focused on a schedule and take net sales to the current upper stage, even though net sales are the main metric of success to calculate the efficiency of the supply chain as well as the overall performance of the industry. Nevertheless, in 2015,2016,2018 and 2019, the supply chain operates closely 99,41%,
99,64%,95,78% and 92,85% as stated in the figures.the analysis of RTS is decreasing it means the cost of the input is much higher than the outcome from the output

Furthermore, analyzes indicate that productivity is declining as a consequence of the supply chain, respectively. A relatively small decrease in productivity will cost the business in the era of globalization, as long as the supply chain is concerned. The analysis reveals that, in 2015, the efficiency rate was down 0.9413, as it decreased by 1 per cent due to an increase of
3.92,85.69,23.90and 1.85 unit respectively in capital invested on the costs, employee costs, power & fuel and raw material costs, along with the delay in the average data collection period and inventory conversion periods, by 1.36

& 4.18 units. The analysis shows that the working capital ratio has fallen significantly by 10.11 items, which demonstrates that the return on work capital is not as expected and that this is critical in the supply chain and represents payment recovery from borrowers and a reduction in debtor ratios, inventory turnover ratio, degree of inventory, and returns on investment by 3.12,2.07, 0.06, and 0.04 respectively. Simultaneously in the year 2016, the supply chain also not work in its full efficiency in the same way in 2015 due to an increase of 11.92,235.36 and 63.74 unit respectively in capital invested on the production costs, employee costs, power & fuel and raw material cost. The company was able to monitor its expenditure on raw material in 2016 and the subsequent years, but freight expenses went up by
72,97units.in the output ratio it is observed that along with the delay in the average data collection period and inventory conversion periods, by 3.55 & 45.89 units, it means that there is a huge delay in the amount to be collected from the customer as well as delay in the stock to be refilled . The study indicates that the work capital ratio has decreased dramatically by 7.44 units. This indicates that the income on work capital is not as anticipated, is a critical element in the supply chains and reflects debtor payment recovery, inventory turnover, inventory cost and returns on assets of 42.74, 39.19.0.73 and 0.11, respectively. Simultaneously, in 2017,2018 the supply chain did not function entirely in the same manner in 2015,2016 because of the massive rise in staff expenses of 214,85 units and 217,52 in each year. Along with a rise of 25.84 & 18.11, 22.53 & 17.25 units in prices of production & power or fuel cost. And even the rate of shipping rose by the estimates of 62.30 and 89.48. It shows that increased employee costs, power and fuel are attributable to higher transport costs, and it can be stated that the company focuses on improving its supply chain. The most insightful research evidence reveals that the company continues to preserve its brand position by relying on net revenue efficiency, i.e. the features, will not alter very little over the whole 10 years. The estimates in Table 1A and Table 1B demonstrate that in the years in which the performance of businesses was not up to 2014,2015 and 2016 the origination of the cash flows surpassed the projected costs of output, staff expense, power & fuel costs, raw material, sales expense and transport. .. Yet measuring the outcomes reveals that the company doesn't fall as needed from the projected target. This also demonstrates that the effectiveness in the production chain don't suit the remaining years of such particular years.
Table 2 explores the efficiency of the CCR model in the supply chain of bearing sector's company Harsha Engg ltd. The results reveal that the supply chain has maximum capacity and the average output from the supply chain is 10 years between 2010 and 2013 and between 2017 and 2019. The supply chain works very closely to its efficiency in 2014, 2015 and 2016, 93.7%, 91.1% and
94.7%, respectively but not up to the mark as desired. The RTS measurement decreases, indicating that the production expense is far greater than the actual output performance. The study indicates that the manufacturing rate and the amount of inventory have not increased throughout the whole ten year period; it demonstrates that demand in the business has remained stable over the whole time and that stock level still the same and are really healthy for the supply chain . The Group raises the staff costs by 11.44, 17.05,7.188 units in the slack era from 2014 to 2016; this may be attributed to the recruiting or raising in staff salaries. The cost of raw material and fuel in 2015 &
2016 even rises considerably by 57.18,13.59 units. Besides, the rise in crude oil price worldwide could be attributed to a slight increase in the fuel costs 036 units. as selling cost and the cost of the transportation looks very related to each other with an increase in the cost of them by 3.87,4.24,3.48 and by 13.06,19.81,17.64 respectively. It is a really strong sign that business emphasizes on supply chain activities. In the output ratio, gaps of 1.91 & 25.61, 2.20 & 34.60 and 1.91 & 20.03 units of 2014 to 2017 have been reported for the estimated time of processing and product conversion. It means the amount to be taken up by the customer and the delay in inventory to be replenished is huge delay is noted that owing to the increase in the workforce cost, sales cost and transport cost make a critical effect on the supply chain of the business and was seen in the slack of Net Sales, Return on Investment and Working Capital Turnover Ratio that is 0.146, 0.460, 0.023 in 2015 0.177,0.478,0.024 in 2016 and 0.011 , 0.5056, 0.013 in 2017 respectively. As it was, though, the efficiency of the supply chain of the business has been shown by certain actions by the superior management of the group. Table 2A and Table 2B figures indicate that the origination of cash flows surpassed estimated costs of development, personnel spending, energy and fuel prices, raw materials, revenue and transportations in the years in which corporate output was not between 2014,2015 and 2016. .. However, measuring the results shows that the company does not fall from the planned goal as needed. That also indicates that the effectiveness of the supply chain will not suit the majority of the years.
The efficiency of the CCR model for the forging sector Menon and Menon ltd. the supply chain is discussed in Table 3. The findings revealed that between 2010 and 2015 and 2019 the supply chain works with full capacity. In 2016-2018, the supply chain operates closely with its quality. As the review brings the ranking 93.7%, 91.1% and 94.7%, but not up to the level as expected. The RTS model reduces, indicating that production expenses are far higher than performance results. The study indicates that net profits and payroll expenses and the raw material expenses have not risen or decreased over the whole decade, but that revenues in the business have been constant throughout the duration of the same time, and are expended fairly on workers, so very good for the supply chain. In the study,

production costs increased by 5.505, 5.19, 4.133 units in the slack era from 2016 to 2018. The cost of selling , fuel and transportation even rises considerably by 3.649, 3.517, 0.14 in 2016 , 1.893, 3.951, 0.217 in 2017 , 1.463, 2.519 and 0.101 units in 2018. And because of the increase in costs, the performance of the supply chain is influenced and the effect of the production slackening can accurately be analyzed. The primary supply chain efficiency metrics, excluding net profits, have huge slacks. This indicates that the supply chain is impacted. It can be assumed that the only explanation for the business is the successful selling strategies. The estimates in table 3A and tabulations 3B demonstrate explicitly that cash flows emerged in the years in which demand conditions did not align, in the subsequent years, with projected costs of growth, labour, energy and fuel prices, natural content, and manufacturer and shipping costs. .. Nonetheless, calculating success means that the organization may not fall below the goal as appropriate. This indicates again that the effectiveness of the manufacturing line does not correlate to the rest of the years.

The quality of the supply chain of the cement-based JK Cement Co. in Table 4 is analyzed. The output demonstrates that the supply chain works at the maximum standard which indicates the full supply chain result in only six years from 2010 to 2012,2014,2016 & 2017. Nonetheless, the supply chain worked at 93,3% in 2013,2015 ,2018and 2019, 88,9% 96,28% and 99,95%, as mentioned above. The supply chain works at similar rates but not with its full efficiency. The RTS model is. decreasing, implying that production costs are much higher than the performance effects There are huge fluctuations in the decisions in the expenditure and shown in the output which are the performance indicators of the supply chain as it is clearly shown that the supply chain performance is not constant .the cost of production is increased by 152.45 & 300.47units followed by an increase in the fuel cost by 3.23 & 37.58 units in 2013 and 2015. There are also increase in the cost of employee cost and Raw material by 14.28 & 94.15, 39.54 & 188.97, 67.19 & 92.77, 88.07 & 181.25 units in 2013, 2015, 2018 and in 2019 .along with the increase in the selling cost by 23.92,156.7 & 53.69 units in the 2015,2018 and 2019.there are also a slight fluctuation in the cost of the transport by 0.323 in 2013. There is also a huge slack in the output data in Debtors ratio, degree of inventory, inventory turnover ratio, return on investment and in a working capital turnover ratio by 14.09, 0.119,7.228, .041, 2.602 respectively in 2013.26.33,0.374,13.755,0.130 and 17.045 in 2015 which we can say that it is the worst working of the supply chain in the period of 10 years with the score of 88.9% might be due to the increase in the production cost, employee cost and raw material cost.in 2018 & 2019 Certain metrics are often fluctuating in these years, but the substantial rise in sales prices by 156.42, 53.69 units in subsequent years 2018 & 2019 still declines from the goal of the supply chain. This demonstrates that the business operates tirelessly to raise its sale. The estimates in Table 4A and Table 4B demonstrate clearly that the market results of the years 2013,2015,2018 and 2019 did not exceed that stage.The cash flow origination exceeded expected production expenses, labour costs, power & fuel costs, services, distribution costs and shipping costs. .. However, measuring the results shows that the company does not fall from the planned goal as needed. That also indicates that the quality of the supply chain will not suit the majority of the years.

The results of Table 5 shows that the supply chain of Amco India ltd from Non-ferrous Sector is working with maximum efficiency between 2016 and 2019 and 2010. The supply chain is strongly linked to its efficiency between 2012-2015. As part of the study, the rank is 98.6%, 98.4%, 91.1% and 95.9% but not to the anticipated point. RTS analyzes are declining, implying that the expense of the data is well above the output value. In the study, production costs increased by 4.07, 0.169, 0.419 units in the slack era from 2013 to 2015. The cost of selling and fuel even rises considerably by 0.167, 0.146,0.110,0.108 and 2.761, 1.604, 0.212, 0.040 units from 2012 to2014 years. along with an increase in employee cost and raw material cost by .598 & 2.243 in 2012 and 2014 respectively. While analyzing the output slack it has been observed that 2012 is the crucial for the companies supply chain as average collection period, inventory conversion period, debtors ratio, inventory turnover ratio and in a working capital turnover ratio by 134.512, 36.134, 2.173, 11.295 and 3.509 respectively . in 2013 & 2014 the slack in observed in the attributes but 2015 is another year where major slack is observed. The Table 5A and Table 5B calculations indicate clearly that market success was not until 2012,2013,2014 and 2015

The cash flow origination exceeded expected production expenses, labour costs, power & fuel costs, services, distribution costs and shipping costs. However, measuring the results shows that the company does not fall from the planned goal as needed. That also indicates that the effectiveness of the supply chain will not suit the majority of the years.

The table no 6 depicts that supply chain of Menon Bearing Ltd works with its maximum capacity and the average output from the supply chain is 10 years between 2010 to 2012 and between 2015 and 2017. The supply chain works very closely to its efficiency in 2013, 2014,2018 and 2019 by 99.7%, 95.7%,97.7and 99%, respectively but not up to the mark as demanded. The RTS measurement depicts decrease, indicating that the production expense is far greater than the actual performance the second thing being that the board are very active and experimenting in the operation of the supply chain. There is slack in the cost of production means new innovative methods are used to increase the production. The cost of the fuel is increased in but in, later year it was managed as shown in figures 1.45, 1.050, 0.100, 0.193 in 2013, 2014,2018 and 2019 respectively. the relationships are clearly shown in the transport expense

and the fuel expense as the expenditure also increased in the same years of fuel expense by 0.217, 0.067, 1.015, 0.696. it clearly shows that the company was regularly concentrating on the working of its supply chain. The same pattern of slack is shown in the output data that average collection period & inventory conversion period is delayed by 15.76 & 7.85, 1.79 & 1.136, 13.69 & 7.944, 34.46 & 17.29 units in the following year 2013,2014,2018 &2019 simultaneously. Followed by the debtors turnover ratio and return on investment. the one point is noticeable in the data that net sales fluctuates once in 2013 by 1.54 units it states that to take the hard decisions for the company the net sales is compromised. The Table 6A and Table 6B figures indicate that in 2013, 2014,2018 and 2019 the output of companies was not until , The cash flow origination exceeded expected production expenses, labour costs, power & fuel costs, services, distribution costs and shipping costs. .. However, measuring the results shows that the company does not fall from the planned goal as needed. That also indicates that the effectiveness of the supply chain will not suit the majority of the years.

Tables No. 7 reveal that KIC Metalics Ltd's supply chain is operating at full efficiency and that the total supply chain production is 10 years from 2010,2011,2014,2017 to 2019.In 2013,2015 and

2016, the supply chain operates similarly with91.4 per cent,996 percent and 91.7 percent respectively, but not up to the necessary level. The RTS measurement reduces, indicating that the production expense is far greater than the actual performance in the following years, but in 2012 The RTS scale is an improvement of 96% that means that the production is greater than the cost output, it is also a form of inefficient supply chain. This is the indication that we can invest less money or pay less for the full efficiency of the supply chain. The second is that in the process of the supply chain the board is very involved and creative. Projection costs are higher, meaning that the efficiency is improved utilizing modern creative techniques. The cost of the fuel is increased in but in , later year it was managed as shown in figures 3.26 , 0.697, 3.32, 2.57 in 2012, 2013,2015 and in 2016 respectively . The RTS model decreases, indicating that production expenses are far higher than performance results. The connection between expenditures for transport and power, as expenditures have risen in the same years of power expenses, is seen clearly by 0.848, 0.192,

0.612, 0.993 units. It clearly shows that the company was regularly concentrating on the working of its supply chain. The cost of production also increases in the same years by 1.79, 0.991, 2.192, 10.885 units. The cost of raw material stays constant for the entire 10 years. The same pattern of slack is shown in the output data that average collection period & inventory conversion period is delayed by 22.79 & 5.60, 38.28 & 39.05,27.57 & 7.81 units in the following year 2012,2013 & 2016 simultaneously. Followed by the degree of inventory and return on investment by 0.48 & 0.045, 0.595 & 0.049, 0.862 & 0.043units. the one point is noticeable in the data that net sales fluctuates once in 2015 by 6.251 units it states that to take the hard decisions for the company the net sales is compromised. Along with the working capital ratio which fluctuates in 2013 & 2013 by 6.036 & 11.582 units . It states that not working with its full efficiency. Table 7A and Table 7B estimates indicate the market success in the years that did not continue until 2012,2013,2015 and 2016 .The cash flow origination exceeded expected production expenses, labour costs, power & fuel costs, services, distribution costs and shipping costs. .. However, measuring the results shows that the company does not fall from the planned goal as needed. That also indicates that the effectiveness of the supply chain will not suit the majority of the years. The consistency of the Pardip overseas ltd apparel supply chain is evaluated in Table 8. The outcome indicates that the supply chain is operating according to the norm, which demonstrates the complete supply chain performance across seven years from 2010,2011,2013,2015,2017 and 2019. Nevertheless, in 2012,2014 and 2016, the supply chain operated at 99.5%, 88.5% and 96.2%, as noted above. The supply chain works at comparable levels but does not function entirely. The RTS shows that in 2012 the scale is decreasing means the input cost is increasing the output is not as per the investment , but in 2014 and 2016 the scale is increasing it means the output is much higher than the efforts made as input. in 2012, it can be decreased to the ideal efficiency by controlling the cost in terms of input. In 2012 the cost of production, employee cost , raw material cost, selling cost and transport cost by 92.84, 2.809,126.73,6.991 and 0.116 units respectively .as the result shown in the output slack that average collection period and inventory conversion period is delayed by 35.834,2.523 units. Along with slack of 1.109,0.179,0.036 and 0.182 units in debtors ratio, inventory turnover ratio, return on investment and working capital turnover ratio respectively in 2014 as we already discussed in input is much more than expected as it is clearly depicts from the slack in the cost of production by 30.451units in 2016 with slack in the fuel cost, raw material cost, and transportation cost by 1.28 & 2.177 units, 31.79 & 13.54 units and 0.654 and 0.261 units. The analysis becomes very clear that we can get output with less efficiency. As far as the output is concerned the inventory conversion period is concerned there is a slack of 37.33 units in 2014 and slack in the average collection period of 4.89 units in 2016. Debtors ratio, net sales and return on investment foud to be slack by 0.979 & 0.211, 2.201&70.186, 0.015& 0.003 in 2014 and 2016. The market success estimates in the years not extended until 2012, 2014 and 2016 are shown in Table 8A and Table 8B the origination of the cash flow surpassed planned costs of output, labour expenses, expenses in terms of energy & power, utilities, distribution and shipping. .. Measuring the performance, though, reveals that the

business will not slip as far from the expected goal. This also shows that most years will not be consistent with the effectiveness of the supply chains.

The table no 9 depicts that the supply chain of VTM Ltd works with its maximum capacity and the average output from the supply chain is 10 years between 2010 to 2013,2017 and 2019. The supply chain works very closely to its efficiency in 2014, 2015,2016 and 2018 by 93.5%, 90.03%,89.4% and 97.4%, respectively but not up to the mark as demanded. The RTS metric reveals a reduction in manufacturing costs, which means that output costs are much better than real results. The second is that the board is very involved and tests the supply chain. Production expenses are reduced such that the efficiency is improved by employing modern creative approaches. The fuel cost is raised but in 2016, as shown in estimates of 0.335 units in 2016, it was handled last year. The recorded slack of 11.68.0.164 & 0.636 in 2014 clearly illustrates this partnership of shipping costs and the sales cost of the raw materials. In 2015 there were 8.705.0.341 and 0.511. In 2016, 5.005 and 0.459 and in 2018, 13.369 and 0.869.The production results indicate that an average compilation and stock transition time has been postponed concurrently by 22.074 and 27.66, 35.42 and 42.40, 13.69 and 7.944, 18.87 and 39.93, 8.49 and 20.308 units for the next year 2014,2016,2016 and2018. After the slack in inventory, the investment return and working capital ratio. In 2014, the units were 2675,0,049&0,844. The units in 2015: 2.714, 0.839,0.080 & 0.546, 1.251, 0.955, 0.067 & 2.645 in 2016. 1.554, 0.650 and 0.082 in 2018. One argument is that net sales fluctuate by 0.267 units in 2018 often, according to which net profit is sacrificed to make tough decisions for the business.

Table 9A and Table 9B have business growth figures for the years 2014, 2015, 2016 and 2018.The sources of cash flow surpassed expected manufacturing rates, labour costs, oil & power spending, transportation, and shipping costs. .. Nevertheless, the metrics of success indicate that the enterprise would not fall away from the planned target. It further shows that the effectiveness of supply chains for several years is not consistent

Table 10 discusses the effectiveness of the CCR model for the aluminium supply chain Century aluminum ltd. The findings indicate that the supply chain operates with maximum efficiency between 2010 and 2012 and 2015 to 2019. The supply chain is closely involved in its efficiency in 2013 and 2014. As the analysis takes place, the rating is 96.4% and 99.8%, but not the anticipated point. The RTS model depicts decreases in production costs, which means that they are much higher than outputs. The study shows that sales prices and the expense of salaries have not risen or decreased during the whole ten years but that company profits have continued over the whole period and are expended equally on workers, which are very positive for the supply chain. In the study there are slack in the employee cost by 0.725, fuel cost by 3.208 and transport by 0.064 units in 2013 and in2014 slack reported in cost of production by 1.434 employee cost and fuel cost by 0.421 and 3.04. And the increased costs influence the performance of the supply chain and the impact of the reduction in production can be precisely analyzed. The key productivity metrics of the supply chain reveal big slacks. The total time of collection is postponed by 6.172 units in 2014, the transfer of the inventory is postponed by 6.163 & 3.372 in 2013 & 2014. Following the debtor's ratios, inventory degree, inventory turnover, investment return and capital work in the 2013 and 2010 units are only reporting a fluctuation in net sales in the 2013 units by 2298 Investment and equity returns, 31.36 & 22.372, 0.409 & 0.406, 11.87 & 7.15, 0.071 & 0.032, 1.057 & 0.968. That shows that different decisions taken regarding the imposed costs affect the efficiency of the supply chain. It is believed that good selling practices are the only reason for the business. The company development estimates for 2013 and 2014 are shown in Table 10A and Table 10B.Cash flow streams met projected output levels, payroll expenses, oil and electricity, distribution and transportation expenses. .. However, success metrics show that the company does not fall away from the planned goal. This also demonstrates that supply chain effectiveness' is not reliable across a period of years.

CONCLUSION

The supply chain system is a complex systems composed by a plurality of stakeholders interconnected; the supply chain made operational of cost and synergy degree of different subsystems have a great impact on the overall performance of the supply chain system. Within this report, an innovative methodology is demonstrated by integrating reliance research and data envelopment studies within order to analyze benchmarking outcomes from an analytical study of supply chain processes utilized by businesses from various sectors.

Hence, Efficiency and effectiveness must, therefore, be measured because both terms constitute distinct aspects of performance. (Chiou et al., 2010). In this paper, we proposed a model for measuring efficiency, effectiveness, and the overall efficiency of organization in SCM. Furthermore, to uniquely rank all suppliers, this paper proposed a DEA-CCRo model. The results of employing the proposed model show the applicability and discriminating power in the supplier selection problem. The main contributions of this paper are to measure the overall efficiency, efficiency, and effectiveness of suppliers, simultaneously can be expressed a(Tavassoli et al.,2014) based on an assessment index method for the output of the supplier chain, Effectiveness, efficiency and performance measurement have a common denominator which is the main attributes of the Supply chain as discussed above (Walters, 2006) .The assessment model is established by DEA, it initially computes the weights of the requirements layer and determines the

RTS(return to Scale). Then the DEA-CCR is used to evaluate the relative utility of each attribute. Data review of a supply chain of various systems has proven to be an outstanding tool in the estimation of efficiency of the product envelopment system. The present research suggested a DEA-based approach to measure the relative productivity of supply chain networks utilizing costs as input and main performance metrics as output. It is necessary to remember that this strategy is not aimed at identifying an optimum proportion of initial allocations. It concentrates on deciding the best percentage of alternatives. Our method can be assumed to be more simple to use. In other terms, the possible advantages of pooling to reduce the disruption of supply chain operations have also been understood in most industries. To further boost performance and to differentiate themselves from rivals, the realistic advice provided to DMU , supply chain managers should be to put further emphasis on the commodity group, on the deferment and the transport processes.

The findings indicate that we established a model that evaluate the Efficiency and the effectiveness of the Supply chain from the common denominator that are the main key performance indicators of the Supply chain The study of key performance indicators as a input and output confirms our simple theories of high cash flow in terms of Cost of Production , Transportation Cost, Fuel Expense , Employee Cost, Raw Material and Selling cost plays a vital role in evaluating the effectiveness of supply chains. Throughout certain instances, a variety of essential primary supply chain efficiency assessment metrics tend in the literature to be given little consideration any of these are to establish explicitly the intent of the analysis, agree on inputs and outputs, pick a model orientation and determine if the data is relative to the raw data. We assume, be more than a normal definition of "inputs" and "outputs" and DEA is more than a calculation of productivity within the notion of a manufacturing process. Besides being used as an output performance measure. The DEA is a method of integrated benchmarking that evaluates success in various industries and assists companies in measuring their results, competitiveness, and quality assumptions. We assume that DEA inputs and outputs can be more of a definition of "inputs" and "outputs" than normal in a typical cycle of development. DEA is a method of "rational benchmarking" that evaluates the results in several ways and allows companies to check their conclusions regarding output, quality effectiveness and efficiency.

REFERENCES

[1] Adler, N., Friedman, L., & Sinuany-Stern, Z. (2002). Review of ranking methods in the data envelopment analysis context. European Journal of Operational Research, 140(2), 249–265. https://doi.org/10.1016/S0377-2217(02)00068-1

[2] Akçayaa, A. E., Gürdal Erteka, G. B., & ASabancı. (n.d.). Analyzing the solutions of DEA through information visualization and data mining techniques: SmartDEA framework. Sabanciuniv., 7763–7775.

[3] Banomyong, R., & Supatn, N. (2011). Developing a supply chain performance tool for SMEs in Thailand. Supply Chain Management, 16(1), 20–31. https://doi.org/10.1108/13598541111103476

[4] Beamon, B. M. (1999). Measuring supply chain performance. In International Journal of Operations and Production Management (Vol. 19, Issue 3, pp. 275–292). https://doi.org/10.1108/01443579910249714

[5] Bozarth, C., Blackhurst, J., & Handfield, R. B. (2007). Following the thread: Industry cluster theory, the New England Cotton textiles industry, and implications for future supply chain research. In Production and Operations Management (Vol. 16, Issue 1, pp. 154–157). Florida International University. https://doi.org/10.1111/j.1937-5956.2007.tb00172.x

[6] Chae, B. (2009). Developing key performance indicators for supply chain: An industry perspective. Supply Chain Management, 14(6), 422–428. https://doi.org/10.1108/13598540910995192.

[7] Chen, Y., Liang, L., & Yang, F. (2006). A DEA game model approach to supply chain efficiency. Annals of Operations Research, 145(1), 5–13. https://doi.org/10.1007/s10479-006-0022-y.

[8] Cook, W. D., Tone, K., & Zhu, J. (2014). Data envelopment analysis: Prior to choosing a model.

[9] Omega (United Kingdom), 44, 1–4. https://doi.org/10.1016/j.omega.2013.09.004.

[10] Cooper, William W., Lawrence M. Seiford, K. T. (2000). DATA ENVELOPMENT ANALYSIS. Cooper, J. D. P. A. M. C. (1998). Supply Chain Postponment and Speculation Stretegies How toChoose the right strategy. Journal of Business Logistics.

[11] Elsayed, A., & Shabaan Khalil, N. (2017). Evaluate and Analysis Efficiency of Safaga Port Using DEA-CCR, BCC and SBM Models-Comparison with DP World Sokhna. IOP Conference Series: Materials Science and Engineering, 245(4). https://doi.org/10.1088/1757-899X/245/4/042033.

[12] Farris, M. T., & Hutchison, P. D. (2002). Cash-to-cash: The new supply chain management metric. International Journal of Physical Distribution and Logistics Management, 32(4), 288–298. https://doi.org/10.1108/09600030210430651.

[13] FELEA, M., & ALBĂSTROIU, I. (2009). Supply chain strategies. In Pharmaceutical Manufacturing and Packing Sourcer (Issue SPRING, pp. 32–35).

[14] Khodakarami, M., Shabani, A., Farzipoor Saen, R., & Azadi, M. (2015). Developing distinctive two-stage data envelopment analysis models: An application in evaluating the sustainability of supply chain management. Measurement: Journal of the International Measurement Confederation, 70, 62–74. https://doi.org/10.1016/j.measurement.2015.03.024.

[15] Khodakarami, M., Shabani, A., & Saen, R. F. (2014). Concurrent estimation of efficiency, effectiveness and returns to scale. International Journal of Systems Science: Operations and Logistics, 1(2), I–XIX. https://doi.org/10.1080/00207721.2014.907943.

[16] Kurien, G. P., & Qureshi, M. N. (2011). Study of performance measurement practices in supply chain management. In International Journal of Business, Management and Social Sciences (Vol. 2, Issue 4). www.ijbmss-ng.com.

[17] Liang, L., Yang, F., Cook, W. D., & Zhu, J. (2006). DEA models for supply chain efficiency evaluation. Ann Oper Res, July, 35–49. https://doi.org/10.1007/s10479-006-0026-7.

[18] Longinidis, P., & Georgiadis, M. C. (2011). Integration of financial statement analysis in the optimal design of supply chain networks under demand uncertainty. International Journal of Production Economics, 129(2), 262–276. https://doi.org/10.1016/j.ijpe.2010.10.018.

[19] MEENAKUMARI, R. (2009). INVESTIGATION ON THE OPERATIONAL PERFORMANCE OF STATE OWNED ELECTRIC UTILITIES IN INDIA. PHD Thesis, October.

[20] Onsarigo Miencha, I., Paul, J., & Selvam, M. (2017). Technical Efficiency for Strategic Change and Global Competitiveness. Strategic Change, 26(1), 53–67. https://doi.org/10.1002/jsc.2109

[21] P, R. R. (2017). A STUDY OF THE RELATIONSHIP AMONG SUPPLY CHAIN PERFORMANCE , MANAGEMENT FACTORS AND ORGANIZATIONAL PERFORMANCE OF MANUFACTURING INDUSTRIES Submitted by Department of Management Studies. Thesis, 600095(May).

[22] Peng, J., & Zhou, Z. (2019). Working capital optimization in a supply chain perspective.

[23] European Journal of Operational Research, 277(3), 846–856. https://doi.org/10.1016/j.ejor.2019.03.022

[24] Raob, C. M. R. and K. P. (2009). INVENTORY TURNOVER RATIO AS A SUPPLY CHAIN PERFORMANCE MEASURE. Serbian Journal of Management, 41–50.

[25] Ruth Banomyong. (2005). Measuring the Cash Conversion Cycle in an International Supply Chain. Chartered Institute of transport and logistics.

[26] Sambrani, V. N., & Pol, N. B. (2017). Supply Chain Management Impact of Distributor ROI Towards Sales Enhancement in FMCG Sector. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2770481.

[27] Sharma, M. (2018). AN ANALYTICAL STUDY ON PERFORMANCE EVALUATION OF INDIAN CIVIL AVIATION SECTOR. PHD Thesis, June 2018.

[28] Sorak, M., & Dragic, M. (2013). Supply Chain Management of Small and Medium-Sized Enterprises. DAAAM INTERNATIONAL SCIENTIFIC BOOK, 951–968. https://doi.org/10.2507/daaam.scibook.2013.59.

[29] avassoli, M., Faramarzi, G. R., & Saen, R. F. (2014). A joint measurement of efficiency and effectiveness for the best supplier selection using integrated data envelopment analysis approach. International Journal of Mathematics in Operational Research, 6(1), 70–83. https://doi.org/10.1504/IJMOR.2014.057861.

[30] Walters, D. (2006). Effectiveness and efficiency: The role of demand chain management. TheInternational Journal of Logistics Management, 17(1), 75–94. https://doi.org/10.1108/09574090610663446.

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Table:1

Company Name:VE Vehicles Ltd Sector:Automobile				Slack In Input Attributes						Slack in output Key Performance indicators of Supply chain							
DMU	RTS of Projected DMU	Score	Rank	Cost of Production	Employee Cost	Power & Fuel Cost	Raw Materials	Selling Cost	Transport	Average Collection	Debtors Ratio period	Degree of Inventory	Inventory Conversion Period	Inventory Turnover Ratio	Net Sales	Return on Investment	Working Capital Turnover Ratio
2010	Constant	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	Constant	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	Constant	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	Constant	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	Constant	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	Decreasing	0.99413	8	3.92756	85.69272	23.90422	1.8501	0	0	1.35731	3.12474	0.04406	4.18269	2.07528	0	0.0607	10.11833
2016	Decreasing	0.99649	7	11.93847	235.3634	63.74537	0	0	72.97071	39.55951	42.74555	0.73177	45.89906	39.19787	0	0.1197	7.44268
2017	Constant	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	Decreasing	0.95786	9	25.83453	214.85436	22.53804	0	0	62.30673	31.74886	46.84851	0.80494	47.03271	41.4838	0	0.14113	6.65972
2019	Decreasing	0.92854	10	18.11602	217.52054	17.25734	0	0	89.48833	49.02176	64.25192	1.06652	59.08414	60.00443	0	0.19853	2.25499

Table 1 A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling Cost			Transport		
No.	year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	19.72	19.72	0.00	2093.60	2093.60	0.00	146.39	146.39	0.00	15.63	15.63	0.00	1868.40	1868.40	0.00	63.16	63.16	0.00
2	2011	25.39	25.39	0.00	3373.13	3373.13	0.00	188.97	188.97	0.00	23.40	23.40	0.00	3087.44	3087.44	0.00	103.35	103.35	0.00
3	2012	36.82	36.82	0.00	4110.03	4110.03	0.00	252.58	252.58	0.00	28.35	28.35	0.00	3724.60	3724.60	0.00	168.16	168.16	0.00
4	2013	47.71	47.71	0.00	4423.08	4423.08	0.00	332.48	332.48	0.00	34.82	34.82	0.00	3932.29	3932.29	0.00	161.93	161.93	0.00
5	2014	53.55	53.55	0.00	4164.86	4164.86	0.00	374.14	374.14	0.00	43.48	43.48	0.00	3574.54	3574.54	0.00	209.51	209.51	0.00
6	2015	63.97	60.02	-6.18	4789.03	4702.83	-1.80	443.92	419.87	-5.42	50.57	48.71	-3.68	4040.71	4040.71	0.00	233.95	233.95	0.00
7	2016	94.57	82.59	-12.67	8168.52	7932.33	-2.89	664.21	600.24	-9.63	66.03	66.03	0.00	7000.83	7000.83	0.00	358.64	285.41	-20.42
8	2017	119.03	119.03	0.00	7418.33	7418.33	0.00	622.59	622.59	0.00	58.17	58.17	0.00	6334.34	6334.34	0.00	224.95	224.95	0.00
9	2018	118.01	91.04	-22.86	8887.71	8663.40	-2.52	683.94	660.41	-3.44	72.84	72.84	0.00	7637.73	7637.73	0.00	381.67	316.62	-17.04
10	2019	122.17	102.66	-15.97	10572.64	10338.38	-2.22	772.05	753.46	-2.41	81.75	81.75	0.00	9173.84	9173.84	0.00	439.19	342.81	-21.94

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Table: 1B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projecti	Diff.(	Data	Projecti	Diff.(	Dat	Projecti	Diff.(	Dat	Projection	Diff.(	Dat	Projection	Diff.(	Data	Projection	Diff.(	Dat	Projecti	Diff.(	Data	Projecti	Diff.(
20.70	20.70	0.00	17.6	17.63	0.00	0.3	0.34	0.00	21.	21.64	0.00	16.	16.87	0.00	2523.1	2523.17	0.00	0.0	0.07	0.00	2.44	2.44	0.00
20.70	20.70	0.00	17.6	17.63	0.00	0.3	0.36	0.00	21.	21.64	0.00	16.	16.87	0.00	3917.4	3917.42	0.00	0.1	0.17	0.00	3.48	3.48	0.00
19.87	19.87	0.00	18.3	18.37	0.00	0.3	0.33	0.00	23.	23.28	0.00	15.	15.68	0.00	4964.2	4964.21	0.00	0.2	0.23	0.00	5.62	5.62	0.00
24.17	24.17	0.00	15.1	15.10	0.00	0.3	0.33	0.00	25.	25.17	0.00	14.	14.50	0.00	5297.6	5297.63	0.00	0.1	0.16	0.00	10.40	10.40	0.00
31.06	31.06	0.00	11.7	11.75	0.00	0.2	0.28	0.00	26.	26.24	0.00	13.	13.91	0.00	5069.6	5069.67	0.00	0.1	0.12	0.00	16.70	16.70	0.00
33.83	35.39	4.63	10.7	14.00	29.72	0.2	0.33	16.37	25.	30.15	16.90	14.	16.32	15.34	5689.3	5722.94	0.59	0.0	0.14	77.39	-55.53	-37.37	-
33.06	72.88	120.4	11.0	53.97	388.9	0.3	1.06	228.0	26.	72.74	173.6	13.	53.11	286.8	9553.9	9587.53	0.35	0.1	0.26	87.14	-	-	-0.27
40.20	40.20	0.00	9.08	9.08	0.00	0.2	0.26	0.00	28.	28.56	0.00	12.	12.78	0.00	8502.8	8502.85	0.00	0.1	0.11	0.00	12.24	12.24	0.00
43.92	79.00	79.86	8.31	57.59	592.9	0.2	1.13	304.3	28.	78.46	179.0	12.	56.86	338.0	10032.	10474.10	4.40	0.1	0.28	118.6	10.49	17.90	70.69
42.44	98.50	132.0	8.60	78.46	812.3	0.3	1.51	345.8	34.	100.65	192.8	10.	76.06	616.1	11586.	12478.17	7.70	0.1	0.34	185.6	12.99	16.42	26.39

Table:2

Company Name:Harsha Engineers Ltd Industry:Bearings - Medium / Small Sector:Bearings			**Slack In Input Attributes**				**Slack in output Key Performance indicators of Supply chain**					
DMU	**RTS of Projected DMU**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2013	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2014	**Decreasing 0.937**	**9**	**0**	**11.448**	**0.036**	**0**	**3.875**	**13.006**	**1.191**	**0**	**0**	**25.612**	**9.005**	**0.146**	**0.46**	**0.023**
2015	**Decreasing 0.911**	**10**	**0**	**17.05**	**0**	**57.018**	**4.246**	**19.812**	**2.204**	**0.157**	**0**	**34.805**	**5.773**	**0.117**	**0.478**	**0.024**
2016	**Decreasing 0.947**	**8**	**0**	**7.188**	**0**	**13.594**	**3.48**	**17.684**	**1.912**	**0.868**	**0**	**20.031**	**0**	**0.011**	**0.506**	**0.013**
2017	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2019	**Constant 1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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Table 2 A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transpo		
No.	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	125.26	125.26	0.00	16.61	16.61	0.00	5.03	5.03	0.00	140.91	140.91	0.00	6.72	6.72	0.00	2.90	2.90	0.00
2	2011	213.38	213.38	0.00	15.38	15.38	0.00	5.07	5.07	0.00	77.20	77.20	0.00	0.59	0.59	0.00	2.25	2.25	0.00
3	2012	229.59	229.59	0.00	22.21	22.21	0.00	0.77	0.77	0.00	170.44	170.44	0.00	0.59	0.59	0.00	4.47	4.47	0.00
4	2013	212.52	212.52	0.00	28.49	28.49	0.00	8.22	8.22	0.00	132.59	132.59	0.00	0.84	0.84	0.00	4.56	4.56	0.00
5	2014	245.08	245.08	0.00	35.03	22.02	-37.13	8.51	4.64	-45.53	149.72	149.72	0.00	13.96	2.51	-82.01	3.86	3.82	-0.95
6	2015	295.52	295.52	0.00	41.98	22.17	-47.20	10.55	6.30	-40.25	177.32	120.30	-32.16	17.86	0.81	-95.46	3.43	3.43	0.00
7	2016	271.58	271.58	0.00	46.05	28.37	-38.40	11.65	8.17	-29.87	151.50	137.91	-8.97	13.39	6.20	-53.68	2.85	2.85	0.00
8	2017	290.10	290.10	0.00	47.73	47.73	0.00	11.61	11.61	0.00	170.07	170.07	0.00	15.91	15.91	0.00	1.57	1.57	0.00
9	2018	406.66	406.66	0.00	55.03	55.03	0.00	12.36	12.36	0.00	264.98	264.98	0.00	30.59	30.59	0.00	2.75	2.75	0.00
10	2019	492.07	492.07	0.00	64.41	64.41	0.00	14.53	14.53	0.00	329.41	329.41	0.00	37.54	37.54	0.00	3.31	3.31	0.00

Table: 2B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Data	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Da	Projection	Diff.(%)	Data	Projection	Diff.(%)
86.08	86.08	0.00	4.24	4.24	0.00	1.6	1.68	0.00	113.7	113.71	0.00	3.2	3.21	0.00	152.3	152.33	0.00	0.0	0.07	0.00	2.03	2.03	0.00
71.85	71.85	0.00	5.08	5.08	0.00	1.3	1.35	0.00	72.7	72.71	0.00	5.0	5.02	0.00	281.0	281.08	0.00	0.0	0.07	0.00	2.46	2.46	0.00
82.39	82.39	0.00	4.43	4.43	0.00	1.4	1.47	0.00	78.4	78.49	0.00	4.6	4.65	0.00	315.9	315.90	0.00	0.1	0.10	0.00	2.92	2.92	0.00
84.88	84.88	0.00	4.30	4.30	0.00	1.5	1.59	0.00	98.3	98.38	0.00	3.7	3.71	0.00	270.4	270.46	0.00	0.0	0.07	0.00	2.67	2.67	0.00
67.10	97.22	44.89	5.44	5.81	6.72	1.5	1.81	16.06	89.2	104.24	16.81	4.0	5.56	35.84	303.8	324.29	6.72	0.0	0.10	39.54	2.47	3.10	25.33
59.64	100.29	68.15	6.12	6.88	12.37	1.6	1.87	17.09	86.4	100.74	16.47	4.2	6.84	62.02	356.4	391.34	9.80	0.0	0.10	43.91	2.70	3.44	27.48
70.87	94.87	33.86	5.15	6.31	22.45	1.7	1.87	6.20	104.2	110.12	5.60	3.5	5.61	60.23	329.4	347.86	5.60	0.0	0.09	24.05	2.30	2.93	27.63
70.87	70.87	0.00	5.15	5.15	0.00	1.6	1.63	0.00	101.6	101.67	0.00	3.5	3.59	0.00	355.7	355.77	0.00	0.0	0.07	0.00	2.06	2.06	0.00
67.22	67.22	0.00	5.43	5.43	0.00	0.9	0.98	0.00	82.3	82.39	0.00	4.4	4.43	0.00	509.0	509.03	0.00	0.1	0.13	0.00	3.17	3.17	0.00
64.60	64.60	0.00	5.65	5.65	0.00	1.3	1.33	0.00	90.3	90.35	0.00	4.0	4.04	0.00	599.7	599.73	0.00	0.1	0.13	0.00	2.64	2.64	0.00

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Table: 3

Company Name:Menon and Menon Ltd

Industry:Castings - Grey Iron

Sector:Castings, Forgings & Fasteners

				Slack In Input Attributes						**Slack in output Key Performance indicators of Supply chain**							
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2013	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2014	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2015	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2016	**Decreasing**	**0.9087**	**10**	**5.501**	**0**	**3.649**	**0**	**3.517**	**0.14**	**19.085**	**6.096**	**0.381**	**11.752**	**14.147**	**0**	**0.397**	**91.425**
2017	**Decreasing**	**0.9361**	**9**	**5.19**	**0**	**1.893**	**0**	**3.951**	**0.217**	**14.342**	**16.846**	**0.426**	**13.606**	**17.572**	**0**	**0.422**	**89.02**
2018	**Decreasing**	**0.9592**	**8**	**4.133**	**0**	**1.463**	**0**	**2.519**	**0.101**	**0**	**10.45**	**0.193**	**4.021**	**8.947**	**0**	**0.256**	**337.802**
2019	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 3A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	103.84	103.84	0.00	19.41	19.41	0.00	14.03	14.03	0.00	41.36	41.36	0.00	0.70	0.70	0.00	0.00	0.00	0.00
2	2011	101.32	101.32	0.00	20.03	20.03	0.00	16.22	16.22	0.00	54.72	54.72	0.00	0.03	0.03	0.00	0.52	0.52	0.00
3	2012	146.72	146.72	0.00	25.54	25.54	0.00	25.65	25.65	0.00	81.50	81.50	0.00	0.09	0.09	0.00	0.46	0.46	0.00
4	2013	157.95	157.95	0.00	28.87	28.87	0.00	29.55	29.55	0.00	83.33	83.33	0.00	0.83	0.83	0.00	0.46	0.46	0.00
5	2014	161.12	161.12	0.00	31.57	29.75	-5.76	25.53	25.53	0.00	84.10	81.00	-3.69	0.97	0.39	-59.91	0.44	0.44	0.00
6	2015	174.01	174.01	0.00	32.77	32.77	0.00	27.58	27.58	0.00	94.22	89.28	-5.24	1.07	0.34	-68.32	0.60	0.60	0.00
7	2016	185.58	180.08	-2.96	35.20	35.20	0.00	31.55	27.90	-11.57	91.99	91.99	0.00	3.81	0.29	-92.32	1.06	0.73	-30.76
8	2017	195.63	190.44	-2.65	37.26	37.26	0.00	31.48	29.59	-6.02	97.74	97.74	0.00	4.24	0.29	-93.19	1.19	0.79	-33.39
9	2018	263.93	259.80	-1.57	37.71	37.71	0.00	41.80	40.34	-3.50	146.47	146.47	0.00	5.87	3.35	-42.92	1.31	1.18	-9.76
10	2019	337.37	337.37	0.00	40.09	40.09	0.00	51.82	51.82	0.00	195.77	195.77	0.00	6.44	6.44	0.00	1.49	1.49	0.00

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Table 3B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Dat	Projection	Diff.(	Data	Projection	Diff.(%)
26.98	26.98	0.00	13.5	13.53	0.00	0.4	0.41	0.00	20.5	20.53	0.00	17.7	17.78	0.00	116.5	116.55	0.00	0.1	0.10	0.00	112.07	112.07	0.00
18.43	18.43	0.00	19.8	19.80	0.00	0.4	0.44	0.00	16.4	16.45	0.00	22.1	22.19	0.00	149.1	149.11	0.00	0.2	0.26	0.00	48.57	48.57	0.00
16.98	16.98	0.00	21.4	21.49	0.00	0.6	0.69	0.00	16.3	16.31	0.00	22.3	22.38	0.00	203.8	203.85	0.00	0.2	0.23	0.00	28.96	28.96	0.00
17.75	17.75	0.00	20.5	20.56	0.00	0.4	0.42	0.00	15.0	15.08	0.00	24.2	24.20	0.00	215.6	215.67	0.00	0.2	0.21	0.00	60.08	60.08	0.00
16.95	28.79	69.91	21.5	25.00	16.08	0.3	0.70	127.3	15.8	24.52	54.56	23.0	28.50	23.88	214.0	214.31	0.11	0.0	0.27	247.0	47.36	88.33	86.50
13.69	31.42	129.5	26.6	28.98	8.67	0.4	0.75	78.28	15.6	27.07	73.54	23.4	32.92	40.67	223.8	238.48	6.54	0.0	0.34	766.3	21.75	95.27	337.9
15.06	35.66	136.7	24.2	32.77	35.20	0.3	0.76	119.8	17.0	30.55	78.85	21.3	37.66	76.25	229.0	252.04	10.05	0.0	0.41	4551.2	15.61	108.61	595.6
21.64	37.46	73.12	16.8	34.87	106.6	0.3	0.81	125.5	17.4	32.19	85.04	20.9	39.99	90.59	250.5	267.67	6.83	0.0	0.44	3297.3	22.37	112.92	404.7
29.34	30.59	4.25	12.4	23.42	88.25	0.3	0.59	54.91	19.8	24.68	24.55	18.4	28.15	52.83	335.2	349.51	4.25	0.0	0.29	881.2	63.86	404.38	533.2
27.91	27.91	0.00	13.0	13.08	0.00	0.4	0.42	0.00	20.1	20.14	0.00	18.1	18.12	0.00	435.9	435.95	0.00	0.1	0.13	0.00	703.15	703.15	0.00

Table :4

Company Name:J K Cements Ltd				**Slack In Input Attributes**						**Slack in output Key Performance indicators of Supply chain**						
Industry:Cement - North India																
Sector:Cement																
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2013	**Decreasing**	**0.933**	**8**	**152.451**	**14.282**	**36.237**	**94.152**	**0**	**0.323**	**3.410**	**14.093**	**0.119**	**0**	**7.228**	**0**	**0.041**	**2.602**
2014	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2015	**Decreasing**	**0.889**	**10**	**300.470**	**39.547**	**37.580**	**188.970**	**23.928**	**0**	**6.810**	**26.338**	**0.374**	**0**	**13.755**	**0**	**0.130**	**17.045**
2016	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Decreasing**	**0.962**	**7**	**0**	**67.192**	**0**	**92.776**	**156.427**	**0**	**7.013**	**24.335**	**0.474**	**17.659**	**9.274**	**0**	**0.048**	**13.939**
2019	**Decreasing**	**0.912**	**9**	**0**	**88.077**	**0**	**181.257**	**53.694**	**0**	**9.213**	**41.702**	**0.777**	**27.015**	**14.694**	**0**	**0.105**	**5.288**

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Table4A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	930.32	930.32	0.00	88.51	88.51	0.00	411.38	411.38	0.00	199.62	199.62	0.00	460.73	460.73	0.00	16.41	16.41	0.00
2	2011	1287.26	1287.26	0.00	127.48	127.48	0.00	554.33	554.33	0.00	277.61	277.61	0.00	566.01	566.01	0.00	19.55	19.55	0.00
3	2012	1458.53	1458.53	0.00	134.77	134.77	0.00	654.74	654.74	0.00	312.67	312.67	0.00	589.77	589.77	0.00	22.98	22.98	0.00
4	2013	1677.13	1524.68	-9.09	157.89	143.61	-9.05	713.99	677.75	-5.08	421.20	327.05	-22.35	706.99	706.99	0.00	26.22	25.90	-1.23
5	2014	1684.66	1684.66	0.00	167.79	167.79	0.00	673.90	673.90	0.00	463.22	463.22	0.00	746.19	746.19	0.00	27.06	27.06	0.00
6	2015	2015.01	1714.54	-14.91	202.54	162.99	-19.53	793.46	755.88	-4.74	557.24	368.27	-33.91	870.76	846.83	-2.75	30.16	30.16	0.00
7	2016	2745.36	2745.36	0.00	234.86	234.86	0.00	743.54	743.54	0.00	667.32	667.32	0.00	889.59	889.59	0.00	31.28	31.28	0.00
8	2017	2091.85	2091.85	0.00	275.46	275.46	0.00	625.26	625.26	0.00	644.99	644.99	0.00	929.58	929.58	0.00	34.09	34.09	0.00
9	2018	2585.20	2585.20	0.00	325.46	258.27	-20.65	889.69	889.69	0.00	731.23	638.45	-12.69	1238.37	1081.94	-12.63	38.67	38.67	0.00
10	2019	2884.34	2884.34	0.00	353.50	265.42	-24.92	#####	1052.32	0.00	842.75	661.49	-21.51	1266.46	1212.77	-4.24	43.05	43.05	0.00

Table 4B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Da	Projection	Diff.(%)	Data	Projection	Diff.(%)
10.95	10.95	0.00	33.	33.33	0.00	0.6	0.66	0.00	30.3	30.34	0.00	12.0	12.03	0.00	2053.2	2053.23	0.00	0.0	0.09	0.00	14.53	14.53	0.00
10.92	10.92	0.00	33.	33.42	0.00	0.8	0.80	0.00	42.7	42.79	0.00	8.5	8.53	0.00	2094.3	2094.35	0.00	0.0	0.02	0.00	6.53	6.53	0.00
9.12	9.12	0.00	40.	40.04	0.00	0.7	0.70	0.00	43.1	43.14	0.00	8.4	8.46	0.00	2546.7	2546.79	0.00	0.0	0.06	0.00	7.51	7.51	0.00
10.84	15.03	38.65	33.	50.19	49.03	0.7	0.97	22.29	44.9	48.12	7.18	8.1	15.94	96.09	2911.9	3121.11	7.18	0.0	0.12	60.72	14.62	18.27	24.98
12.88	12.88	0.00	28.	28.34	0.00	0.8	0.84	0.00	56.9	56.94	0.00	6.4	6.41	0.00	2795.8	2795.85	0.00	0.0	0.02	0.00	8.38	8.38	0.00
11.81	20.09	70.09	30.	61.08	97.67	0.7	1.22	62.28	49.5	55.68	12.44	7.3	22.04	199.0	3357.1	3774.69	12.44	0.0	0.17	376.4	8.57	26.69	211.2
13.48	13.48	0.00	27.	27.08	0.00	0.5	0.54	0.00	41.4	41.48	0.00	8.8	8.80	0.00	4131.1	4131.19	0.00	0.0	0.02	0.00	24.19	24.19	0.00
13.08	13.08	0.00	27.	27.91	0.00	0.6	0.64	0.00	38.6	38.62	0.00	9.4	9.45	0.00	3755.5	3755.54	0.00	0.0	0.04	0.00	15.65	15.65	0.00
12.89	20.41	58.31	28.	53.76	89.88	0.6	1.09	83.36	39.5	58.71	48.62	9.2	18.88	104.2	4591.2	4771.24	3.92	0.0	0.12	71.56	14.35	28.85	101.0
14.42	25.04	73.60	25.	69.47	174.4	0.5	1.39	149.8	40.3	71.31	76.62	9.0	24.61	172.2	4981.3	5465.24	9.72	0.0	0.17	191.8	27.98	35.99	28.61

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Table:5

Company Name:Amco India Ltd Industry:Aluminium - Sheets / Coils/ Wires Sector:Non-Ferrous Metals				Slack In Input Attributes						Slack in output Key Performance indicators of Supply chain							
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Decreasing**	**0.986**	**7**	**0**	**0.033**	**2.761**	**0.598**	**0.167**	**0**	**134.512**	**2.173**	**0.348**	**36.134**	**11.295**	**0**	**0.044**	**3.509**
2013	**Decreasing**	**0.984**	**8**	**4.077**	**0.824**	**1.604**	**0**	**0.146**	**0**	**1.607**	**1.074**	**0.222**	**3.676**	**1.759**	**0**	**0.043**	**0**
2014	**Decreasing**	**0.911**	**10**	**0.196**	**0**	**0.212**	**2.243**	**0.110**	**0.038**	**0**	**1.174**	**0.289**	**18.103**	**0**	**1.100**	**0.044**	**1.104**
2015	**Decreasing**	**0.959**	**9**	**0.419**	**0.231**	**0.040**	**0**	**0.108**	**0**	**28.964**	**0.685**	**0.143**	**20.793**	**0.648**	**1.648**	**0.048**	**0**
2016	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2019	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 5A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No.	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	97.90	97.90	0.00	3.85	3.85	0.00	5.81	5.81	0.00	81.98	81.98	0.00	1.10	1.10	0.00	1.41	1.41	0.00
2	2011	112.50	112.50	0.00	4.75	4.75	0.00	5.95	5.95	0.00	92.61	92.61	0.00	1.26	1.26	0.00	1.39	1.39	0.00
3	2012	131.42	131.42	0.00	4.70	4.67	-0.70	7.21	4.45	-38.29	115.12	114.52	-0.52	1.24	1.07	-13.48	1.47	1.47	0.00
4	2013	73.35	69.27	-5.56	3.77	2.95	-21.86	4.93	3.33	-32.53	56.98	56.98	0.00	1.00	0.85	-14.64	1.12	1.12	0.00
5	2014	56.72	56.72	0.00	2.66	2.66	0.00	3.85	3.85	0.00	48.96	48.96	0.00	0.84	0.84	0.00	1.18	1.18	0.00
6	2015	55.77	55.35	-0.75	2.94	2.71	-7.85	3.73	3.69	-1.06	45.07	45.07	0.00	0.88	0.77	-12.22	1.19	1.19	0.00
7	2016	41.34	41.34	0.00	2.08	2.08	0.00	3.02	3.02	0.00	33.64	33.64	0.00	0.59	0.59	0.00	0.94	0.94	0.00
8	2017	55.28	55.28	0.00	2.31	2.31	0.00	1.84	1.84	0.00	45.16	45.16	0.00	0.68	0.68	0.00	0.83	0.83	0.00
9	2018	62.92	62.92	0.00	2.23	2.23	0.00	2.10	2.10	0.00	54.87	54.87	0.00	0.51	0.51	0.00	0.70	0.70	0.00
10	2019	76.46	76.46	0.00	2.24	2.24	0.00	2.57	2.57	0.00	67.36	67.36	0.00	0.57	0.57	0.00	0.90	0.90	0.00

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Table 5B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Dat	Projection	Diff.(%)	Data	Projection	Diff.(%)
73.44	73.44	0.00	4.97	4.97	0.00	0.8	0.81	0.00	40.8	40.87	0.00	8.9	8.93	0.00	107.6	107.61	0.00	0.0	0.06	0.00	3.89	3.89	0.00
73.44	73.44	0.00	4.97	4.97	0.00	1.0	1.03	0.00	44.9	44.95	0.00	8.1	8.12	0.00	119.2	119.29	0.00	0.0	0.01	0.00	3.64	3.64	0.00
65.41	200.84	207.0	5.58	7.83	40.35	0.8	1.21	42.22	38.5	75.18	95.25	9.4	20.91	120.5	140.0	142.05	1.40	0.0	0.06	234.6	5.53	9.11	64.90
105.1	108.48	3.14	3.47	4.60	32.57	0.5	0.81	39.85	50.1	54.62	8.94	7.2	9.16	25.76	73.36	74.54	1.61	0.0	0.06	342.9	4.56	4.64	1.61
111.2	111.28	0.00	3.28	3.28	0.00	0.6	0.67	0.00	45.4	45.45	0.00	8.0	8.03	0.00	55.99	55.99	0.00	0.0	0.09	0.00	3.21	3.21	0.00
91.48	124.35	35.93	3.99	4.85	21.43	0.8	1.06	20.53	48.4	71.27	47.22	7.5	8.51	12.87	57.05	61.13	7.16	0.0	0.05	62.53	4.45	4.64	4.27
96.56	96.56	0.00	3.78	3.78	0.00	0.8	0.86	0.00	57.0	57.03	0.00	6.4	6.40	0.00	46.09	46.09	0.00	0.0	0.04	0.00	3.52	3.52	0.00
98.38	98.38	0.00	3.71	3.71	0.00	0.5	0.59	0.00	44.5	44.57	0.00	8.1	8.19	0.00	58.04	58.04	0.00	0.0	0.05	0.00	4.23	4.23	0.00
97.07	97.07	0.00	3.76	3.76	0.00	0.5	0.58	0.00	36.1	36.17	0.00	10.0	10.09	0.00	67.99	67.99	0.00	0.0	0.03	0.00	4.40	4.40	0.00
84.30	84.30	0.00	4.33	4.33	0.00	0.5	0.50	0.00	29.5	29.58	0.00	12.3	12.34	0.00	79.93	79.93	0.00	0.0	0.02	0.00	5.83	5.83	0.00

Table:6

Company Name:Menon Bearings Ltd				**Slack In Input Attributes**						**Slack in output Key Performance indicators of Supply chain**						
Industry:Aluminium - Bearings medium																
Sector:Non-Ferrous Bearings																
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Debtors Collection Ratio period**		**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2013	**Decreasing**	**0.997**	**7**	**5.005**	**0.087**	**1.457**	**0**	**0**	**0.217**	**15.768**	**0.054**	**0**	**7.985**	**0**	**1.540**	**0.082**	**0.707**
2014	**Decreasing**	**0.957**	**10**	**0**	**0**	**1.050**	**0.560**	**0.423**	**0.067**	**1.797**	**0.148**	**0.011**	**1.136**	**0.172**	**0**	**0.033**	**0**
2015	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2016	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Decreasing**	**0.977**	**9**	**0**	**0.112**	**0.100**	**3.636**	**0.093**	**1.015**	**13.698**	**0.883**	**0.361**	**7.944**	**1.423**	**0**	**0.058**	**0.347**
2019	**Decreasing**	**0.990**	**8**	**0**	**0.352**	**0.193**	**2.830**	**2.359**	**0.696**	**34.476**	**1.784**	**0.389**	**17.292**	**3.359**	**0**	**0.130**	**0.893**

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Table 6 A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	42.10	42.10	0.00	5.57	5.57	0.00	4.19	4.19	0.00	19.48	19.48	0.00	3.83	3.83	0.00	0.83	0.83	0.00
2	2011	62.00	62.00	0.00	7.51	7.51	0.00	5.83	5.83	0.00	30.01	30.01	0.00	4.32	4.32	0.00	0.76	0.76	0.00
3	2012	68.50	68.50	0.00	6.88	6.88	0.00	7.36	7.36	0.00	33.52	33.52	0.00	3.67	3.67	0.00	1.28	1.28	0.00
4	2013	69.79	64.79	-7.17	7.26	7.17	-1.20	8.30	6.84	-17.56	31.03	31.03	0.00	4.07	4.07	0.00	1.42	1.20	-15.30
5	2014	69.35	69.35	0.00	7.30	7.30	0.00	7.40	6.35	-14.19	34.20	33.64	-1.64	4.40	3.98	-9.61	1.36	1.29	-4.94
6	2015	78.72	78.72	0.00	7.88	7.88	0.00	8.24	8.24	0.00	39.38	39.38	0.00	4.46	4.46	0.00	1.36	1.36	0.00
7	2016	82.26	82.26	0.00	8.44	8.44	0.00	9.14	9.14	0.00	39.27	39.27	0.00	3.29	3.29	0.00	1.33	1.33	0.00
8	2017	87.25	87.25	0.00	9.26	9.26	0.00	0.73	0.73	0.00	42.14	42.14	0.00	4.16	4.16	0.00	1.53	1.53	0.00
9	2018	105.23	105.23	0.00	11.28	11.17	-0.99	0.98	0.88	-10.16	54.46	50.82	-6.68	5.11	5.02	-1.82	2.86	1.85	-35.48
10	2019	123.98	123.98	0.00	13.51	13.16	-2.60	1.23	1.04	-15.67	62.71	59.88	-4.51	8.27	5.91	-28.52	2.87	2.17	-24.25

Table 6 B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Da	Projection	Diff.(%)	Data	Projection	Diff.(%)
90.57	90.57	0.00	4.0	4.03	0.00	0.6	0.68	0.00	44.1	44.19	0.00	8.2	8.26	0.00	56.48	56.48	0.00	0.1	0.10	0.00	3.70	3.70	0.00
63.04	63.04	0.00	5.7	5.79	0.00	0.5	0.56	0.00	31.8	31.82	0.00	11.4	11.47	0.00	79.65	79.65	0.00	0.1	0.13	0.00	4.79	4.79	0.00
62.29	62.29	0.00	5.8	5.86	0.00	0.5	0.55	0.00	30.7	30.78	0.00	11.8	11.86	0.00	87.62	87.62	0.00	0.1	0.14	0.00	5.92	5.92	0.00
67.10	83.07	23.81	5.4	5.51	1.29	0.7	0.73	0.31	32.4	40.50	24.94	11.2	11.29	0.31	83.18	84.98	2.16	0.0	0.15	129.0	4.48	5.20	16.08
69.00	73.87	7.07	5.2	5.67	7.25	0.6	0.65	6.26	33.2	35.86	7.88	10.9	11.64	6.03	86.81	90.68	4.46	0.1	0.15	33.88	5.21	5.44	4.46
63.26	63.26	0.00	5.7	5.77	0.00	0.6	0.65	0.00	30.9	30.98	0.00	11.7	11.78	0.00	103.2	103.22	0.00	0.1	0.19	0.00	4.54	4.54	0.00
68.61	68.61	0.00	5.3	5.32	0.00	0.9	0.98	0.00	31.9	31.91	0.00	11.4	11.44	0.00	111.3	111.38	0.00	0.2	0.23	0.00	3.99	3.99	0.00
80.04	80.04	0.00	4.5	4.56	0.00	0.9	0.92	0.00	35.1	35.16	0.00	10.3	10.38	0.00	123.6	123.63	0.00	0.2	0.22	0.00	2.80	2.80	0.00
80.93	96.54	19.29	4.5	5.50	21.95	0.7	1.11	51.75	33.6	42.41	25.95	10.8	12.52	15.49	145.6	149.11	2.36	0.2	0.27	30.74	2.96	3.37	14.10
78.49	113.74	44.90	4.6	6.48	39.35	0.9	1.31	43.80	32.3	49.97	54.42	11.2	14.75	30.76	173.9	175.68	0.98	0.1	0.32	70.84	3.05	3.97	30.26

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Table:7

Company Name:KIC Metaliks Ltd Industry:Aluminium - Castings - Grey Iron Sector:Non-Castings, Forgings & Fasteners				Slack In Input Attributes						Slack in output Key Performance indicators of Supply chain							
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Increasing**	**0.96**	**8**	**1.795**	**0**	**3.267**	**0**	**0.304**	**0.848**	**22.793**	**0**	**0.482**	**5.609**	**0**	**0**	**0.045**	**6.036**
2013	**Constant**	**0.914**	**10**	**0.991**	**0**	**0.697**	**0**	**0**	**0.192**	**38.285**	**0**	**0.595**	**39.052**	**0.896**	**0**	**0.049**	**11.582**
2014	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2015	**Decreasing**	**0.996**	**7**	**2.192**	**0.433**	**3.32**	**0**	**5.818**	**0.612**	**16.533**	**0**	**0**	**0**	**0.985**	**6.251**	**0.009**	**0**
2016	**Constant**	**0.917**	**9**	**10.885**	**2.936**	**2.571**	**0**	**3.99**	**0.993**	**27.574**	**0**	**0.862**	**7.81**	**0**	**0**	**0.043**	**0**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2019	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 7A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	519.74	519.74	0.00	3.42	3.42	0.00	8.19	8.19	0.00	501.60	501.60	0.00	11.97	11.97	0.00	1.79	1.79	0.00
2	2011	156.98	156.98	0.00	4.22	4.22	0.00	5.38	5.38	0.00	141.59	141.59	0.00	3.48	3.48	0.00	2.32	2.32	0.00
3	2012	310.15	308.36	-0.58	5.61	5.61	0.00	8.73	5.46	-37.42	289.02	289.02	0.00	3.47	3.17	-8.78	2.70	1.85	-31.40
4	2013	469.44	468.45	-0.21	9.30	9.30	0.00	8.11	7.41	-8.60	437.57	437.57	0.00	1.97	1.97	0.00	2.78	2.59	-6.89
5	2014	480.52	480.52	0.00	7.95	7.95	0.00	6.98	6.98	0.00	451.43	451.43	0.00	0.48	0.48	0.00	2.79	2.79	0.00
6	2015	424.15	421.96	-0.52	10.53	10.10	-4.11	10.83	7.51	-30.66	385.79	385.79	0.00	6.87	1.05	-84.69	2.74	2.13	-22.35
7	2016	292.67	281.79	-3.72	10.31	7.37	-28.48	8.65	6.08	-29.73	256.24	256.24	0.00	6.14	2.15	-64.99	2.92	1.93	-34.02
8	2017	275.66	275.66	0.00	10.42	10.42	0.00	6.87	6.87	0.00	237.38	237.38	0.00	1.20	1.20	0.00	1.08	1.08	0.00
9	2018	537.26	537.26	0.00	12.62	12.62	0.00	6.35	6.35	0.00	500.64	500.64	0.00	0.49	0.49	0.00	1.16	1.16	0.00
10	2019	795.25	795.25	0.00	14.84	14.84	0.00	7.31	7.31	0.00	752.78	752.78	0.00	0.59	0.59	0.00	1.20	1.20	0.00

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Table 7B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%	Dat	Projection	Diff.(%	Dat	Projection	Diff.(%	Data	Projectio	Diff.(%	Dat	Projectio	Diff.(%	Data	Projectio	Diff.(%	Dat	Projection	Diff.(%	Data	Projection	Diff.(%
49.39	49.39	0.00	7.3	7.39	0.00	0.5	0.57	0.00	88.8	88.81	0.00	4.1	4.11	0.00	415.2	415.23	0.00	0.0	0.07	0.00	5.35	5.35	0.00
100.0	100.00	0.00	3.6	3.65	0.00	2.4	2.47	0.00	177.1	177.18	0.00	2.0	2.06	0.00	261.5	261.54	0.00	0.0	0.06	0.00	2.30	2.30	0.00
34.47	58.69	70.29	10.5	11.03	4.15	0.9	1.48	54.48	105.8	115.80	9.46	3.4	3.59	4.15	342.5	356.75	4.15	0.0	0.06	249.8	7.94	14.31	80.16
15.18	54.90	261.6	24.0	26.31	9.45	0.9	1.67	69.92	92.8	140.70	51.50	3.9	5.20	32.25	480.8	526.23	9.45	0.0	0.06	371.7	13.43	26.28	95.71
8.26	8.26	0.00	44.1	44.19	0.00	0.9	0.92	0.00	113.3	113.35	0.00	3.2	3.22	0.00	474.4	474.42	0.00	-0.0	-0.02	0.00	18.36	18.36	0.00
12.98	29.56	127.8	28.1	28.25	0.41	0.9	0.92	0.41	115.8	116.35	0.41	3.1	4.15	31.69	425.9	433.98	1.88	0.0	0.02	81.23	21.97	22.06	0.41
32.13	62.62	94.91	11.3	12.39	9.09	0.6	1.55	145.4	113.7	131.85	15.96	3.2	3.50	9.09	312.2	340.63	9.09	0.0	0.05	934.2	13.88	15.14	9.09
38.14	38.14	0.00	9.5	9.57	0.00	0.5	0.57	0.00	98.1	98.12	0.00	3.7	3.72	0.00	288.5	288.55	0.00	0.0	0.02	0.00	18.32	18.32	0.00
18.73	18.73	0.00	19.4	19.49	0.00	0.4	0.45	0.00	45.0	45.01	0.00	8.1	8.11	0.00	565.6	565.60	0.00	0.0	0.07	0.00	49.96	49.96	0.00
16.39	16.39	0.00	22.2	22.27	0.00	0.5	0.51	0.00	31.1	31.14	0.00	11.7	11.72	0.00	848.8	848.84	0.00	0.1	0.16	0.00	70.04	70.04	0.00

Table :8

Company Name:Pradip Overseas Ltd				**Slack In Input Attributes**						**Slack in output Key Performance indicators of Supply chain**							
Industry:Aluminium - Textiles – Weaving																	
Sector:Non-Textiles																	
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Decreasing**	**0.995**	**8**	**92.484**	**2.809**	**0**	**126.73**	**6.991**	**0.116**	**35.834**	**1.109**	**0**	**2.523**	**0.179**	**0**	**0.036**	**0.182**
2013	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2014	**Increasing**	**0.885**	**10**	**0**	**0**	**1.285**	**31.179**	**0.295**	**0.657**	**0**	**0.979**	**0**	**37.337**	**0**	**2.201**	**0.015**	**0.199**
2015	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2016	**Increasing**	**0.962**	**9**	**30.451**	**0**	**2.177**	**13.542**	**0**	**0.261**	**4.892**	**0.211**	**0**	**0**	**0.159**	**70.186**	**0.003**	**0**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2019	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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Table 8A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	1444.94	1444.94	0.00	2.55	2.55	0.00	13.32	13.32	0.00	1414.65	1414.65	0.00	4.58	4.58	0.00	0.93	0.93	0.00
2	2011	1987.29	1987.29	0.00	6.39	6.39	0.00	15.98	15.98	0.00	1870.82	1870.82	0.00	10.49	10.49	0.00	1.30	1.30	0.00
3	2012	1640.56	1548.08	-5.64	9.02	6.21	-31.14	17.74	17.74	0.00	1525.92	1399.19	-8.31	17.52	10.53	-39.90	1.54	1.42	-7.50
4	2013	849.95	849.95	0.00	5.68	5.68	0.00	19.48	19.48	0.00	661.16	661.16	0.00	10.12	10.12	0.00	1.54	1.54	0.00
5	2014	636.07	636.07	0.00	4.21	4.21	0.00	20.42	19.13	-6.29	567.80	536.62	-5.49	6.15	5.85	-4.80	2.37	1.71	-27.74
6	2015	277.97	277.97	0.00	4.51	4.51	0.00	24.29	24.29	0.00	193.71	193.71	0.00	5.33	5.33	0.00	2.37	2.37	0.00
7	2016	354.88	354.88	0.00	4.33	4.33	0.00	23.67	23.67	0.00	249.17	249.17	0.00	4.30	4.30	0.00	2.37	2.37	0.00
8	2017	158.98	158.98	0.00	4.73	4.73	0.00	22.11	22.11	0.00	64.87	64.87	0.00	1.01	1.01	0.00	2.38	2.38	0.00
9	2018	94.84	94.84	0.00	6.05	6.05	0.00	22.21	22.21	0.00	7.84	7.84	0.00	0.60	0.60	0.00	2.38	2.38	0.00
10	2019	92.69	92.69	0.00	5.88	5.88	0.00	24.25	24.25	0.00	1.67	1.67	0.00	0.47	0.47	0.00	2.38	2.38	0.00

Table 8B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Data	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Da	Projection	Diff.(%)	Data	Projection	Diff.(%)
55.90	55.90	0.00	6.5	6.53	0.00	1.7	1.78	0.00	92.1	92.17	0.00	3.9	3.96	0.00	1605.8	1605.80	0.00	0.0	0.08	0.00	2.14	2.14	0.00
60.73	60.73	0.00	6.0	6.01	0.00	2.6	2.67	0.00	103.6	103.69	0.00	3.5	3.52	0.00	2138.5	2138.52	0.00	0.0	0.06	0.00	2.18	2.18	0.00
121.2	157.66	30.02	3.0	4.13	37.32	4.8	4.87	0.47	128.5	131.65	2.43	2.8	3.03	6.78	1669.9	1677.73	0.47	0.0	0.07	21.93	1.43	1.62	13.14
289.6	289.68	0.00	1.2	1.26	0.00	7.8	7.82	0.00	165.9	165.91	0.00	2.2	2.20	0.00	942.9	942.93	0.00	0.0	0.08	0.00	0.76	0.76	0.00
521.4	589.55	13.06	0.7	1.77	152.9	3.4	3.90	13.06	232.4	300.19	29.12	1.5	1.78	13.06	598.5	678.97	13.43	0.1	0.20	64.39	0.48	0.74	54.36
1177.4	1177.42	0.00	0.3	0.31	0.00	3.0	3.08	0.00	579.3	579.37	0.00	0.6	0.63	0.00	239.8	239.84	0.00	0.3	0.36	0.00	0.24	0.24	0.00
811.1	811.11	0.00	0.4	0.45	0.00	2.8	2.85	0.00	380.2	380.21	0.00	0.9	0.96	0.00	237.6	237.68	0.00	0.3	0.34	0.00	0.36	0.36	0.00
618.6	618.64	0.00	0.5	0.59	0.00	1.9	1.90	0.00	200.5	200.55	0.00	1.8	1.82	0.00	159.8	159.84	0.00	0.3	0.34	0.00	0.35	0.35	0.00
544.7	544.78	0.00	0.6	0.67	0.00	1.5	1.59	0.00	205.0	205.06	0.00	1.7	1.78	0.00	103.5	103.51	0.00	0.0	0.02	0.00	0.23	0.23	0.00
629.3	629.31	0.00	0.5	0.58	0.00	1.3	1.32	0.00	214.7	214.71	0.00	1.7	1.70	0.00	96.34	96.34	0.00	0.0	0.03	0.00	0.20	0.20	0.00

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Table:9

Company Name:VTM Ltd Industry:Aluminium - Textiles – Weaving Sector:Non-Ferrous Textiles				Slack In Input Attributes						Slack in output Key Performance indicators of Supply chain							
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2013	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2014	**Decreasing**	**0.935**	**8**	**8.501**	**0**	**0**	**11.684**	**0.164**	**0.636**	**21.746**	**0.341**	**2.675**	**27.664**	**0**	**0**	**0.049**	**0.844**
2015	**Decreasing**	**0.903**	**9**	**0**	**0.726**	**0**	**8.705**	**0.341**	**0.511**	**35.422**	**0**	**2.714**	**42.4**	**0.839**	**0**	**0.08**	**0.546**
2016	**Decreasing**	**0.894**	**10**	**0**	**2.627**	**0.335**	**5.005**	**0**	**0.459**	**18.887**	**2.461**	**1.215**	**36.936**	**0.955**	**0**	**0.067**	**2.645**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Decreasing**	**0.974**	**7**	**13.401**	**3.033**	**0**	**13.379**	**0.829**	**0**	**8.499**	**1.554**	**0.645**	**20.308**	**0**	**0.267**	**0.082**	**2.225**
2019	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 9A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	71.04	71.04	0.00	4.19	4.19	0.00	5.89	5.89	0.00	45.91	45.91	0.00	0.77	0.77	0.00	0.88	0.88	0.00
2	2011	106.04	106.04	0.00	5.44	5.44	0.00	6.92	6.92	0.00	76.19	76.19	0.00	1.86	1.86	0.00	0.50	0.50	0.00
3	2012	109.71	109.71	0.00	5.82	5.82	0.00	6.63	6.63	0.00	80.32	80.32	0.00	3.14	3.14	0.00	1.49	1.49	0.00
4	2013	124.90	124.90	0.00	6.51	6.51	0.00	6.95	6.95	0.00	92.18	92.18	0.00	2.09	2.09	0.00	1.49	1.49	0.00
5	2014	157.49	148.99	-5.40	8.00	8.00	0.00	8.96	8.96	0.00	119.97	108.29	-9.74	2.87	2.71	-5.73	1.52	0.88	-41.87
6	2015	154.07	154.07	0.00	9.25	8.52	-7.85	9.77	9.77	0.00	118.74	110.03	-7.33	3.04	2.70	-11.22	1.41	0.90	-36.25
7	2016	142.14	142.14	0.00	10.14	7.51	-25.90	10.12	9.78	-3.31	105.05	100.04	-4.76	2.30	2.30	0.00	1.35	0.89	-33.97
8	2017	139.90	139.90	0.00	10.36	10.36	0.00	7.33	7.33	0.00	103.75	103.75	0.00	2.91	2.91	0.00	0.98	0.98	0.00
9	2018	154.90	141.50	-8.65	11.57	8.54	-26.22	7.26	7.26	0.00	117.87	104.49	-11.35	3.74	2.91	-22.17	0.66	0.66	0.00
10	2019	144.61	144.61	0.00	11.30	11.30	0.00	3.44	3.44	0.00	112.48	112.48	0.00	3.84	3.84	0.00	0.66	0.66	0.00

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Table 9B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Da	Projection	Diff.(%)	Data	Projection	Diff.(%)
53.99	53.99	0.00	6.7	6.76	0.00	3.7	3.78	0.00	89.9	89.90	0.00	4.0	4.06	0.00	77.82	77.82	0.00	0.0	0.05	0.00	2.03	2.03	0.00
47.71	47.71	0.00	7.6	7.65	0.00	4.4	4.43	0.00	58.4	58.49	0.00	6.2	6.24	0.00	131.7	131.76	0.00	0.1	0.12	0.00	3.68	3.68	0.00
58.40	58.40	0.00	6.2	6.25	0.00	2.6	2.62	0.00	58.1	58.12	0.00	6.2	6.28	0.00	116.6	116.65	0.00	0.0	0.06	0.00	3.04	3.04	0.00
44.84	44.84	0.00	8.1	8.14	0.00	3.9	3.93	0.00	41.3	41.38	0.00	8.8	8.82	0.00	143.1	143.18	0.00	0.1	0.11	0.00	2.99	2.99	0.00
39.50	64.00	62.03	9.2	10.23	10.67	2.7	5.62	104.1	44.0	74.77	69.81	8.2	8.87	6.98	169.1	180.97	6.98	0.1	0.15	56.66	3.66	4.76	30.05
36.14	75.43	108.7	10.	11.18	10.72	3.1	6.24	95.86	50.9	98.84	93.89	7.1	8.77	22.44	167.8	185.81	10.72	0.0	0.15	137.9	4.04	5.02	24.23
48.28	72.90	50.99	7.5	10.92	44.42	4.5	6.27	38.76	55.4	98.99	78.45	6.5	8.32	26.38	154.0	172.37	11.87	0.0	0.15	105.0	1.89	4.76	151.7
53.28	53.28	0.00	6.8	6.85	0.00	2.9	2.99	0.00	54.3	54.32	0.00	6.7	6.72	0.00	150.4	150.43	0.00	0.0	0.04	0.00	5.19	5.19	0.00
51.05	60.91	19.31	7.1	8.89	24.39	3.8	4.61	19.38	49.4	71.08	43.72	7.3	7.58	2.66	164.6	169.27	2.82	0.0	0.12	212.1	2.09	4.37	109.3
56.68	56.68	0.00	6.4	6.44	0.00	2.0	2.08	0.00	58.5	58.59	0.00	6.2	6.23	0.00	159.8	159.80	0.00	0.0	0.05	0.00	3.36	3.36	0.00

Table:10

Company Name:Century Aluminium Mfg Co Ltd

Industry:Aluminium - Sheets / Coils/ Wires / Others

Sector:Non-Non-Ferrous Metals

				Slack In Input Attributes						**Slack in output Key Performance indicators of Supply chain**							
DMU	**RTS of Projected DMU**	**Score**	**Rank**	**Cost of Production**	**Employee Cost**	**Power & Fuel Cost**	**Raw Materials**	**Selling Cost**	**Transport**	**Average Collection period**	**Debtors Ratio**	**Degree of Inventory**	**Inventory Conversion Period**	**Inventory Turnover Ratio**	**Net Sales**	**Return on Investment**	**Working Capital Turnover Ratio**
2010	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2011	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2012	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2013	**Decreasing**	**0.964**	**10**	**0**	**0.725**	**3.208**	**0**	**0**	**0.064**	**0**	**3.136**	**0.409**	**6.163**	**11.877**	**2.298**	**0.071**	**1.057**
2014	**Decreasing**	**0.998**	**9**	**1.434**	**0.421**	**3.041**	**0**	**0**	**0**	**6.172**	**2.372**	**0.046**	**7.763**	**7.151**	**0**	**0.032**	**0.968**
2015	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2016	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2017	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2018	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2019	**Constant**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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Table 10A

		Cost of Production			Employee Cost			Power & Fuel Cost			Raw Materials			Selling			Transp		
No	Year	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2010	301.88	301.88	0.00	4.72	4.72	0.00	8.29	8.29	0.00	281.99	281.99	0.00	0.82	0.82	0.00	0.70	0.70	0.00
2	2011	223.20	223.20	0.00	5.92	5.92	0.00	8.83	8.83	0.00	201.57	201.57	0.00	0.01	0.01	0.00	0.73	0.73	0.00
3	2012	276.88	276.88	0.00	7.25	7.25	0.00	11.84	11.84	0.00	248.76	248.76	0.00	0.01	0.01	0.00	0.91	0.91	0.00
4	2013	357.22	357.22	0.00	9.25	8.50	-8.15	16.24	12.91	-20.49	326.64	326.64	0.00	1.95	1.95	0.00	1.09	1.02	-6.05
5	2014	443.71	442.27	-0.32	10.84	10.42	-3.90	23.37	20.32	-13.04	402.30	402.30	0.00	2.83	2.83	0.00	1.03	1.03	0.00
6	2015	456.70	456.70	0.00	9.82	9.82	0.00	22.08	22.08	0.00	417.97	417.97	0.00	3.98	3.98	0.00	0.81	0.81	0.00
7	2016	421.96	421.96	0.00	9.21	9.21	0.00	19.60	19.60	0.00	386.70	386.70	0.00	4.31	4.31	0.00	0.85	0.85	0.00
8	2017	324.76	324.76	0.00	9.99	9.99	0.00	12.38	12.38	0.00	295.92	295.92	0.00	5.27	5.27	0.00	0.97	0.97	0.00
9	2018	375.85	375.85	0.00	11.05	11.05	0.00	13.91	13.91	0.00	344.47	344.47	0.00	5.43	5.43	0.00	1.09	1.09	0.00
10	2019	376.36	376.36	0.00	12.29	12.29	0.00	13.85	13.85	0.00	343.32	343.32	0.00	5.03	5.03	0.00	10.10	10.10	0.00

Table10B

Average Collection period			Debtors Ratio			Degree of Inventory			Inventory Conversion			Inventory Turnover Ratio			Net			Return on Investment			Working Capital Turnover		
Data	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Dat	Projection	Diff.(%)	Data	Projectio	Diff.(%)	Dat	Projectio	Diff.(%)	Data	Projectio	Diff.(%)	Da	Projection	Diff.(%)	Data	Projection	Diff.(%)
38.34	38.34	0.00	9.5	9.52	0.00	0.5	0.56	0.00	14.5	14.53	0.00	25.1	25.12	0.00	316.	316.19	0.00	0.1	0.10	0.00	6.85	6.85	0.00
25.14	25.14	0.00	14.5	14.52	0.00	0.4	0.45	0.00	9.18	9.18	0.00	39.7	39.77	0.00	226.	226.00	0.00	0.1	0.12	0.00	8.95	8.95	0.00
32.39	32.39	0.00	11.2	11.27	0.00	0.7	0.76	0.00	13.4	13.41	0.00	27.2	27.22	0.00	289.	289.48	0.00	0.0	0.08	0.00	5.40	5.40	0.00
46.56	48.27	3.68	7.8	11.38	45.21	1.0	1.48	45.25	30.2	37.74	24.71	12.0	24.84	105.9	368.	384.58	4.34	0.0	0.08	825.7	4.88	6.16	26.20
40.97	47.24	15.33	8.9	11.31	26.97	1.3	1.42	3.56	28.4	36.24	27.50	12.8	20.05	56.17	472.	473.15	0.24	0.0	0.05	322.0	5.00	5.98	19.70
43.61	43.61	0.00	8.3	8.37	0.00	1.3	1.32	0.00	37.5	37.59	0.00	9.7	9.71	0.00	490.	490.48	0.00	0.0	0.01	0.00	5.05	5.05	0.00
45.57	45.57	0.00	8.0	8.01	0.00	1.6	1.69	0.00	57.6	57.66	0.00	6.3	6.33	0.00	453.	453.30	0.00	0.0	0.01	0.00	3.96	3.96	0.00
55.14	55.14	0.00	6.6	6.62	0.00	2.8	2.88	0.00	82.7	82.77	0.00	4.4	4.41	0.00	375.	375.11	0.00	0.0	0.01	0.00	2.38	2.38	0.00
43.35	43.35	0.00	8.4	8.42	0.00	3.3	3.33	0.00	90.5	90.57	0.00	4.0	4.03	0.00	415.	415.83	0.00	0.0	0.02	0.00	2.42	2.42	0.00
27.22	27.22	0.00	13.4	13.41	0.00	3.6	3.60	0.00	109.9	109.94	0.00	3.3	3.32	0.00	425.	425.03	0.00	0.0	0.01	0.00	2.18	2.18	0.00