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A Quantitative Measure of Benefits of ERP in an Integrated Steel Plant of India

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Abstract: This article is an attempt to find an answer to a research question of how to measure the benefits of implementation of Enterprise Resource Planning (ERP) System in an Integrated Steel Plant which is very complex in nature, in a quantitative manner based on evidences. Most of the previous studies on success of an ERP implementation were based on qualitative aspects influenced by the perceptions of people. This Study measures the benefits derived in the management of Working Capital, reduction in Cycle Time, improvement in manpower productivity and Techno-economic Parameters. The Study was conducted on Durgapur Steel Plant under Steel Weity of India Ltd, the second largest producer of Steel in the World and spans for a period of ten years from 2010-11 to 2019-20, after installation of the ERP System in 2009-10. To the best of the knowledge of us, this is the first study of this kind. The results were substantially encouraging in areas like reduction in procurement costs, reduction in cycle time, improvement in manpower productivity and in some of the techno- economic parameters like savings in gross energy consumption, savings in specific water consumption, and improvement in volume of electronic auction in secondary sales. The Study design was adapted from the methodology recommended by the ERP implementation consultants like M/S Management Development Institute, Gurgaon; M/S Price Water House Coopers and the research consultant M/S Panorama Consulting Solution. The Net Present Value (NPV) of the benefit of the ERP Investment is (+) INR 2852 Millionagainst an investment of INR353.4 Million in 2009-10. The Payback period is 3.23 years and the Internal Rate of Return (IRR) is 77.07 Percent against an average Cost of Capital of @10 Percent per annum.

Keywords: ERP, Benefits of ERP, ERP in Steel Industries, Information Technology, Literature Review.

JEL: M1, M11, M15, M19, P41

Introduction

India is the second largest producer of Steel after China in the world keeping Japan in the third position as per the report of the World Steel Association of 2020. India Produced 111 million tonnes of Steel in 2019, out of which Steel Weity of India Ltd (SAIL) alone produced 16.15 million tonnes and Durgapur Steel Plant, a unit under SAIL produced 2.2 million tonnes. The ERP-SAP-R3 was installed in Durgapur Steel Plant 2009-10.

There was no comprehensive research study on benefits of implementation of ERP in Indian Integrated Steel Plants primarily due to the very complex nature and the huge size of the Integrated Steel Plants. An Integrated Steel Plant like Durgapur Steel Plant (DSP) consists of various Units under the production departments like Raw Material handling complex, Coke Ovens, Sinter Plants, Blast Furnaces, Steel Melting Shops, Rolling Mills, Power Plant, Oxygen Plant, Water Management, Energy Management, Rail Traffic, Foundry, Plant Garage, Refractories, Quality Control, Air Conditioning etc where each shop is basically a factory in itself. Apart from these there are various supporting services departments like Mechanical Maintenance, Electrical Maintenance, Purchase and Stores, Finance and Accounts, Marketing, Human Resource Development etc.

Most of the previous studies on benefits derived from ERP implementation were subjective and perceptual in nature. These were on measuring and ranking of Critical Success factors.

It was very hard to find a study on measuring benefits of ERP implementation in quantitative terms or in financial terms applied to an Integrated Steel Plant of India. There was a huge gap in such an approach.

The study aims for cementing this gap. Here the research question is how to measure the benefits of implementation of ERP in an integrated Steel plant like DSP in quantitative or in financial terms like Net Present Value (NPV), Payback period and on the Internal Rate of Return (IRR) based on Savings in Operational Parameters.

The article follows review of literature, Methodology and Timeframe, Results and analysis, Conclusions and Policy Recommendation.

Literature Review

Panorama Consulting Solutions in its Annual Report on ERP (2019), which is the most comprehensive Global Study based on 241 respondents, that consists of 44 percent of Multinational Organizations, 32 percent of Manufacturing Organizations, having an average number of employees of 1080 and average annual revenue is of USD 1.7 billion, has followed the methodology of measuring the tangible benefits of implementation of ERP under the head " Operational Efficiency" which are on the following parameters:

1. To reduce Working Capital
2. To reduce Cycle time / Lead time
3. To reduce manpower and / or labour cost
4. To reduce procurement costs

It notes that ERP benefit is a result of the combined coordination of people, process and Technology and none of these individually can claim for its sole contribution. Ziff Davis (2018) in its "Beginners

Guide to ERP" opines that many parameters of costs and benefits are hidden and hard to quantify. It may so happen that after ERP implementation the costs may go up and the productivity may come down for a short while. The secret is to continuously train the employees even after the ERP implementation. The benefits may appear in directly quantifiable terms or in absolutely abstract forms. M/S Price Water House Coopers (2015), the ERP Consultant of Indian Iron & Steel Company (IISCO) at Burnpur, West Bengal, India, under Steel Weity of India Ltd, where the implementation of ERP went for " Go Live in June 2019", mentions in its feasibility report that the methodology to be considered for quantitative measure of success of ERP implementation would be on the parameters like Increase in Transaction efficiencies, Reduction in Procurement Costs, Reduction in Debtor Outstanding, Reduction in Finished Goods Carrying Costs, Reduction in Maintenance Costs, Reduction in Raw Material Inventory Carrying Costs and Reduction in Non-moving / Slow moving inventory. Vishal Bishnoi(2011) observed in its study on implementation of ERP in Indian Multinational Organizations that most of the previous studies on benefits derived from the implementation of ERP were based on perceptions. His Study attempts to measure the tangible benefits on parameters like Inventory reduction, Personnel reduction, Productivity improvement, Procurement cost reduction but it does not cover a longer period of time.

There were some studies on qualitative measures of ERP benefits based on perception of the people and by taking interviews and surveys (Surajkumar Mukti and A,M,Rawani (2016)).

Methodology and Timeframe:

In the Present Study we have focused on the Tangible benefits of Implementation of ERP that is measureable in monetary terms and in Techno-economics.

The biggest Challenge in Implementation of ERP in an Integrated Steel Plant is to Integrate all the Units of Production and Services which are interlinked with each other like a Chain and generate Real Time data to achieve Operational excellence.

The implementation of ERP in DSP went on "Go-Live" in late 2009-10 and Final Acceptance Certificate was issued on 31.03.2010.The ERP Consultant of DSP was M/S Management Development Institute (MDI), Gurgaon, India. The MDI's recommendation for Methodology to be adopted to measure the benefits of ERP implementation as per its Feasibility report is as follows :-

1. Improvement in Manpower Productivity.
2. Reduction in Procurement Costs of Goods and Services.
3. Reduction in Inventory Carrying Costs for Raw Material.
4. Reduction in Inventory Carrying Cost of Stores and Spares.
5. Reduction in Inventory Costs of Finished Goods.
6. Reduction in Cycle Time or Lead Time.
7. Improvement in Techno-Economic Parameters.

In the Present Research Study the We have followed the same Methodology as recommended by the Consultants such as M/S Management Development Institute (MDI), Gurgaon; M/S Price Water House Coopers and M/S Panorama Consulting Solution. All these are based on quantitative parameters which can be reasonably expressed in monetary terms. The We have further Calculated the benefits of the ERP Projects in terms of Net Present Value (NPV), Pay Back Period and the Internal Rate of Return (IRR).

To the best of the knowledge of, this is the first study of this magnitude covering a ten years period on measuring the benefit of implementation of ERP in quantitative terms in an Integrated Steel Plant.

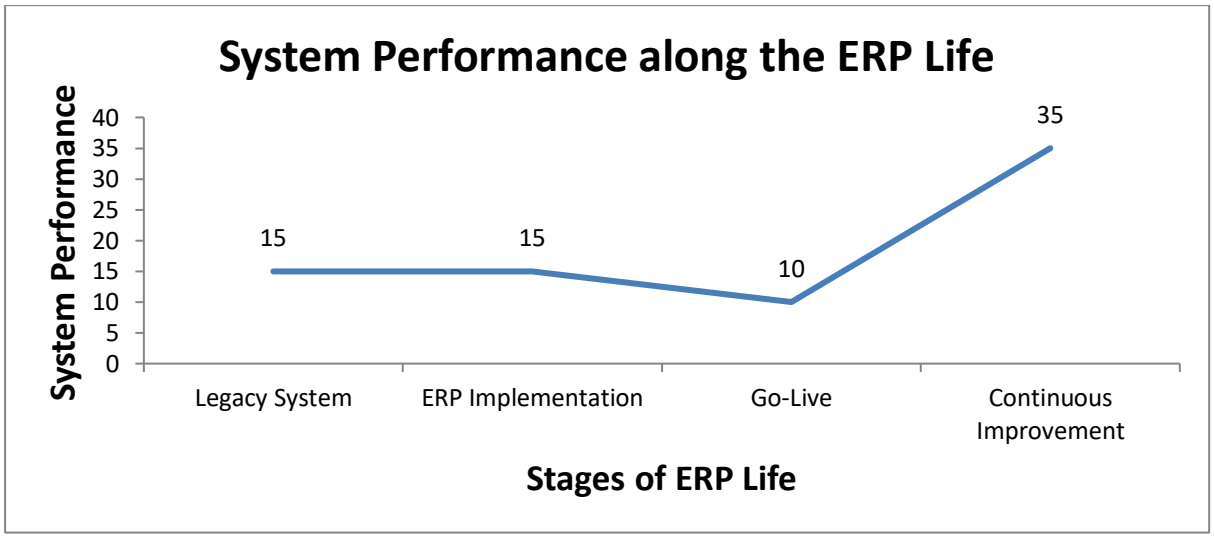
Choosing Time frame of the Research Study:

Panorama Consulting Solutions (2019), observed that there should be continuous improvement in benefit realization after "Go Live" and it may take between two to ten years for realization of Payoff period.

Azadeh Pishdad, Andy Koronios et al(2014) noted that it takes about five to six years for an ERP module to become completely ingrained, routinized and institutionalized.

Willis and Willis-Brown (Norway, 2002) has depicted Stages of ERP life from Legacy System to ERP Implementation to Go-live to Continuous improvement after Go-live of System Performance which is represented in Figure-1 below.

Figure-1



The data for System Performance are taken for illustration purposes only on a Scale of 0 to 40.

In the present Research Study the we have chosen a period of ten years from 2010-11 to 2019-20 after ERP implementation in 2009-10.

Results and Analysis:

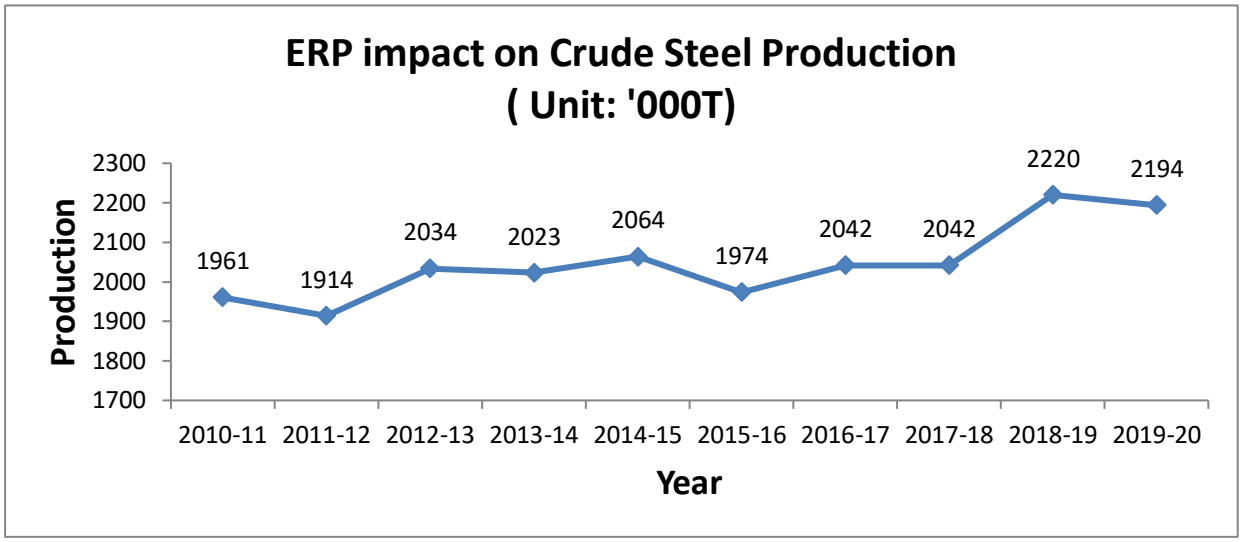
The total estimated Project Cost of ERP implementation was INR 406 Million. The actual Project cost was INR 353 Million.. There was a saving of INR 53 Million. There was no Cost-Over-Run for the Project

ERP impact on Manpower Productivity:

The Crude Steel Production from 2010-11 to 2019-20 in shown in Figure -2.

The implementation of ERP in 2009-10 was a major Catalyst in improving the Crude Steel Production by providing real time information on various parameters of production.

Figure-2

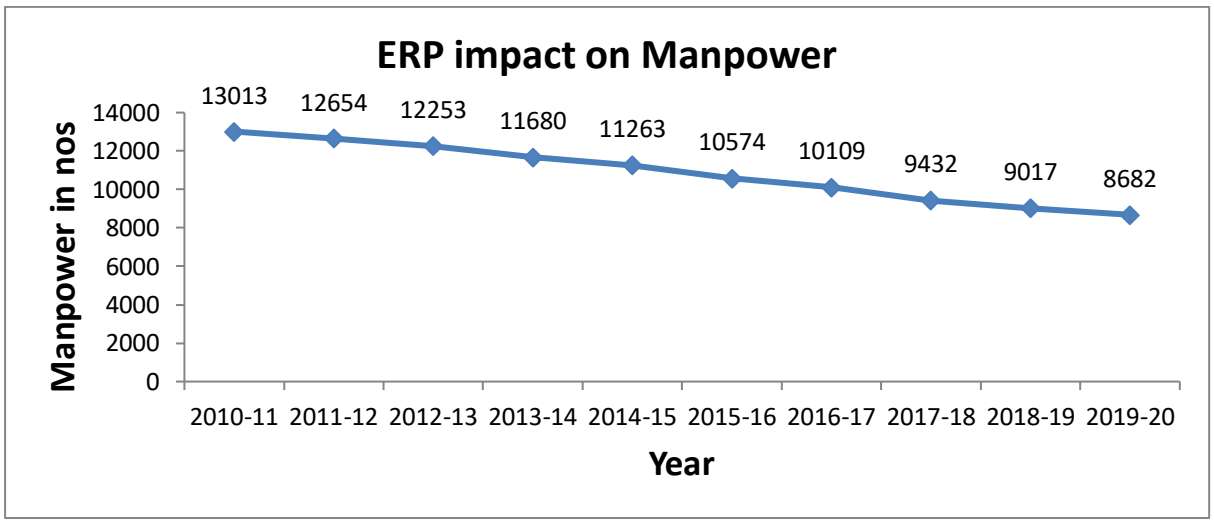


Source :Statistical Reports

The implementation of ERP in 2009-10 was a major Catalyst in reducing the Manpower Consistently over time by eliminating many duplication of jobs with increased Crude Steel Production.

The Manpower Position from 2010-11 to 2019-20 in shown in Figure -3.

Figure-3

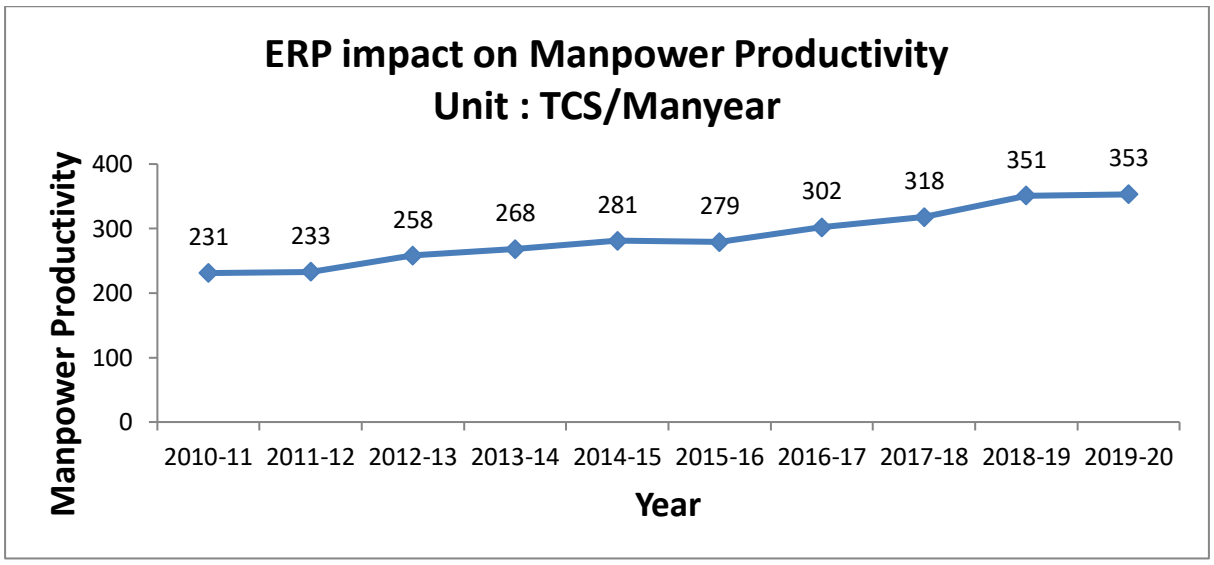


Source: Statistical Reports

The Manpower Productivity is measured in terms of Tonnes of Crude Steel (TCS) Produced per Man Year. (Unit: TCS / Man year).

The implementation of ERP has consistently improved the Productivity of Manpower and increased efficiency of Labour which is shown in Figure-4.

Figure-4



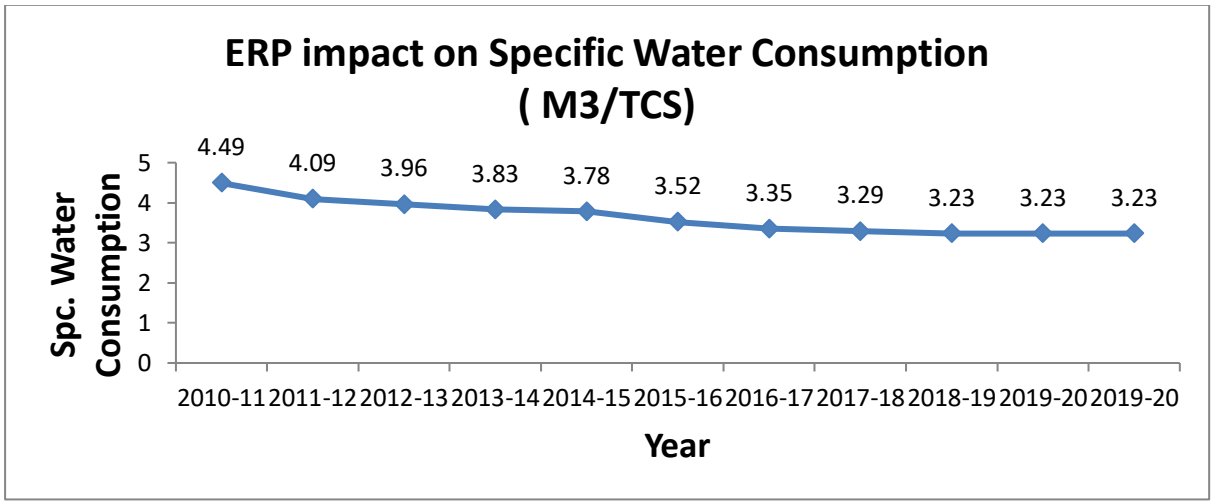
Source :Statistical Reports

ERP impact on Specific Water Consumption (Unit : M^3 / TCS).

Water is a very scarce resource in this World. Water is mainly used in the Steel Industry for Cooling of Machines and for drinking purposes. The ERP implementation has helped in getting real time information on Consumption of Water and leakages of Water from various points in the Steel Plant and taking Corrective action to Conserve Water and reduces Water Consumption per tonne of Crude Steel produced.

The improvement of Specific Water Consumption after implementation of ERP system is shown in Figure – 5.

Figure-5

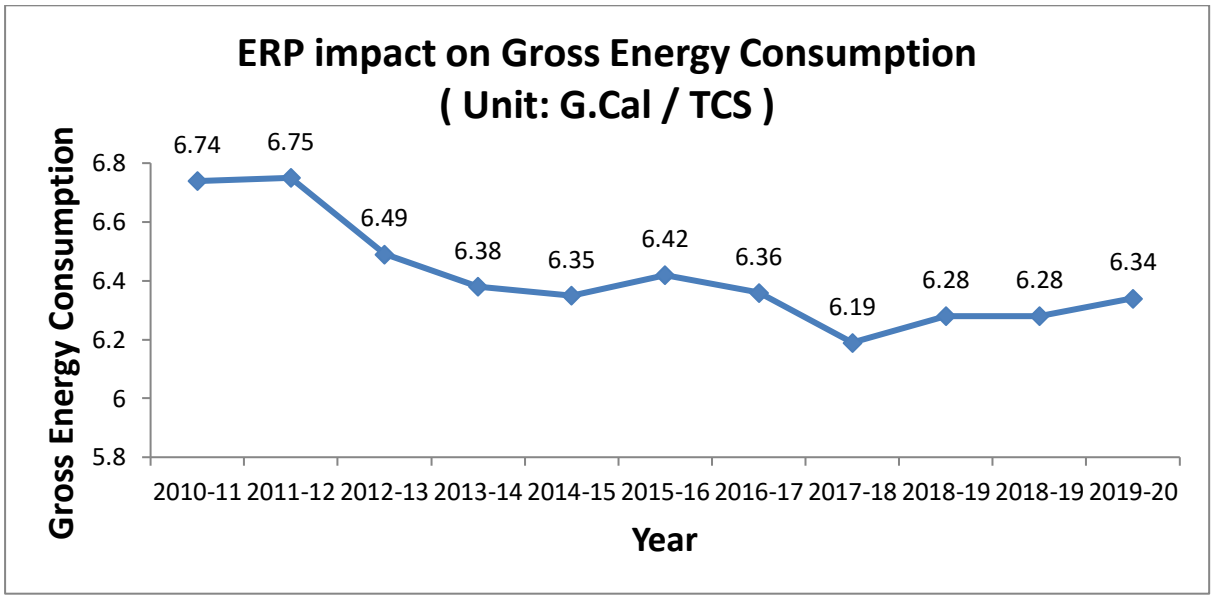


Source: Statistical Reports

ERP impact on Gross Energy Consumption (Unit: G Cal/TCS).

Energy is a scarce resource in this World. The Objective of any Industry is to Conserve energy with efficiency. The energy used in Steel Plant is a combination of Fuel energies like Coke Oven gases, Blast furnaces gases, oils etc which have high Calorific values. The implementation of ERP has provided real time information on consumption of energy and helped in decision making in Conservation of energies in various point of energy consuming Units in the Steel Plant. The impact of ERP implementation on Gross Energy Consumption is shown in Figure – 6.

Figure – 6

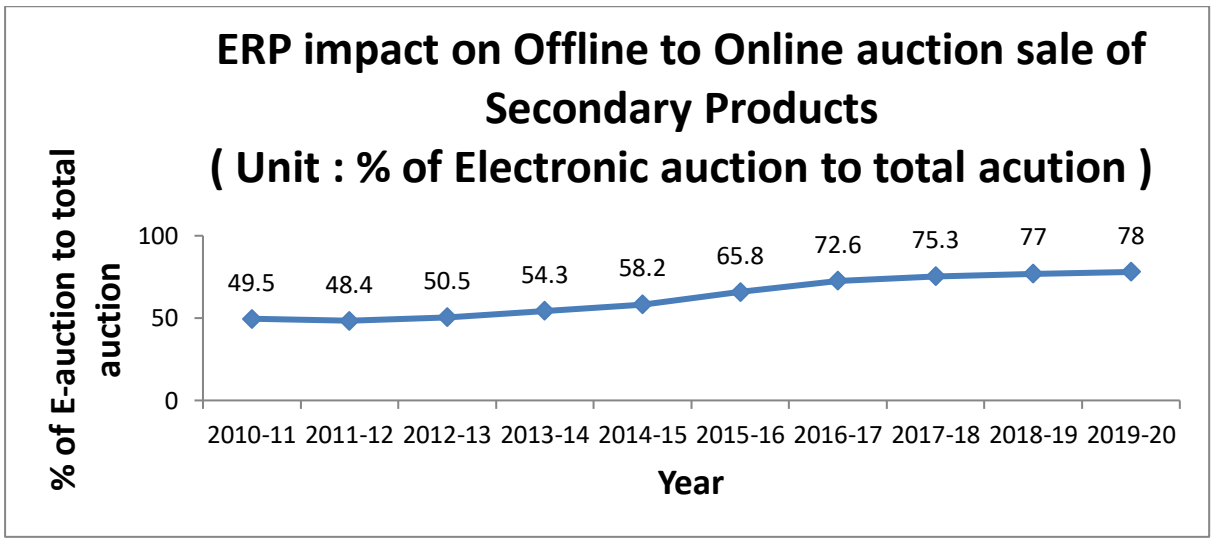


Source: Statistical Reports

ERP impact on Switching from Off-line auction Sale to On-line auction Sale to generate faster and higher revenues

Marketing Department of Durgapur Steel Plant is responsible for Revenue generation by sale of all Secondary Products like Steel Scrap, Iron Scrap, Idle Assets, Miscellaneous items, Coal Chemicals and Saleable Steel. The improvement in switching over from Off-line Auction Sale to On-line Auction Sale with a target of 80% E-auction is shown in Figure- 7. Offline auction is reserved to 20% for MSME Sectors. E-Auction has contributed in greater Competiveness and better price realisation..

Figure – 7



Source: Statistical Reports

ERP impact on Savings in procurement costs of Goods and Services

The Procurement of Goods consists of Mechanical Spares, Electrical Spares, General Consumable Items, Rolls, Refractory items, Ferro Alloys etc which are a part of Current Assets and Working Capital of the Company. The Procurement of Services consists of Job Contracts of Cleaning in nature.

The Table-1 below shows the Savings in procurement cost of Goods and Services for the last ten years just after the implementation of ERP system in 2009-10..

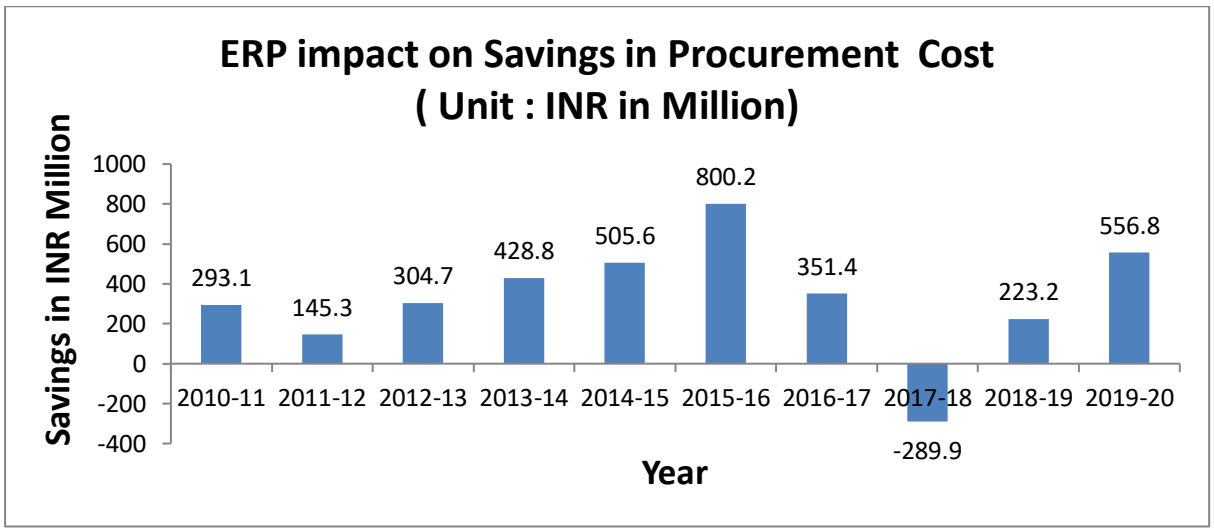
Table-1 Savings in Procurement Costs of Goods and Services (INR in Millions)

Year	Savings in Procurement of Goods	Savings in Procurement of Services	Total Savings
2010-11	293.1	0	293.1
2011-12	145.3	0	145.3
2012-13	312.0	(7.3)	304.7
2013-14	431.6	(2.8)	428.8
2014-15	509.0	(3.4)	505.6
2015-16	764.4	35.8	800.2
2016-17	372.3	(20.9)	351.4
2017-18	(391.5)	101.6	(289.9)
2018-19	194.2	29.0	223.2
2019-20	526.4	30.4	556.8

Source: Statistical Reports: Note: ( ) Means Negative Savings

The Savings in Procurement Costs of Goods and Services is shown below in Figure- 8. In the year 2017-18 the saving was negative because of extraordinary procurement of Spares for a newly installed rolling Mill named Medium Structural Mill (MSM)

Figure-8



Source: Statistical Reports

It is observed that the Savings derived from the ERP System was because of the Vendor bases were enlarged and the electronic bidding system encouraged competition resulting reduction in procurement costs of Goods and Services significantly.

To measure the Present Value of Savings of Procurement Costs, the we uses the following formula :

(1) The Cost of Capital (i) is taken as 10% which is the average Cost of Capital.

(2) The Present Value (PV) is derived by the formula :

$$PV = CF_1 / (1+ i)^1 + CF_2 / (1 + i)^2 + CF_3 / (1 + i)^3 + \ldots\ldots\ldots\ldots + CF_n / (1 + i)^n$$

Where CF_1 is the Savings of Procurement Cost one year later , CF_2 is the Savings of Procurement Cost two years later and so on.

(3) n is the number of years.

Now from Table -1 putting the values of Savings from Procurement Costs for CF_1 = INR 293.1 Million for 2010-11; CF_2 = INR 145.3 Million for 2011-12, CF_3= INR 304.7 Million for 2012-13; CF_4= INR 428.8 Million for 2013-14; ..... CF_{10} = INR 556.8 Million for 2019-20 , the Present Value (PV) is :

PV of Savings from Procurement Costs is INR 2028.4 Million

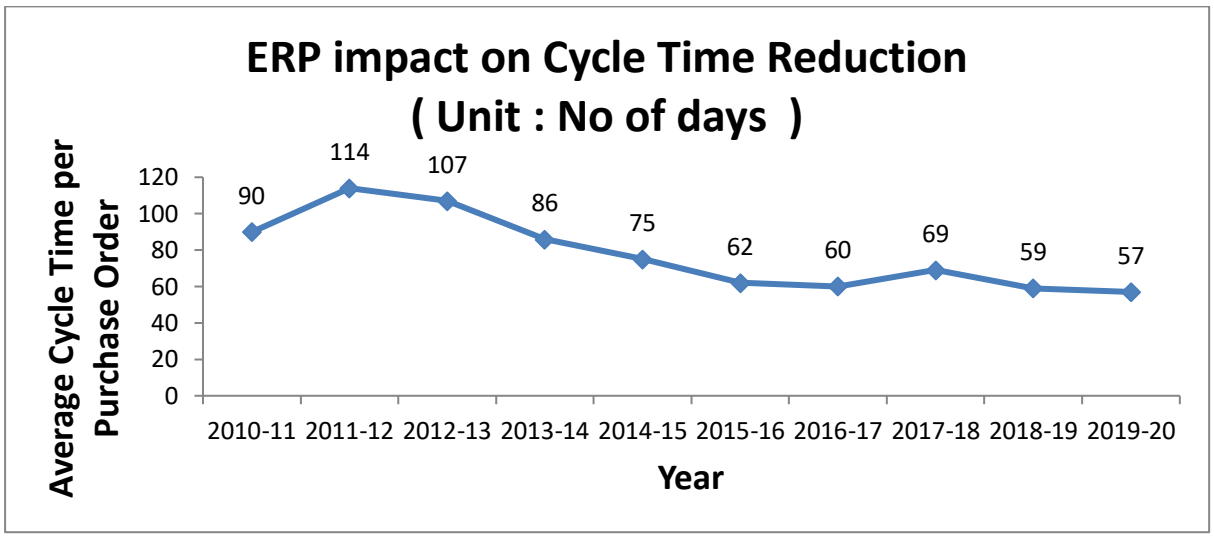
ERP impact on reduction of Cycle Time:

A Cycle Time is the time taken to convert a Purchase request initiated by a User department of the Plant to a Purchase Order to the Supplier. With a Shorter Cycle Time the Labour Cost per Purchase Order is reduced.

The ERP System has completely changed the Offline Method to Online method or from Paper based to Paper less method of Procurement System.

The ERP impact on Cycle Time reduction from Purchase Requisition to Purchase Order placement is shown in Figure-9.

Figure – 9



Source: Statistical Reports

The ERP impact of reduction in Cycle Time on savings in labour Cost is shown in Table- 2.

Table-2 ERP impact on Savings in labour Cost due to Cycle Time reduction

Year	Labour Cost (INR Million)	Average Cycle Time per PO (days)	Savings in Cycle Time per PO (YOY days)	Savings in Labour Cost YOY (INR Million)
2010-11	3907.9	90	Base	Base
2011-12	3075.9	114	(24)	(647.5)
2012-13	4656.0	107	07	304.5
2013-14	4696.6	86	21	1146.8
2014-15	4458.9	75	11	653.9
2015-16	4898.9	62	13	1027.1
2016-17	4057.9	60	02	135.2
2017-18	4337.0	69	(09)	(565.6)
2018-19	3900.2	59	10	661.0
2019-20	3594.7	57	02	126.1

Source : Statistical Reports. Note: ( ) Means Negative Savings

To measure the Present Value of Savings in labour Cost on reduction of Cycle Time from Purchase Requisition to placement of Purchase Order, the study uses the following:

(1) The Cost of Capital (i) is taken as 10% which is the average Cost of Capital.
(2) The Present Value (PV) is derived by the formula :

$$PV = CF_1 / (1+ i)^1 + CF_2 / (1 + i)^2 + CF_3 / (1 + i)^3 + \ldots\ldots\ldots\ldots + CF_n / (1 + i)^n$$

Where CF_1 is the Savings in Labour Cost one year later , CF_2 is the Savings in Labour Cost two years later and so on.

(3) n is the number of years.

Now from Table-2 putting the values for CF_1 = 0 (Base Year) for 2010-11; CF_2 = (-) INR 647.5 Million for 2011-12; CF_3= INR 304.5 Million for 2012-13; CF_4= INR 1146.8 Million for 2013-14;,,,,, CF_{10}= INR 126.1 Million for 2019-20;

PV of Savings in Labour Costs for Cycle Time reduction is INR 1597.2 Million

ERP impact on the Management of Working Capital

One of the most important parts of any Business is the Management of Working Capital. The major Components of the Working Capital consist of Raw Material, Stores and Spares, and the Finished Goods Stock. The objective of the ERP implementation is to have an Optimum Inventory and minimise the Inventory Carrying Costs. The inventory Carrying Costs of Raw Materials, Stores & Spares and Finished Goods Stock is shown in Table-3. The Inventory Carrying Cost is taken as 10% as equal to the Cost of Capital.

Table-3 Inventory carrying Costs (INR in Million)

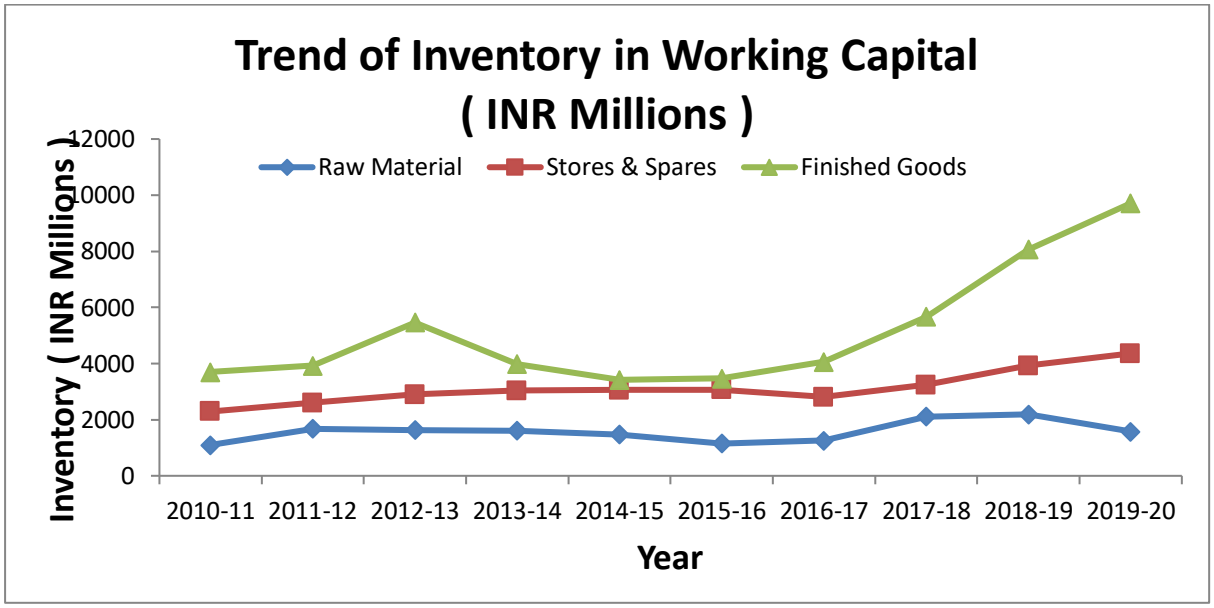
Year	Raw Material Inventory	Stores & Spares Inventory	Finished Goods Inventory	Total Inventory	Inventory Carrying Costs @10%	Savings in Inventory Carrying Costs on YOY basis
2010-11	1100	2290	3700	7090	709	Base
2011-12	1680	2600	3920	8200	820	(111)
2012-13	1630	2900	5470	10000	1000	(180)
2013-14	1610	3040	3980	8630	863	137
2014-15	1470	3060	3420	7950	795	68
2015-16	1150	3070	3470	7690	769	26
2016-17	1260	2810	4060	8130	813	(44)
2017-18	2110	3240	5670	11020	1102	(289)
2018-19	2190	3930	8070	14190	1419	(317)
2019-20	1580	4360	9710	15650	1565	(146)

Source : Financial Statistics. Note: ( ) Means Negative Savings

The Trend of Inventory in the Working Capital for Raw Material, Stores & Spares and Finished Goods Post implementation of ERP over the last ten years is shown in Figure- 10. From the Figure-10 it is

apparent that the ERP had a Stable impact on Raw Material Inventory and Stores and Spares inventory but had no impact on Finished Good inventory which was more Market driven.

Figure – 10



Source: Financial Statistics.

To measure the Present Value of Savings on reduction of Inventory Carrying Costs of Raw Material, Stores & Spares and Finished Goods , the we uses the following :

(1) The Cost of Capital (i) is taken as 10% which is the average Cost of Capital.

(2) The Present Value (PV) is derived by the formula :

$$PV = CF_1 / (1+ i)^1 + CF_2 / (1 + i)^2 + CF_3 / (1 + i)^3 + \ldots\ldots\ldots\ldots + CF_n / (1 + i)^n$$

Where CF_1 is the Savings in inventory Carrying Cost one year later , CF_2 is the Savings in inventory Carrying Cost two years later and so on.

(3) n is the number of years.

Now from Table-3 , putting the values for $CF_1 = 0$ (Base Year) for 2010-11; $CF_2 =$ (-) INR 111 Million for 2011-12; $CF_3 =$ (-) INR 180 Million for 2012-13; $CF_4 =$ INR 137 Million for 2013-14;,,,,, $CF_{10} =$ INR 146 Million for 2019-20;

PV of Savings in inventory Carrying Costs of Raw Material, Stores & Spares and Finished Goods is (-) INR 424.6 Million which is Negative.

Calculation of Net Present Value (NPV) for the Overall Project in Implementation of ERP System:

While Calculating the Net Present Value out of the Investment in ERP Project, there are certain benefits which are indirectly reflected in the Profit and loss account of the Company and are in nature of Overhead Cost. These benefits are difficult to be exactly quantified in terms of Savings in monetary terms while Calculating NPV. These benefits are (i) Improvement in Manpower Productivity in producing more amount of Crude Steel with lesser Manpower over the years. (ii) Improvement in Energy Consumption per tonne of Crude Steel Production (G.Cal/TCS) over the years with lesser amount of Energy.(iii) Improvement in Specific Water Consumption per tonne of Crude Steel (M^3/TCS) with lesser amount of Water over the years. (iv) Improvement in Electronic Auction from 49.5% in 2010-11 to 78% in 2019-20 resulting in faster and better price discovery for Sale of Secondary Products by Marketing Department.

NPV has been calculated with Specific Savings derived from Specific Sources which are as follows:-

(i) ERP impact on Savings from Procurement of Goods and Services.
(ii) ERP impact on Cycle Time reduction for Procurement.
(iii) ERP impact on reduction of Inventory Carrying Costs of Raw Material, Stores & Spares and Finished Goods.

The Formula for Net Present Value (NPV) :

$$NPV = CF_0 + CF_1 / (1 + i)^1 + CF_2 / (1 + i)^2 + \cdots\cdots\cdots + CF_n / (1 + i)^n$$

Where, CF_0 is the Initial Investment for ERP Project which is INR 353.4 Million.

PV of Savings from Other Sources = $CF_1 / (1 + i)^1 + CF_2 / (1 + i)^2 + \cdots + CF_n / (1 + i)^n$

The Calculation of PV of Investment (Outflow) and Savings (Inflow) is shown in Table-4.

Table – 4 PV of Investment (Outflow) and Savings (Inflow) (INR in Millions)

Sl No	Items	PV of Investment / Outflow	PV of Savings / Inflow
1	ERP Investment	353.4	
2	Savings from Procurement		2028.4
3	Savings from Cycle Time reduction		1597.2
4	Savings from reduction of Inventory Carrying Costs	424.6	
Total		778.0	3625.6

The NPV is (INR 3625.6Milliom – Rs 778.0Million) = (+) INR 2847.6 Million

The positive NPV of INR 2847.6 Million indicates that the investment in ERP Project was effective and resulted in benefit for the Company.

Calculation of Payback Period:-

The Savings achieved in the 1st year, 2nd year, 3rd year and so on from Procurement of Goods & Services, Reduction in Cycle Time and Reduction of Inventory Carrying Costs are shown in Table – 5.

Table-5 Savings from Procurement, Cycle Time and Inventory Carrying Costs (INR in Million)

Years	Savings in Procurement (Absolute)	Savings in Cycle Time Reduction YOY	Savings in Reduction of Inventory Carrying Costs YOY	Total Savings
2010-11	293.1	Base	Base	293.1
2011-12	145.3	(647.5)	(111.0)	(613.2)
2012-13	304.7	304.5	(180)	429.2
2013-14	428.8	1146.8	137.0	1712.6
2014-15	505.6	653.9	68.0	1227.5
2015-16	800.2	1027.1	26.0	1853.3
2016-17	351.4	135.2	(44.0)	442.6
2017-18	(289.9)	(565.6)	(289.0)	(1144.5)
2018-19	223.2	661.0	(317.0)	567.2
2019-20	556.8	126.1	(146.0)	536.9

Source : Rearranged from Table-1, Table-2 and Table-3.

From Table-5, considering the Cost of Capital as @10% and the Initial ERP Investment at CF_0 = INR 353.4 Million; CF_1 = INR 293.1 Million ; CF_2= (-) INR 613.2 Million; CF_3= INR 429.2 Million so on and CF_{10}= INR 536.9 Million; using the formula for NPV, the Payback Period (PBP) is Calculated as 3.23 years.

So the Payback Period is achieved at 3.23 years.

Calculation of Internal Rate of Return (IRR) for the Implementation of ERP System

IRR is calculated using Newton's Method:-

$$0 = CF_0 + CF_1 / (1 + i) + CF_2 / (1 + i)^2 + CF_3 / (1 + i)^3 + \cdots\cdots\cdots + CF_n / (1 + i)^n \ ;$$

In this formula, NPV = 0 and the value of IRR is equivalent to i x 100.

Now putting the values of CF_0 = (-) INR 353.4 Million which is the initial investment and from Table – 5, the total Savings in the following years as CF_1 = INR 293.1 Million; CF_2 = (-) INR 613.2 Million; CF_3 = INR 429.2 Million; ..... and CF_{10} = INR 536.9 Million; the IRR is calculates as

IRR = 77.07 %.

So the Internal Rate of Return (IRR) is 77.07% which is much higher than the Cost of Capital of 10%. This signifies that the investment in the ERP Project has resulted in substantial benefit to the Company.

Conclusion and Policy Recommendation

This Study was conducted with a research question in mind that whether there were substantial benefits after implementation of ERP Systems in 2009-10. The Study covered a ten years period post ERP implementation from 2010-11 to 2019-20. It has been observed that the ERP implementation has resulted in significant improvement in Production of Crude Steel, Consistent reduction of manpower with consistent improvement in manpower productivity, Consistent improvement in Techno-economic parameters like reduction in Specific Water consumption, reduction in Specific Energy consumption, Consistent increase in Electronic auction in the Sale of Secondary Products. There was Significant Savings in Procurement Costs, Significant Savings in Cycle time reduction in Procurement, Significant stability in maintaining Inventory except for Inventory of Finished Steel. The Net Present Value is found to be Positive ie (+) INR 2847.6 Million against an initial investment of INR 353.4 Million, the Payback Period is 3.23 years and the Internal Rate of Return (IRR) is 77.07% which is much higher than the Cost of Capital of @10%.

The Study was conducted purely based on evidence and not on the basis of Perception of the People as was done in most of the previous studies either nationally or internationally. The Study design was based on Observational, longitudinal and retrospective in nature.

The benefits derived from implementation of ERP System was possible mainly due to a painstaking process of integration of Vendors in the ERP System, integration of all User Departments in the ERP System, migration of all relevant historical data from the Legacy System to ERP System , Training of all the Vendors and Users of the ERP System , a real time availability of information and the most difficult part of handling a Change Management.

The Present Study can be useful to any manufacturing industries who implemented orimplementing ERP System. There is a further scope of research on implementation of ERP System in Project Managements, Cost Accounting, and on Human Resource Developments of an integrated Steel Plant..

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References:-

Ali Tarhini, Hussain Ammar et al (2015); " Analysis of the Critical Success Factors for Enterprise Resource Planning Implementation from Stakeholders's Perspective: A Systematic Review " – International Business Research, Vol – 8, No – 4.Annual Accounts – Durgapur Steel Plant – 2010-11 to 2019-20.

Azadeh Pishdad, Andy Koronios et al (2014), ERP Institutionalization – A Quantitative Data Analysis using the Integrative framework of IS Theories. Australasian journal of Information Systems , Volume 18, Number 3.Financial Year Book – Durgapur Steel Plant – 2010-11 to 2019-20.

Guangyu Xiong & Petri Helo, (2008); " Challenges to the Supply Chain in the Steel Industry"; International journal of Logistics Economics and Globalization / University of Vaasa, Finland

Guy G. Gable, DarshanaSedera et al (2003); " Enterprise Systems Success : A Measurement Model" – Association for information Systems, AIS Electronic Library (AISeL)

Malik F. Salesh, MunnerAbbad et al; (2013); " ERP implementation success factors in Saudi Arabia ", International journal of computer science and security (IJCSS), volume- (7); Issue (1)

Moshe Zviran, Nava Pliskin et al (2004); " Measuring User Satisfaction and Perceived Usefulness in the ERP Context" – The Leon Recanati Graduate School of Business Administration, Tel Aviv, Israel.

Operational Statistics – Durgapur Steel Plant – 2010-11 to 2019-20. Panorama Consulting Solutions (2019) – ERP Report

R.Addo – Tenkorang and P.Helo(2011); Proceedings of the world congress on Engineering and computer science 2011, vol II, WCECS 2011, San Francisco, USA.

Soud Almahamid and Omer Awsi(2015); " Perceived Organizational ERP Benefits for SMEs : Middle Eastern Perspective; Interdisciplinary Journal of Information, Knowledge and Management; Volume – 10.

Stephan A. Kronbichler, Herwig Ostermann et al (2010); " A Comparison of ERP- SuccessMeasurement Approaches "; Journal of Information Systems and Technology Management ; Vol-7; N0-2, p-281-310

Suraj Kumar Mukti and A.M.Rawani, (2016) NIT, Raipur, Deptt of Mechanical Engg, on ERP System Success Models- a literature Review, Vol II, NO 3, February. Asian Research Publishing Network, Journal of Engineering and Applied Science].

Vishal Bishnoi(2011), Thesis on Implementation of ERP Software and Electronic Analysis of its implementation in Indian Multinational Organizations, Shobhit University, Meerut, Shobhit Institute of Engineering & Technology

Young B. Moon (2007), " Enterprise Resource Planning (ERP); a review of the literature", International journal of Management and Enterprise Development, Vol-4, No-3, pp- 235-264.

Yusuf, Y. Gunasekaran, A, and Wu, C (2006); " Implementation of Enterprise Resource Planning in China" ,Technovation, Vol-26, No-12, pp-1324-1336

Ziff Davis-(2018). Beginners Guide to ERP