

International Journal of Engineering Sciences & Research Technology

(A Peer Reviewed Online Journal)

Impact Factor: 5.164



Chief Editor
Dr. J.B. Helonde

Executive Editor
Mr. Somil Mayur Shah

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY
PRODUCTIVITY MEASUREMENT MODEL FOR CEMENT MANUFACTURING
FIRM

Rabendra Singh*¹ & Prof. Purushottam Kumar Sahu²

Department of Mechanical Engineering, BM College of Engg. and Tech. Indore M.P. (INDIA)

DOI: 10.5281/zenodo.2583727

ABSTRACT

Productivity performance play a vital role in the field of manufacturing firm and it has been important aspect in manufacturing firm for improving the quality of firm and quality of product .productivity play an important role in any manufacturing industry for customer satisfaction and improve company's performance. In any firm with labor Productivity as a main factor and contributing a more important role. The total productivity of cement firm was determined for a period of ten years by using Craig and Harris model. After analysis the result carried out showed that years 2008 and 2009 had a lowest and highest total productivity level respectively. Therefore, this research work could serve as guiding information for cement firm for determining productivity level without just focusing on Labour cost.

KEYWORDS: Raw material, Capital input, Labour input, total input, partial productivity, total productivity

1. INTRODUCTION

Now a day's, in any manufacturing organization productivity play a vital role for improving the reputation of the firms. The environment of firms running in globalized competition between the various company and firm. If the reputation of firm has to increase then productivity of firm should be increased in proper way. Not only firm's productivity increased but also partial productivity of labor, partial productivity of raw material, and partial productivity of capital should be increased. Productivity measure is an important aspect in manufacturing firm. Now a day's in developing country like India the issue of productivity, partial productivity, total productivity has become most important aspect for any manufacturing firm. The productivity measurement is the quantification of both the output and input resources of production system. The cement manufacturing is one of the labor intensive manufacturing firms that contribute to the economy growth of India. In this project research work a case study is done in the prism cement Satna/Rewa MP for calculating the partial productivity and total productivity for 10 years from 2008-2017 with the help of selected resources such as labor input, capital input, material inputs and miscellaneous inputs etc. The productivity measurement has always been an important aspect in manufacturing firms. Nowadays, the issue of productivity improvement, especially in developing countries, has become important for manufacturing firms' managers, strategic planners, government policy makers and it is becoming a key factor affecting the overall performance of firms [1]. It is perceived that the more different are the goals of the individuals, institutions and bodies that have a stake in productivity as a problem, the more different their definitions of productivity will be [2].

2. LITERATURE REVIEW

Krugman [3], Planned to declare that defining or measuring productivity is a exceptional task when he asserted that "productivity isn't everything, but in the long run it is almost everything. And also describe the definition of productivity for any industry. Productivity plays a vital role In the field of customer satisfaction, and getting a better result for industry.

Eatwell and Newman [4], defined productivity as a ratio of some measure of output to some index of input use which means that productivity is nothing more than the arithmetic ratio between the amount produced and the amount of any resources used in the course of production.

According to Sink [5], The overall performance of a any industry is comprised of at least seven criteria: effectiveness, efficiency, quality, productivity, quality of work life, innovations, and profitability. Productivity is therefore a key achievement factor for all firms. With the help of this criteria productivity can be calculated for the customer satisfaction and getting better achievement in the field of work environment in any industries.

Craig and Harris [6], Provide a total productivity model at the industry level comprising output and inputs. And model is used for determining the partial productivity for getting a better result for firm industry. And improve the quality and performance of firm.

Berndt [7], Reviewed and deciphered a few of the most vital viewpoints hidden connections specialized advance, efficiency development and vitality utilize saw from the vintage of a business analyst. He presumed that the basic subject of exemplification, dissemination and learning are basic to comprehend the powers connecting vitality use, specialized advance and efficiency development.

3. PROBLEM DEFINITION

After study the literature survey, in any manufacturing organization partial productivity and total productivity play an important role, for information regarding partial productivity and total productivity, but it is not possible for calculating true value of partial productivity without correct method. In any manufacturing organization the calculation of partial productivity and total productivity for 10 years have not calculated by correct method. It is not possible to find the highest value and lowest value of partial productivity from 10 years Functional input data.

4. OBJECTIVE OF PROJECT WORK

The objective of this project is to find the true value of partial productivity for 10 years by using method of Craig and Harris model. And find out the highest and lowest value of partial productivity. Also the objective of this project is to find the value of labor productivity for 10 years, capital productivity for 10 years, material productivity for 10 years and total productivity for 10 years and finally find the highest and lowest value of partial and total productivity

5. METHODOLOGY AND CASE STUDY

The objective of this proposed research work, is to find out the highest and lowest value of productivity for 10 years with the help of Craig and Harris model. With the help of Craig and Harris model partial productivity of individual input is found and also total productivity will also find. In this proposed research work a calculation of Craig and Harris model is done step by step. The data is collected from prism cement after selection of functional input.

In this project work a Craig and Harris model is applied for calculation of partial and total productivity for 10 years.

The next most impartment study using the index approach at the company level is of Craig and Harris model [8]. Define total productivity measure as

Total productivity = Total output / (labour input + capital input + Raw material input + Misc. input).

In this project research work the main focus is going to calculate Partial productivity and total productivity of input functions for 10 year from 2008-2017. Due this calculation of productivity the reputation of firm will increase and customer will satisfy and getting a profit for company. Product and productivity are related to each other. All the data related to functional input is taken from prism cement Satna MP. And in this proposed research work there is also a comparison between highest and lowest of total productivity from 2008-2017.

Partial productivity measure (PPM)

Productivity measures that use one class of inputs or [factors](#), but not multiple factors, are called partial productivities [9-10], Partial productivity = Total output / Individual input

- Labour productivity = Total output / Labour input

- Capital productivity = total output/Capital input
- Material Productivity = total output/material input Martand Telsang [10].

Total Productivity Measure (TPM)

It is based on all the inputs, this model can be applied to any manufacturing organization or any company [11].

$$\text{Total productivity} = \text{Total tangible output} / \text{Total tangible input} [11].$$

Table1: Functional data for productivity of Prism firm from 2008 -2017 (last 10 years)(in Rs cr.)

Year/functiona l input	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Sales revenue	88.2 3	633.9 2	2859.5 7	3426.4 6	4540. 3	4799.4 5	5145.5 2	5701. 9	5605. 1	5096. 6
Finished goods stock exchange	20.7	22.1	23.2	24	22.8	21.6	20	20.7	19.64	18.9
Capital input	17.9 6	109.1 6	621.2	28.6	66.4	83.9	62.8	68.8	68.3	94.3
Material input	139	124	1293	1685	2175	2231	2349	2668	2618	2405
Miscellaneous input	19	10	51	796	1157	1291	1115	1282	1205	314
labor	35	27	134	172	222	258	288	314	362	380

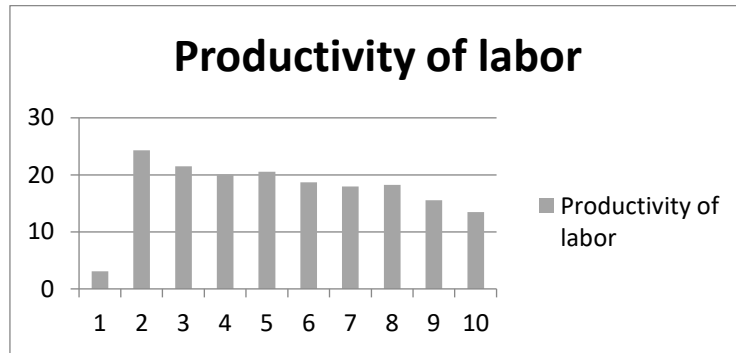
6. RESULT AND DISCUSSION

After using the formulae of Craig and Harris Model the result of Partial and Total productivity will be,

Table 2: Partial Productivity of labor for last 10 years

S.no.	Years	Productivity of labor
1	2008	3.1123
2	2009	24.2970
3	2010	21.5132
4	2011	20.0608
5	2012	20.5504
6	2013	18.6862
7	2014	17.9358
8	2015	18.2248
9	2016	15.5382
10	2017	13.4618

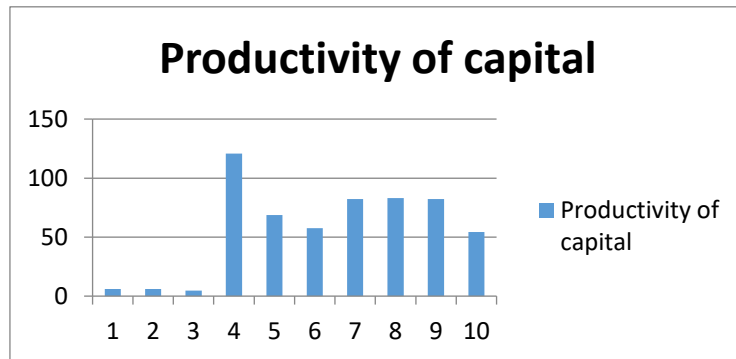




Graph 1-Partial productivity of labor input for 10 year

Table 3: Partial Productivity of capital input for last 10 years

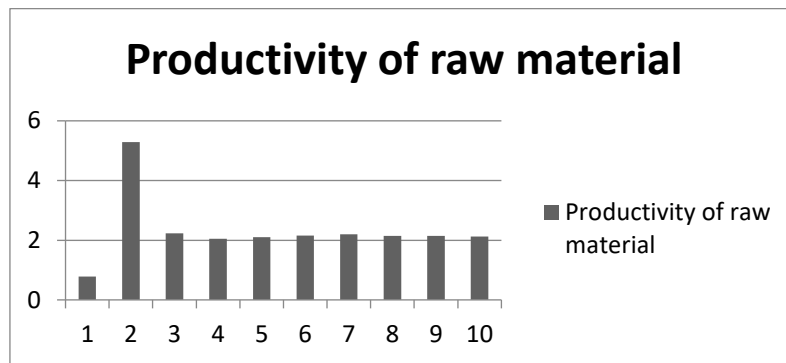
S.no.	Years	Productivity of capital
1	2008	6.0652
2	2009	6.0097
3	2010	4.6406
4	2011	120.6454
5	2012	68.7199
6	2013	57.4619
7	2014	82.2535
8	2015	83.1774
9	2016	82.3547
10	2017	54.2472



Graph 2: Partial Productivity of capital input for last 10 years

Table 4: Partial Productivity of raw material last 10 years

S.no.	Years	Productivity of raw material
1	2008	0.7837
2	2009	5.2904
3	2010	2.2295
4	2011	2.0478
5	2012	2.0979
6	2013	2.1609
7	2014	2.1990
8	2015	2.1449
9	2016	2.1485
10	2017	2.1270



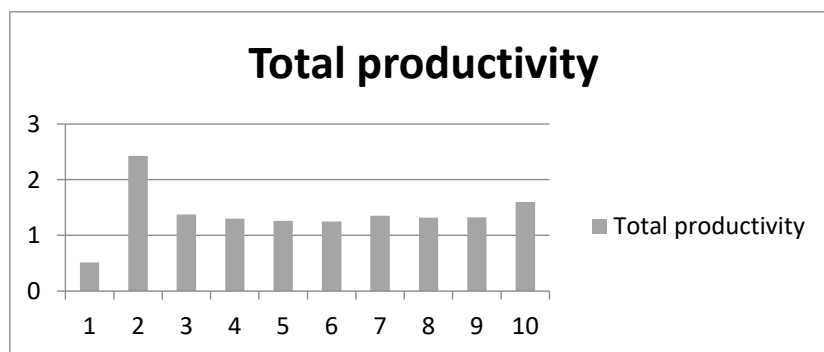
Graph 3- Partial Productivity of raw material last 10 years

Annual total productivity of the firm:

The total productivity of the firm computed yearly i.e. for 10 year from 2008 to 2017 is shown in table which is graphically represented in graph and indicate the firm under study experienced fluctuation in its operation. Table and graph show there is fluctuation because of irregular power supply system, irregular government policy and irregular inflation rate.

Table 5: Yearly Total Productivity of the firm

S.no	years	Total productivity
1	2008	0.5164
2	2009	2.4283
3	2010	1.3733
4	2011	1.2998
5	2012	1.2604
6	2013	1.2477
7	2014	1.3541
8	2015	1.3207
9	2016	1.3224
10	2017	1.6019



Graph 4: Total productivity from 2008-2017.

7. DISCUSSION

The total productivity of the prism cement firm investigated was computed for a period of 10 years. The result obtained that the company had its highest productivity in the year 2009. This was attributed to the reduce capital input and material input. The year with lowest total productivity was 2008. Could be attributed to the low total output in this year i.e.2008. the finding have revealed that total productivity of cement firm depend upon five major factors of productions namely total output, capital input, material input, miscellaneous input , and labor cost.





8. CONCLUSION

Determining real total productivity should not be based on Labour factor alone but rather on all other factors. To promote industrial growth functional inputs types factors enhancing productivity. It is very important to choose a methodology that fills the purpose of data to be used in manufacturing industry. And finally total productivity still depend upon other factors of production.

REFERENCES

- [1] Arturo L. Tolentino, "New Concepts of Productivity and its Improvement". The European Productivity Network Seminar, Budapest, 2004.
- [2] Oyeranti G.A. (2006). Concept and Measurement of Productivity, Department of Economics, University of Ibadan, Ibadan.
- [3] Krugman P. 1990. The age of diminished expectations, MIT press, Cambridge, MASS. p. 9.
- [4] Eatwell J.M. and Newman P. 1991. The New Palgrave: A Dictionary of Economics. vols. 3, 4 and 12, Macmillan, Tokyo.
- [5] Sink D. 1983. Much do about productivity: Where do we go from here. *Industrial Engineering*. 15(10): 36-48.
- [6] Craig C.E. and R.C. Harris. 1973. Total productivity measurement at the firm level. *Sloan Management Review*. 14(3): 12-29.
- [7] Berndt E. R. 1990. Energy use, technical progress and productivity growth: A survey of Economic issues. *The journal of productivity analysis*. 2: 67-83.
- [8] Craig CE and Harris (1973). Total productivity measurement at the firm.
- [9] Sumanth, David J. Total Productivity Management (TPmg): A Systemic and Quantitative Approach to Compete in Quality, Price and Time. CRC Press. p. 5. ISBN 9781574440577. Retrieved 11 March 2017.
- [10] Martand Telsang 'a test book of industrial engineering and production management'
- [11] Adedoyin, Rasak Adedapo'' Total Productivity at Firm Level: A Case Study of a steel
- [12] Manufacturing Company in Osun State, Nigeria'' *International Journal of Engineering Innovation & Research* Volume 4, Issue 1, ISSN: 2277 – 5668

CITE AN ARTICLE

Singh, R., & Sahu, P. K., Prof. (2019). PRODUCTIVITY MEASUREMENT MODEL FOR CEMENT MANUFACTURING FIRM. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, 8(3), 1-6.

