

Productivity Analysis Using Methods David J. Sumanth

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Abstract

Productivity cycle analysis is a necessity for every company, it is intended to determine the level of performance that has been set and as an evaluation for performance improvement in the future. The problem that occurs is that the level of productivity fluctuates and there is a decrease in the productivity index, where the value of input goes up and output goes down. The purpose of this study is to determine the measurement of productivity and productivity index and how to increase it the productivity. The method proposed is David J. Sumanth. The data used are input and output data. The results obtained are the productivity level of total output and input for the first period of 2.90%, the second period of 2.79%, the third period of 2.88%, the fourth period of 3.33% and the fifth period of 3.06%. The figures obtained from the productivity calculation show that each month the ratio of output and input is still not balanced. The highest index occurred in 2020 at 1.16% and the lowest index occurred in 2018 at 0.97%. This is because the partial input input also fluctuates.

Keywords: Productivity Cycle, Productivity Index, David J. Sumanth, Input, Output

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1. Introduction

Improvement productivity This is attention main from all party in the middle condition economy national Which Still unstable. The rise, material standard, rates base electricity, the rise fuel, And others resulting in higher production costs. But Companies are still required to produce products Which quality And volume production Which Keep going increase. By increase prices the company sued For control system production use reach productivity Which tall. The first step that the company must take is measure productivity on the production floor whether it is achieved, furthermore done evaluation and further made into consideration planning productivity in the future upcoming [1].

Say productivity always connected with quantities of *input* and *output* used in process production Good service and goods [2]. Productivity focused on how much efficient And whether the goods or services produced are effective and the costs Which caused consequence process production the [3].

Chips Balado 4x7 Star Jaya is a company Which move in the field food, Which produce chips spicy Which address in Jl. Behind Olo I No. 22 Padang. Almost all processes production is done by hand (manual). However, Still there is a number of problem related to productivity Work Which low, that is problem internal such as low quantity of production results and target from company Which No achieved. Whereas Bintang Jaya 4 x 7 Balado Chips are available a number of customer Which has order chips previously. Therefore, Balado 4x7 Star Chips Jaya have demands Which tall

will productivity Work for his employees so that target production achieved.

The problem Which there is on productivity is, existence problem on level productivity Balado Chips 4x7 Bintang Jaya. Productivity level fluctuating with average productivity 1.44%. On 2015 and in 2016 there was a decline in the index productivity, where *input value* increases *output* decreases. Principles productivity Which Good that is if *input* down and *output* up. Problems with targets production, production targets are not achieved. Year 2013 target production 196,000 kg whereas the production achieved was only 192,512 kg or 98.22%. Year 2014 target production 193,500 kg whereas the production achieved was only 191,017 kg or 98.72%. Year 2015 target production 200,000 kg whereas the production achieved was only 193,922 kg or 96.96%. Year 2016 target production 147,000 kg whereas the production achieved was only 138,711 kg or 94.36%. Year 2016 is achievement production lowest compared to year previously. Matter This will impact on company Because profit Which obtained is not optimal, Balado Crisps should be 4x7 Bintang Jaya can get the benefits that more, if the target is met.

Research to measure productivity using method David J. Sumanth had time done on palm oil processing company. To measure index productivity highest And lowest on company. Results study show index productivity partial highest achieved by productivity organization on year 2007 with productivity index is 101.32%. Meanwhile Which lowest experienced by productivity product with index its productivity the lowest on in 2007 it was 53.88% [4]. Other research that

with implementation method David J. Sumanth And POSPAC at a motorcycle battery production company, for measuring productivity partially. The results of the study show index productivity partial highest achieved by organizational productivity in 2007 with index its productivity as big as 101.32% [5].

Further research with the application of the method David J. Sumanth on company production cement, want to achieved in study This is For plan finance Which will come with productivity benchmarks that occurred in 4 (four) years Which Then. Results study show, increase input got mark Rp 31,866,973,797,000, And If using an average-based increase figure The increase *in output* was achieved at Rp. 30,392,863,939,000 [6].

Study other with implementation method David J. Sumanth at a tanning company. For show performance And efficiency company to environment as well as mark total productivity. Results study show performance And efficiency company to environment in condition Good. Whereas solution selected For repair productivity is alternative 1 with annual cost savings of Rp. 365,173,120 as well as mark total productivity as big as 129% [7].

Study furthermore with model David J. Sumanth on company production coffee. Study the measure productivity of the index *tangible* And *intangibles*. Results study show *index tangible* consists of from *Human* (39.39%), *Material* (36.58%), And *Others Expense* (31.28%) with domination mark as big as 72% [8]. Study other with David J. Sumanth's approach to cultivation shrimp. Study This aiming For know business feasibility, productivity level, growth, *Survival Rate* And *Feed Conversion Ratio* shrimp Vaname. The results of the study showed the R/C ratio value as big as 1.26, with thus business worthy For run [9].

Study other with approach David J. Sumanth on company *furniture*, with model David J. Sumanth. The purpose of the research is to find out company productivity evaluation and measurement and connection between level productivity with level profitability. The results of this study are about measuring productivity partial show level productivity changeable And Still need partial productivity improvement efforts especially inefficient use of each input [10]. Other research using the Marvin E. Mundel method in food production companies. Research objectives For know index productivity company. Results calculation show index Productivity year 2017 as big as 5,250 And Index Productivity year 2016 as big as 5,245, so that happen increase by 0.5% compared to year 2016 [11].

Study furthermore with method OMAX on company production spacer. For know measurement productivity company. Results calculations show total productivity 931.7 [12]. Study other with method APC on company service inspection. Objective study For measure index productivity company. Mark index productivity highest

159,377 on input capital, the lowest productivity index value was 78.332 in input material, mark index profitability highest 160,670 in energy input, mark profitability index lowest 89,820 in material input, repair index price highest 1,259 on input energy And index repair lowest price 0.715 on input capital [13].

Method David J. Sumanth can compared to to measure productivity and productivity index Which in accordance with characteristics company as reference settlement every element productivity issues [14]. As for objective study For know measurement productivity And index productivity as well as For know method increase productivity. David J. Sumanth Method important for the development of science because, can measure the productivity of the company. Measurement productivity can be used as a benchmark in development of a company's management. Level productivity Which achieved company is indicator as efficiency company in combine source Power Which There is in company mentioned [15].

2. Methodology

A. Method And Time Study

Method Which used is David J. method Sumanth For measurement productivity And index productivity. Study done in Balado Chips 4 x 7 Bintang Jaya is located at Jl Behind Oh I No. 22 Field. Period Collection data done date 10 – 15 January 2022.

B. The data that used

Data types namely secondary data. Secondary data what is needed is data from 2017-2021 consists of from: Data element *output*, consists of from revenue from sales. As well as element data *input* Which consists of from material standard (cost material standard main, cost auxiliary raw materials), labor (cost wages, cost allowance day highway), cost energy (electricity, water, material burn), cost etc (cost machine maintenance, costs sales tax, cost transport).

C. Technique Processing Data

Measurement calculation steps productivity And index productivity that is:

1. Calculation of the deflator price used

For remove influence price changes on period measurement used deflator, so that the value is obtained in the period measurement with price constant. Deflator Which will used is rate inflation Indonesia Which there is on table following.

Table 1. Rate Inflation Indonesia

Period	I	II	III	IV	V
Year	2017	2018	2019	2020	2021
Rate inflation (%)	3.61	3.13	2.72	1.68	1.87

Deflator functioning For remove influence from change price on measurement period. By using the deflator, constant values/prices of related elements can be obtained in the measurement periods.

$$Dt = \left(1 + \frac{It}{100}\right) \times Dt - 1 \quad (1)$$

Where:

Dt = deflator

$Dt-1$ = deflator before period nth

It = rate period inflation nth

2. Calculation Price Constant

Deflator is used For remove influence change price period measurement, so that obtained values on period measurement with price constant.

$$HK = \frac{100}{100 + \text{deflator}} \times HB \quad (2)$$

Where:

HK = mark price constant on period measurement

D = deflator

HB = mark Prices apply in the period measurement

3. Calculation level productivity

Level calculation productivity consists of from productivity total, power Work, material standard, energy, And productivity etc.

1) Level productivity total

Calculation level productivity total use formula:

$$\text{Productivity total} = \frac{\text{Total output}}{\text{Total input}} \quad (3)$$

2) Level productivity power Work

Calculation level productivity power Work use formula:

$$\text{Productivity power work} = \frac{\text{Total output tenaga kerja}}{\text{Total input tenaga kerja}} \quad (4)$$

3) Level productivity material standard

Calculation level productivity material standard use formula:

$$\text{Productivity material standard} = \frac{\text{Total output bahan baku}}{\text{Total input bahan baku}} \quad (5)$$

4) Level productivity energy

Calculation level productivity energy use formula:

$$\text{Productivity energy} = \frac{\text{Total output energi}}{\text{Total input energi}} \quad (6)$$

5) Productivity level expenditure etc Calculation level productivity expenditure etc use formula:

$$\text{Other expenditure productivity} = \frac{\text{Total output pengeluaran lain-lain}}{\text{Total input pengeluaran lain-lain}} \quad (7)$$

4. Measurement of productivity value index and index productivity factors

Calculation index mark And factors productivity consists of from productivity total, materials standard, power Work, energy, And etc can counted with formula:

$$IP = \frac{P_t}{P_o} \quad (8)$$

Where:

IP = Index Productivity

P_t = Mark productivity on period measurement

P_o = Mark Productivity on period base

$$\text{Change from period base (\%)} = \frac{P_t - P_o}{P_o} \times 100\% \quad (9)$$

$$\text{Change from period previously (\%)} = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100\% \quad (10)$$

Where:

t = 2, ..., n

n = amount period measurement

TP_1 = level productivity on period t

TP_{t-1} = level productivity on period previously

TP_t = productivity level in period t

TP_o = TP_1 = level productivity on period base

3. Results And Discussion

A. Measurement productivity

Stage The first is the calculation price deflator Which used.

Table 2. Rate Inflation Indonesia And Deflator

Period	I	II	III	IV	V
Year	2017	2018	2019	2020	2021
Inflation rate (%)	3.61	3.13	2.72	1.68	1.87
Deflator	1.03	1.06	1.09	1.11	1.13

Mark deflator on year I as big as 1.03, the second year amounted to 1.06, the third year is 1.09, 4th year of 1.11,

and the fifth year as big as 1.13. For remove influence change prices in the measurement period use a *deflator*, so that the value is obtained in the period measurement with price constant. Deflator functioning For remove influence from change price on measurement period. With use deflator will can obtained value/price constant from elements related on periods measurement.

Next calculate the price constant income that is as following.

Table 3 Price Constant Income (Output)

No	Year	Valid Price (Rp)	Constant Price (Rp)
1	2017	3,208,900,000	3,176,185,291
2	2018	2,851,987,000	2,822,073,026
3	2019	2,596,450,000	2,568,453,853
4	2020	2,261,000,000	2,236,178,420
5	2021	1,749,391,778	1,731,897,860

Constant price income in 2017 amounted to Rp 3,176,185,291, year 2018 Rp 2,822,073,026, in 2019 amounted to Rp 2,568,453,853, in 2020 amounting to Rp. 2,236,178,420, and in 2021 amounting to Rp 1,731,897,860. With calculation Which the same constant price is obtained from each period.

Table 5. Level Productivity Total

No	Year	Period	Total Output (Rp)	Total Input (Rp)	Productivity Level (%)
1	2017	I	3,176,185,291	1,096,320,260	2.9
2	2018	II	2,822,073,026	1,010,306,508	2.79
3	2019	III	2,568,453,853	892,879,338	2.88
4	2020	IV	2,236,178,420	671,006,335	3.33
5	2021	V	1,731,897,860	565,395,592	3.06

Productivity level total period I is 2.90. By using the same formula above, then obtained level productivity total period next. Results calculation level productivity material standard can be seen on the table following.

Table 6. Level Productivity Material standard

No	Year	Period	Total Output (Rp)	Total Input (Rp)	Productivity Rate (%)
1	2017	I	3,176,185,291	290,390,973	10.9
2	2018	II	2,822,073,026	252,583,614	11.2
3	2019	III	2,568,453,853	212,602,631	12.1
4	2020	IV	2,236,178,420	171,039,462	13.1
5	2021	V	1,731,897,860	110,357,280	15.7

Level productivity material standard period I of 10.9. By using the formula the same one in on, so obtained level productivity material standard next period.

B. Index productivity

The calculation of the productivity value index consists of productivity total, raw materials, labor, energy, and others. Productivity index total can be seen on the following table.

Furthermore, the calculation of the constant price of raw materials can be seen in the following table.

Table 4. Price Constant Material Raw (Input)

No	Year	Valid Price (Rp)	Constant Price (Rp)
1	2017	293,382,000	290,390,973
2	2018	255,261,000	252,583,614
3	2019	214,920,000	212,602,631
4	2020	172,938,000	171,039,462
5	2021	111,472,000	110,357,280

Price constant material standard year 2017 as big as Rp 290,390,973, year 2018 Rp 252,583,614, 2019 as big as Rp 212,602,631, year 2020 as big as Rp. 171,039,462, And year 2021 amounting to Rp. 110,357,280.

Furthermore is calculation level productivity. Calculation of productivity level consists of from productivity total, material standard, power Work, energy, and productivity etc. Calculation results level productivity total can seen on table following.

Table 7. Total Productivity Value Index

No	Period	Productivity Rate (%)	Index	Base Period Changes	Changes from Previous Period
1	I	2.9	1.01	0.01	-
2	II	2.79	0.97	-0.03	-0.04
3	III	2.88	1	0	0.03
4	IV	3.33	1.16	0.16	0.16
5	V	3.06	1.06	0.06	-0.09

In calculating the productivity value index total in period I the IP value was obtained of 1.01, the value changes from period base as big as 0.01, and value change from period previously as big as -0.04.

Calculation index factors productivity consists of from factor output (*output*), factor input (*input*), raw materials, labor, energy, etc. Following results calculation index factor output (*output*) that can be seen on the table following.

Table 8. Index Factor Output (Output)

Year	Period	Output Factors	Index	Base Period Changes	Previous Period Changes
2017	I	3,176,185,291	1.24	0.24	-
2018	II	2,822,073,026	1.1	0.1	-0.11
2019	III	2,568,453,853	1	0	-0.09
2020	IV	2,236,178,420	0.87	-0.13	-0.13
2021	V	1,731,897,860	0.67	-0.33	-0.23

In the calculation of the factor index output in period I the IP value was 1.24, the value changes from base period as big as 0.00, and value change from period previously as big as -0.11.

C. Index Factors Productivity

Calculation index factors productivity consists of from factor output (*output*), factor input (*input*), raw materials, labor, energy, etc. Following results calculation index factor output (*output*) that can seen on table following.

Table 9. Index Factor Output (*Output*)

Year	Period	Output Factors	Index	Base Period Changes	Changes from Previous Period
2017	I	3,176,185,291	1.24	0.24	-
2018	II	2,822,073,026	1.1	0.1	-0.11
2019	III	2,568,453,853	1	0	-0.09
2020	IV	2,236,178,420	0.87	-0.13	-0.13
2021	V	1,731,897,860	0.67	-0.33	-0.23

In the calculation of the output factor index (*output*) in period I it was found IP value of 1.24, value changes from period base as big as 0.00, and value change from period previously as big as -0.11.

While the index factor input (*input*) can seen on the table following.

Table 10. Index Factor Input (*Input*)

Year	Period	Output Factors	Index	Base Period Changes	Changes from Previous Period
2017	I	1,096,320,260	1.23	0.23	-
2018	II	1,010,306,508	1.13	0.13	-0.08
2019	III	892,879,338	1	0	-0.12
2020	IV	671,006,335	0.75	-0.25	-0.25
2021	V	565,395,592	0.63	-0.37	-0.16

On calculation index factor input (*input*) on period I Bintang Jaya have quality good, but still required obtained mark IP as big as 1.23, the change value from measurement quality to ensure quality product Which the base period is 0.23, and the change value from the previous period is -0.08.

D. Improvement Productivity

Based on results measurement productivityso action Which can done For increase productivity company can analyzed with *Fishbone diagram*. *Fishbone diagram* is one of the methods for analyzing reason from A problem, mismatch And the gap that occurs. To find out reason low productivity what happened to the company, so need known the cause as well as done corrective action or grouping of factors Which become reason low level productivity on company.

Based on *Fishbone diagram*, can be done productivity planning against Balado Crisps 4x7 Star Jaya that is:

1. Productivity Income

The decline income The same It means withthe decline level profit company. Matter This actually need help from management for do promotion And increase quality. Even though the company Kripik Balado 4x7

2. Productivity Material Baku

- 1) Material standard can due to Because cost material standard Which No stable, matter This can done with to build Work The same Which good with *supplier* so that the company can get price Which best in material standard.
- 2) Lack of material standard quality, so that impact on the results production produced. Should be company always coordinatewith *supplier* before order material standard.

3. Productivity Power Work

- 1) Employees, lack of motivation from the company to employee Which Work. Whereas motivation required For increase company performance. For that reason, the company can give award or incentive on employee Which capable showperformance

Which Good.

- 2) Method in do work Still Not yet There is map process operation. Employee do work only based on experience Work. So that Of course just can make it difficult for employees who just started working. For That can done with make map process operation Which standard.

4. Productivity Energy

- 1) Product Which produced more Lots from usually, matter This to signify the need There is optimization use of energy in a way balancing the load work with capacity machines production.
- 2) Energy Which used Not yet optimal, The same as it is with matter Which mentioned in on, required optimization use energy.

4. Conclusion

Based on results processing data And analysis results so can concluded that level total productivity *output* and *input* period I amounted to 2.90%, period II 2.79%, period III 2.88%, period IV 3.33%, And period V as big as 3.06%. The numbers Which obtained from calculation productivity the show that every month comparison *output* and *input* still not balanced. Whereas index productivity total experience decline but on end period measurement index experience improvement compared to with period basically. Index highest happen in 2020 amounting to 1.16% And index lowest happen on year 2018 as big as 0.97%. Matter This due to Because input *input* partial Also fluctuate. Efforts yes must done in Chips Balado 4x7 Star Jaya use increase productivity Wrong the only one is provide incentives to high-achieving employees with objective For Motivate employee other use look after interest And motivation in business improvement productivity. For further research, it is hoped that researching more in Again about productivity company. So that on variables certain Can more especially in terms of costs. So that the findings are can confirmed And generalized with Good, further research should use space scope study Which more wide (population Which large), so that the implications research provides results Which more Good.

Author Contributions Statement

Name of Author	C	M	So	V a	Fo	I	R	D	W
Yudi Faturrahman	✓	✓	✓	✓	✓	✓		✓	✓

Conflict of Interest Statement

Authors state no conflict of interest.

Informed Consent

We have obtained informed consent from all individuals included in this study.

Data Availability

The data that support the findings of this study are available from the corresponding author, [R], upon reasonable request.

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