

VALUE-ADDED AS THE BASIS FOR MEASURING LABOUR PRODUCTIVITY

Ph. D., M.Sc. Eng. Anna Kijewska
Silesian University of Technology, Poland

ABSTRACT

Productivity is generally defined as a ratio of output to input and may be expressed in physical quantity or financial value. At the organizational level, the financial value may refer to sales, value of production or value-added. Value-added (VA) indicates the wealth created through the organisation's production process or provision of services. According to the definition VA can be calculated as the difference between sales and the cost of materials and services incurred to generate the sales. This method is called the subtraction method or the VA creation method. Another way of calculating VA is by adding personnel cost (e.g. salaries and wages), management, cost of maintaining the business (e.g. interest from loans, depreciation), and profit. This method of calculation is called the subtraction method or the VA distribution method. If we assume that manpower plays key role in creating the wealth of an organisation, labour productivity (i.e. value-added per employee) may be used as the overall measurement of productivity. However, to investigate what affects labour productivity, disaggregation of this ratio should be made to the levels of activity and operational ratios. In this way, several indicators can be obtained, which allow the board to assess the productivity of its company. These levers are areas or actions that organisation can focus on to improve productivity, although the analysis shows that these levels are not autonomous. Improvements at one level require simultaneous action at some other levels to achieve the effect. A set of indicators used to assess productivity of the company can be called value-added productivity measurement.

The aim of the study is to assess the productivity of the Polish mining company based on the generated value-added and on indicators obtained from disaggregation of VA on the activity and operational levels. The analysis of results will allow showing in which areas improvements should be made.

Keywords: value-added, productivity, labour productivity, activity indicators, productivity indicators

INTRODUCTION

Each company must evaluate its activities. This assessment, on the one hand, aims to determine its current situation in relation to previous periods, and on the other hand to determine its position in relation to the competitors. One of the areas to be analysed is a broadly understood financial analysis, where several indicators are calculated from groups of ratios such as liquidity, debt, asset management,

profitability and market value. The analysis of the productivity of the company is a supplement, or rather broadening of the financial analysis.

Productivity shows the company's ability to use its resources. It is commonly defined as a ratio of a volume measure of output to a volume measure of input use. There are some objectives of productivity measures. These are [5]:

- to trace *technology* change which appears either in its disembodied form (e.g. scientific results, new organisational techniques) or embodied in products (e.g. new design, improved quality);
- to identifying changes in *efficiency*; to what extent a production process has achieved the maximum amount of output that is physically achievable with current technology and given a fixed amount of inputs,
- to achieve *cost savings*; it could be seen as a chance to identify real cost savings in production;
- to compare with other companies for measures expressed in physical units.

There are many different measures of productivity. At the industry or company level it is useful to use productivity measures that relate some measure of gross output to one or several inputs or to use a value-added concept to capture movements of output. Various productivity measures can be computed, depending on the treatment of inputs and outputs. Single-factor productivity ratios, such as labour productivity or capital productivity, give output per unit of a single input type. Multi-factor or total-factor productivity ratios take into account the fact that multiple inputs are jointly used [4].

Labour productivity is the most common productivity measures, partly because it is the easiest to compute. Labour productivity corresponds to output per unit of labour input or value-added per worker-hour. It reflects the efficiency and effectiveness of labour in the production and sale of the output. There are many factors that affect labour productivity; these are: demand factors, innovation, investment in machinery and equipment, technology, systems and processes, attitudes and skills of workers.

THE CONCEPT OF VALUE-ADDED

Value-added (VA) can be calculated through the modification of retained profit formula, which is obtained after subtraction from sales bought-in-materials and services, depreciation, wages, interests, dividends and taxes:

$$R = S - B - Dep - W - I - Div - T \quad (1)$$

where: R – retained profit, S – sales, B – bought-in-materials and services, Dep – depreciation, W – wages, I – interest, Div – dividends, T – taxes.

Hence Value-added is calculated according to the following formula (gross value-added):

$$S - B = W + I + \text{Dep} + \text{Div} + T + R \quad (2)$$

or (net value-added)

$$S - B - \text{Dep} = W + I + \text{Div} + T + R \quad (3)$$

VA can be calculated in two ways; either the left side is calculated – it is called subtractive method, or the right side is calculated – it is called additive method.

VA is distributed as wages to employees, depreciation for reinvestment in machinery and equipment, interest to lenders of money, dividends to investors and profits to the organisation. This distribution level reflects Value-added Statement which is obtained by modifying the profit and loss account. Equation (2) reflects the format of the VAS. Left side of (2) presents the upper part of the VAS, where the value of purchased materials and services is deducted from the sale revenues, which shows gross VA obtained by the company. The right-hand side of this equation corresponds to the lower part of VAS; it shows the distribution of the created gross value-added between participants that generate this value [3]. The simplified form of the VA statement can be illustrated as follows:

Sales Revenue	1000
Less: Cost of bought in goods and services	250
Value-added	750
<u>Distribution of Value-added</u>	
Employee Benefits	250
Capital providers (Creditors and Lenders)	100
Taxes	100
Value retained	300
Value-added	750

The value-added can be computed by using data from a company's financial statements. The analysis of VA information focuses on how well a firm is able to increase the sales by better integrating customer requirements into product functionality and service delivery. It also helps a company focus on listening to the voice of its customers, building core competency, and search for ways to purchase the raw materials at the optimal price. Hence creativity and innovation in translating customer needs into product and service development become critical [7, p. 42].

LABOUR PRODUCTIVITY INDICATORS

For each organization, the set of productivity indicators can be designed and adapted accordingly to its needs. It should be guided by certain principles:

- Indicators should measure something significant;

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- Indicators should be meaningful and action-oriented;
- Components parts of the indicators should be reasonably related;
- Indicators should be compared within industry or benchmarked;
- Data should be reliable and consistent;
- Indicators should be easily understood by employees and practical to obtain.

There are at least ten key indicators commonly used to measure an organisation's overall productivity performance. These are [2]:

	Indicator	Unit	Formula	What It Measures
1	Labour Productivity	Monetary unit	$\frac{\text{Value added}}{\text{No. of employees}}$	Efficiency and effectiveness of employees in the generation of VA
2	Sales per employee	Monetary unit	$\frac{\text{Sales}}{\text{No. of employees}}$	Efficiency and effectiveness of marketing strategy
3	Value-added-to-sales ratio	%	$\frac{\text{Value added}}{\text{Sales}}$	Proportion of sales created by the organisation over and above purchased materials and services
4	Profit margin	%	$\frac{\text{Operating profit}}{\text{Sales}}$	Proportion of sales left to the organisation after deducting all costs
5	Profit-to-value-added ratio	%	$\frac{\text{Operating profit}}{\text{Value added}}$	Operating profit allocated to the providers of capital as a proportion of value-added
6	Labour cost competitiveness	Times	$\frac{\text{Value added}}{\text{Labour cost}}$	Efficiency and effectiveness of the organisation in terms of its labour cost
7	Labour cost per employee	Monetary unit	$\frac{\text{Labour costs}}{\text{No. of employees}}$	Average remuneration per employee
8	Sales per monetary unit of capital	Times	$\frac{\text{Sales}}{\text{Fixed assets}}$	Efficiency and effectiveness of fixed assets in the generation of sales

9	Capital intensity	Monetary unit	<u>Fixed assets</u> No. of employees	Extent to which an organisation is capital-intense
10	Capital productivity	Times	<u>Value added</u> Fixed assets	Efficiency and effectiveness of fixed assets in the generation of value-added

An effective productivity measurement system should be an integral part of any organisation's information system. Regular data collection and calculation of productivity indicators allows for an in-depth analysis of the company's operations and internal comparative analysis within the assumed time horizon, as well as a comparison with indicators from a given sector. Generalizing, productivity indicators can be used to [1]:

- Evaluate the effectiveness of action plans;
- Monitor performance;
- Set targets and formulate strategies;
- Account to various stakeholders – customers, investors, employees, suppliers and funding agencies;
- Link effort and reward for employees.

The presented indicators are interrelated, and some of them can be assigned to the category respectively key management indicator, activity indicators and operational indicators. At the top is key management indicator, which is labour productivity. It can be broken down into activity and operational indicators. Activity indicators provide a picture of costs, activity levels and resource utilisation rates – they are useful for middle and higher management. Operational indicators are usually physical ratios that relate to operational aspects that need to be monitored and controlled.

PRODUCTIVITY INDICATORS OF MINING COMPANY

The calculations illustrating presented in this paper issue were carried out on the example of one of the Polish mining companies for the years 2014-2017. Based on the annual reports and financial statements, the conducted calculations are presented in tables 1-3.

Table 1. Value-added statement for mining company

	2014	2015	2016	2017
Revenues from sales	1 627	1 657	1 538	1 798
Material costs	580	1 368	586	604
Value Added [million €]	1 046	289	953	1 194
Distribution of Value Added distribution [million €]	2014	2015	2016	2017
	1 046	289	953	1 730
Employees	870	841	658	757
Capital providers	26	36	47	-2
Interest	26	36	47	-2
Dividend	0	0	0	0
State Budget	-3	-128	54	181
Income Tax	-54	-182	3	137
Taxes	51	54	51	44
Company	154	-459	193	793
Depreciation	311	326	192	194
Retained earnings	-157	-785	1	599

Table 2. Value-added distribution for mining company

Value Added Distribution	2014	2015	2016	2017
Employees	83%	291%	69%	44%
Capital providers	2%	12%	5%	0%
State Budget	-0,3%	-44%	6%	10%
Company	15%	-159%	20%	46%
	100%	100%	100%	100%

Table 3. Productivity performance indicators for mining company

Ratios	2014	2015	2016	2017
1-Labour productivity	€ 43 886	€ 11 424	€ 41 503	€ 57 571
2-Sales per employee	€ 68 227	€ 65 537	€ 67 024	€ 86 662
3-Value-added-to-sales-ratio	64,32%	17,43%	61,92%	66,43%
4-Profit margin	-11,37%	-56,18%	3,37%	40,83%
5-Profit-to-value added ratio	-17,67%	-322,30%	5,44%	61,47%
6-Labour cost competitiveness	1,20	0,34	1,45	1,58
7-Labour cost per employee	36 476	33 241	28 685	36 492
8-Sales per 1 € of capital	0,57	0,82	0,91	1,10
9-Capital intensity	€ 119 591	€ 80 037	€ 73 697	€ 78 993
10-Capital productivity	0,37	0,14	0,56	0,73

The situation in mining, including also in Poland, is very variable, which is reflected in the financial results. The net profit generated by the audited company changed from the net loss in 2014 (-156.9 million €) and in 2015 (-785 million €), through net profit in 2016 (1 million €) and in 2017 (599.2 million €). This, among

others had an impact on the VA generated - as can be seen in Table 1. These two years of net loss meant that the company did not pay taxes and retained earnings are recorded as negative. This makes it difficult to analyse VA distribution.

It is much easier to analyse the years 2016-2017. The main changes are the reduction of VA distribution to employees and the increase of VA distribution to the company.

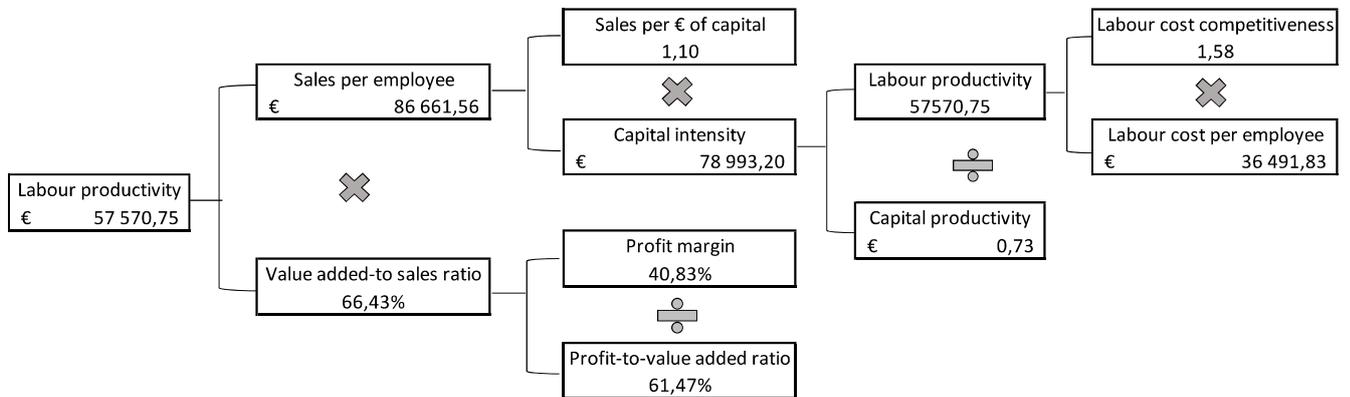


Fig. 1. Disaggregation of the Labour productivity indicator (values for the year 2017 of the mining company)

Analysing the productivity performance indicators (Tab. 3), the years 2015 to 2017 are optimistic. Most indicators are gradually increasing. For example, Labour productivity has more than quadrupled, and Sales per employee increased by over 30%. It is worth showing the relationship between these indicators, so you can see which indicators and to what extent they have affected Labour productivity. This is shown in Figure 1.

For each company, the disaggregation of Key management indicator (Labour productivity) can be achieved for the analysis to show the relationship between the various indicators specific to a particular industry and indicate the activity and operational indicators. An example of such a visualization for a surveyed mining company is shown in Figure 2.

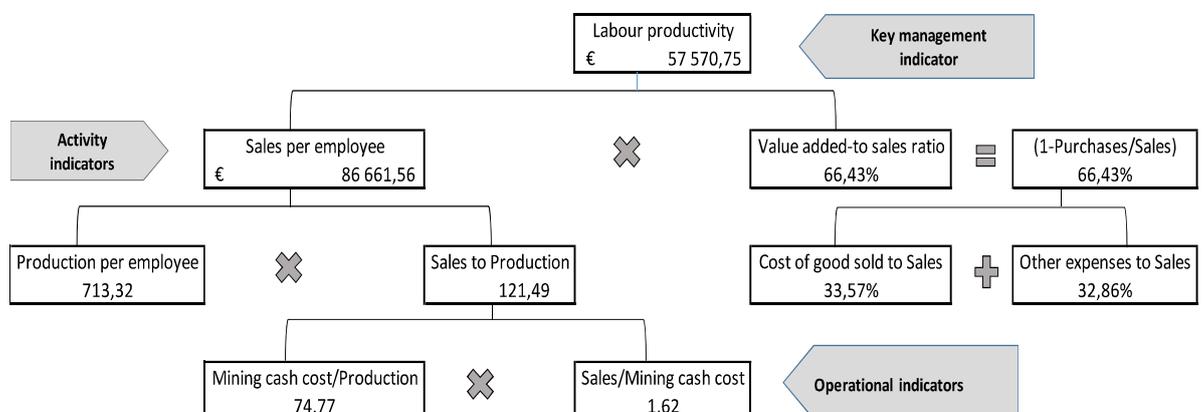


Fig. 2. Factors affecting the labour productivity indicator (values for the year 2017 of the mining company)

CONCLUSION

Productivity measurement usually deals with three perspectives with the primary focus on the input side. The first one is called the total factor in which an organisation's output is divided by total input. Partial or multi-factor productivity measurement involves the relationships between total output and two or more input factors. And the last one is called single factor productivity measurement calculated as a total output divided by a single input factor. Each perspective represents different challenges for measurement effort [6].

Recently, we have been observing a special emphasis on the output side and the attention has turned to how much value, i.e. value-added, a firm is able to generate. The term value-added is used to show how well a firm can utilize both tangible and intangible assets which represent its input factors. This is because an output should not only represent what a firm produces but also reflect the value-added into the products and/or services to be used by customers.

The basic productivity indicator based on value-added is Labour productivity. But for a thorough analysis it is necessary to disaggregate this indicator into other ones. In this way, a number of indicators mutually related to each other can be obtained. Thanks to this, it is possible to analyse which indicators and to what extent they have affected Labour productivity, as well as being able to simulate using the "what if" method.

The work presents these issues on the example of a Polish mining company, but the problem is of a general nature and such analysis can be carried out for a company from any sector, possibly selecting an activity and operational indicators.

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