



# Measuring Company Performance Using the Integrated Indicator

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**Abstract:** *When assessing the company's financial position and performance, we most often use financial indicators such as net income, rate of return on assets, rate of return on equity, cash flow and the like. However, dynamic business conditions have brought the need to use an integrated (composite) indicator, especially for a comparative long-term analysis of several companies. The composite indicator consists of individual indicators (variables) and allows for a comprehensive assessment of performance in order to get a full picture of the company's business that all stakeholders can understand. The application of this indicator is possible at the national and international levels. Therefore, this paper aims to point out how performance measurement using a composite indicator facilitates the assessment of business operations, but also investors' decision-making.*

## 1. INTRODUCTION

The rapid expansion of production and trade, the general trend of world market globalization, growing competition, technological and software development have conditioned the intensification of flows of goods, services and capital. In such conditions, managers need timely and accurate information as well as tools to identify opportunities for business improvement. Managers do not have a large number of tools at their disposal to examine multiple variables, which will at the same time facilitate decision-making regarding changing business strategy. However, the application of composite indicators will provide information on performance flows and performance evaluation over time. Also, their application can provide information on the environment in which companies operate.

The research subject includes 12 service companies selected with the highest revenue in 2020. Data in the period from 2018 to 2020 is observed. Secondary data is used and the selected variables (operating income, net income, total assets, equity and return on assets), using multivariate analysis, i.e. composite indicators, create a new variable (Total Performance Indicator) that allows us to rank companies and more easily assess their financial position and performance. This paper aims to form a composite indicator using multivariate analysis to examine the extent to which composite indices are suitable for measuring performance.

In that sense, the paper is divided into three parts. The first part provides an overview of the literature. The second part of the paper deals with the methodology of factor analysis, research design and description of indicators that are the starting point for data processing in the statistical program (*Statistical Package for the Social Sciences* – SPSS). Finally, the results and analyses are presented.

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## 2. REVIEW OF LITERATURE

The service sector is growing in importance and has an increasing share in the national economy. The basic task of service companies is to provide differentiated services of high quality at an appropriate price with minimal costs. The service sector is becoming the dominant sector of offering products/services in line with consumer needs. Faced with competition, managers need to bring company services closer to customers in order to achieve success (Blešić et al., 2011). Continuous monitoring of the achieved performance enables companies to focus their strategy on the goals set.

Performance measurement as an integral part of management accounting has been widespread since the 1990s among the scientific and professional community as well as numerous practitioners (Haktanir, 2005; Atkinson, 2006). Success in achieving the company's goals will depend on the way performance is measured, but also on the time at which the measurement is made. Of course, the process of measuring performance is constant and continuous, but for an adequate assessment of the company's performance, it is necessary to evaluate and review the achieved performance at least once a year. There are several studies evaluating the evolution of performance measurement and performance management systems (Bititci et al., 2012; Choong, 2014). The concept of performance measurement is very important for a company's business strategy, competitive position and long-term economic sustainability (Pnevmatikou-di & Stavrinoudis, 2016). Measures such as earnings per share, return on investment (RoI), and rate of return on capital employed (RoCE) can be used to measure performance (Ezzemel, 1992). Neely et al., (2005) point out that the level of performance that a company achieves is the result of the efficiency and effectiveness of the actions it takes. A performance measurement system is defined as a set of metrics used to quantify actions. In this regard, popular indicators of efficiency and effectiveness are the rate of return on investment and market share.

Performance measurement systems can help companies evaluate, control, learn, and improve their business (Behn, 2003). Neely (2005) highlights five phases to explain the evolution of performance measurement literature. He calls the first phase the *problem identification* that characterizes the 1980s. At this stage, dissatisfaction with the use of traditional measures is observed and expressed (Chakravarthy, 1986). The 1990s bring the second phase of *potential solutions* to address dissatisfaction. In this period, Kaplan & Norton (1992) propose a balanced scorecard with four perspectives: the financial perspective, the consumer perspective, the internal processes perspective, and the learning and growth perspective. BSC (Balanced Scorecard – BSC) has become a practical approach used in measuring performance (Neely, 2005). In the third phase, methods for applying a *performance measurement system* in the late 1990s are sought. The fourth phase focuses on *empirical research on company capabilities and their performance measurement*. The focus is on researching the ability to measure the impact of performance measurement on customers (Evans, 2004). The final phase is the *theoretical verification of the set of performance measurement frameworks* that causes new problems (Choong, 2014; Malina et al., 2007).

For performance measurement in service organizations such as banks, retail, and insurance organizations there are various approaches (Sainaghi, 2010). However, there is a noticeable lack of performance management studies in the hospitality and tourism industry (Sainaghi et al., 2017) which has unique characteristics such as service complexity, capital investment, sensitive production processes where customers are involved in the production process, the importance of work location, environmental sensitivity and the like.

In recent years, when making decisions about the company performance, the method of multivariate analysis, i.e. composite indices, has been used. Composite indices represent the aggregation of basic indicators into one indicator and are used in different sectors. Although there are different ways of measuring performance, a large number of authors emphasize the creation of a composite indicator as a tool for performance evaluation. Composite indices are used in the health sector, social services, education and other sectors (Freudenberg, 2003). They enable the use of a single result that includes a range of performance indicators.

There are many dilemmas to consider before using composite indicators. They relate primarily to whether composite indices can accurately reflect company performance and whether the way they are created affects their instability and unreliability. In addition, you need to know to what extent they can be affected by uncertain conditions. Regardless of these dilemmas, what is certain is that the use of composite indicators offers a full assessment of performance and presents a broader picture of the company's business that the public can understand.

### 3. SAMPLE DESIGN AND RESEARCH METHODOLOGY

The use of composite indicators as a tool for multivariate analysis is becoming popular because the observation of a certain problem can be included in one indicator. There is a large number of definitions that describe multivariate analysis, so we opt for the following: *multivariate analysis is a set of statistical methods that simultaneously analyze multidimensional measurements obtained for each observation unit from the set of objects we examine* (Kovačić, 1994).

Composite indicators allow the measurement of multidimensional concepts that cannot be viewed based on a single indicator (Nardo et al., 2008). Due to the ability to evaluate the company's performance, the popularity of composite indicators is growing. They enable monitoring of performance over time, enable ranking of companies and facilitate the interpretation of the results obtained. When defining the sample for the application of the composite indicator methodology, we first look at the list of companies with the highest revenue in 2020, published by the Business Registers Agency. The sample consists of 12 companies from the service sector (six companies from the trade sector: *Delhaize Serbia, Nelt Co., Mercator-s, Lidl, Phoenix Pharma and Mercata Vt.*), while the second group consists of six companies from the hospitality industry: *Mona Hotel, Hotelsko TT Palisad, Mountain Resort Kopaonik, Hotel Putnik Kopaonik, Tonati and Solaris Resort Vrnjačka Banja*). The composite indicator is designed and tested using real data. Secondary data taken from companies' financial statements are used. The basic set of selected variables (operating income, net income, total assets, equity and return on assets) and the method of their measurement are shown in Table 1.

**Table 1.** Variables selected to create a composite indicator

Variables	Measurement	Acronym
Operating income	Highlighted in income statement	OI
Net income	Highlighted in income statement	NI
Total assets	Highlighted in balance sheet	TA
Equity	Highlighted in balance sheet	K
Return on assets	Operating Income/Total assets	ROA

**Source:** Authors

Table 2 shows the ranking of companies by individual original values of selected variables (operating income, net income, total assets, equity and return on assets). In the period from 2018

to 2019, out of the five observed variables, Delhaize is in the first place, while Solaris is in the last place in four of the five observed variables. Solaris has the first position based on ROA in 2019 (10.34). The ranking of other companies according to the values of their variables is given in Table 2.

The quality of the composite indicator depends on the methodology used in its creation, but it also depends on the quality of the data used in the analysis. By combining individual indicators into one indicator, the model forms a composite indicator. The composite indicator aims to measure multidimensional concepts that cannot be covered by a single indicator. The advantages of using a composite indicator include the following (OECD, 2008): summarizing complex, multidimensional areas in order to support decision-makers; it is easier to interpret one composite indicator than a larger number of individual ones; may indicate the progress of the test unit over time; reduces the empirical set of indicators without losing the necessary information; enables communication with the public and promotes accountability and enables users to efficiently compare complex dimensions.

However, composite indicators can create a misconception about the observed phenomenon if they are not adequately formulated or interpreted (Nardo et al., 2005). The subjective choice of constructing composite indicators is also mentioned as a disadvantage (for example, the choice of data aggregation, the choice of weights, etc.), which can lead to erroneous conclusions regarding the performance of companies or countries (Munda & Nardo, 2003).

Creating composite indicators is a very complex process and involves specific steps that need to be followed. The phases of creation offer different alternatives that determine the quality and accuracy of the obtained results. Creating a composite index involves the following steps (OECD, 2008):

- Formulation of a theoretical framework;
- Data selection;
- Treatment of missing data;
- Multivariate data analysis;
- Data normalization;
- Weighting;
- Aggregation;
- Sensitivity analysis;
- Examination of correlation with other indicators and
- Result interpretation.

The above steps need to be harmonized, and the choice of method within these steps depends on the data available. Before creating a composite indicator, descriptive statistics of the defined sample should be considered. This is important because differences in the values of indicators in terms of units of measurement require data normalization. As there are different units of measurement in the sample, the normalization is performed using min - max transformation, which enables the transformation of values to an identical range of values. Normalized values range from 1 to 7 based on the World Economic Forum methodology. In this way, we raise the comparative ability of the indicator.

For positive indicators, i.e. to increase the value of variables that positively affect performance, the following formula 1 is applied during transformation (WEF, 2016, p. 241). We subtract the

Table 2. Ranking of companies according to individual variables from 2018 to 2020

Company	Year	Operating income	Rank	Net income	Rank	Total assets	Rank	Equity	Rank	ROA	Rank
Delhaize Serbia, Beograd	2018	100.054.412,00	2	2.665.532,00	1	84.120.570,00	1	43.381.505,00	1	82,94%	1
	2019	104.316.102,00	1	5.175.014,00	1	86.236.774,00	1	43.381.506,00	1	9,02%	2
	2020	110.942.458,00	1	3.930.919,00	1	72.196.168,00	1	28.094.597,00	2	10,07%	1
Lidl, Nova Pazova	2018	113.310.885,00	1	(5.506.033,00)	12	32.919.883,00	3	38.424.488,00	2	(15,47%)	12
	2019	37.849.263,00	5	(1.986.593,00)	11	41.475.819,00	3	40.786.204,00	2	(2,30%)	12
	2020	57.013.057,00	4	1.138.121,00	2	53.999.296,00	3	40.786.204,00	1	4,70%	4
Mercator-s, Novi Sad	2018	83.078.502,00	3	(1.662.330,00)	11	54.070.144,00	2	15.950.663,00	3	(1,45%)	10
	2019	77.514.350,00	3	(2.157.800,00)	12	65.807.174,00	2	10.743.906,00	3	1,64%	8
	2020	79.215.605,00	2	(5.478.054,00)	12	55.477.309,00	2	4.871.515,00	3	2,92%	3
Nelt Co.	2018	78.271.156,00	4	536.442,00	3	25.794.613,00	4	534.631,00	6	2,14%	7
	2019	78.195.986,00	2	601.208,00	2	26.476.799,00	4	534.631,00	6	2,82%	6
	2020	77.060.501,00	3	783.179,00	4	26.798.700,00	4	534.631,00	6	3,71%	2
Phoenix Pharma	2018	43.981.793,00	5	146.139,00	5	20.893.429,00	5	1.403.220,00	5	1,76%	8
	2019	52.173.571,00	4	568.707,00	3	22.563.122,00	5	1.403.220,00	5	2,14%	7
	2020	55.900.338,00	5	1.004.396,00	3	25.082.084,00	5	1.403.220,00	5	2,66%	5
Mercata Vt.	2018	29.297.909,00	6	255.577,00	4	6.653.464,00	6	16.256,00	11	6,96%	4
	2019	23.969.592,00	6	336.613,00	4	6.426.845,00	6	16.256,00	10	6,16%	4
	2020	55.398.515,00	6	650.391,00	4	9.604.554,00	6	27.492,00	11	7,64%	6
Mountain Resort Kopaonik	2018	973.467,00	7	612.302,00	2	5.501.334,00	7	2.160.783,00	4	2,98%	5
	2019	796.653,00	7	279.166,00	5	4.928.769,00	7	2.160.783,00	4	(1,75%)	11
	2020	663.930,00	7	55.659,00	6	4.960.227,00	7	2.160.783,00	4	0,70%	9
Solaris Resort Vrnjačka Banja	2018	178.099,00	10	5.675,00	8	28.153,00	12	8.667,00	12	22,88%	2
	2019	167.006,00	10	3.922,00	10	54.697,00	12	12.589,00	11	10,34%	1
	2020	111.477,00	12	6.533,00	9	56.501,00	12	6.056,00	12	(11,30%)	12
Mona Hotel	2018	484.357,00	8	70.901,00	6	90.394,00	11	353.765,00	7	9,39%	3
	2019	481.148,00	8	18.897,50	6	991.488,00	10	353.765,00	7	7,85%	3
	2020	272.458,00	9	(46.207,00)	10	1.051.011,00	10	353.765,00	7	(3,82%)	7
Hotelsko TT Palisad	2018	405.932,00	9	7.878,00	7	1.879.629,00	8	209.136,00	8	2,18%	6
	2019	405.931,00	9	8.112,00	9	1.867.765,00	8	209.136,00	8	0,97%	10
	2020	242.905,00	10	155,00	8	1.834.667,00	8	209.136,00	9	(3,36%)	8
Hotel Putnik Kopaonik	2018	18.595,00	11	(6.923,00)	10	692.059,00	10	162.502,00	9	(0,46%)	9
	2019	148.596,00	11	15.912,00	7	755.306,00	11	162.502,00	9	3,45%	5
	2020	162.414,00	11	28.508,00	7	787.425,00	11	162.502,00	10	5,04%	10
Tonati, Beograd	2018	0	12	562,00	9	979.626,00	9	20.000,00	10	(1,83%)	11
	2019	125.212,00	12	10.628,00	8	1.750.602,00	9	11.000,00	12	1,20%	9
	2020	276.389,00	8	(121.639,00)	11	1.689.559,00	9	297.015,00	8	(5,97%)	11

Source: Authors' calculation adapted from Business Registers Agency, 2020.

minimum value and divide it by the range between the minimum and maximum value. Formula 2 will be applied to indicators where a higher value leads to a weaker result or a decrease in the development indicator.

$$TI_{ji} = 6 * \frac{I_{ji} - I_j^{min}}{I_j^{max} - I_j^{min}} + 1 \quad (1)$$

$$TI_{ji} = -6 * \frac{I_{ji} - I_j^{min}}{I_j^{max} - I_j^{min}} + 7 \quad (2)$$

where:

$TI_{ji}$  – transformed value of j-th indicators in the indicator;

$I_{ji}$  – value of the j-th indicator in the i-th company;

$I_j^{min}$  – minimum value of the j-th indicator in companies;

$I_j^{max}$  – maximum value of the j-th indicator in companies.

As the increase of selected variables has a positive effect on the performance of companies, we applied formula 1 for data transformation.

#### 4. RESULTS AND DISCUSSION

Correlation analysis allows for determining the degree of agreement between indicators. It determines the strength and direction of the linear correlation between two variables (Pallant, 2009, p.129). Small values of partial correlation indicate the existence of real factors among the data. Based on the values in the correlation matrix (Table 3), it can be noticed that the highest degree of direct quantitative agreement is between operating income and operating assets (0.872), then between total assets and equity (0.794), while in the third place is the ratio of equity and total assets (0.642). The lowest degree of agreement is between net income and operating income.

**Table 3.** Correlation matrix

		ROA	Operating income	Equity	Total assets	Net income
Correlation	ROA	1.000				
	Operating income	0.235	1.000			
	Equity	0.324	0.642	1.000		
	Total assets	0.391	0.872	0.794	1.000	
	Net income	0.399	0.036	0.121	0.162	1.000

**Source:** Authors' calculation using SPSS

The Kaiser-Meyer-Olkin measure and the Bartlett test are used to determine the justification for the application of factor analysis. The value of the Kaiser-Meyer-Olkin measure should be greater than 0.6 (Haier et al., 2010), which in this case is (0.646). If the value is not higher, then the correlation matrix is not appropriate for factor analysis, while the Bartlett test measures the adequacy of sampling for each variable in the model, as well as for the whole model. The condition is that the realized level of significance is less than 0.05 because it indicates that the correlation matrix of data has significant correlations between indicators (Pallant, 2009, p.138). The realized level of significance of the test is 0.000, which is less than 0.05 and justifies the use of factor analysis.

Finally, a component matrix is obtained in which it is important that the sum of the weights is equal to 1. The value shown in Table 5 is pre-processed by obtaining a sum for each indicator



and then dividing the value of the individual weight by that sum to receive a weight that can be further used to create a composite indicator.

**Table 4.** KMO and Bartlett test

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</b>		0.646
<b>Bartlett's Test of Sphericity</b>	Approx. Chi-Square	93.488
	Df	10
	Sig.	0.000

**Source:** Authors' calculation using SPSS

**Table 5.** Weights

<b>Indicator</b>	<b>Total Performance Indicator</b>
Operating Income	0.245
Net Income	0.082
Total assets	0.272
Equity	0.245
ROA	0.156

**Source:** Authors' calculation using SPSS

After weighting, the weighted values of the indicators are aggregated to obtain the value of the composite indicator. Based on the weight, it is possible to define a formula for calculating the Total Performance Indicator:

$$TPI = 0.245 \times OI + 0.082 \times NI + 0.272 \times TA + 0.245 \times E + 0.156 \times ROA$$

Where:

*TPI* – Total Performance Indicator.

The obtained indicator will be applied to selected companies in the period from 2018 to 2020. The Total Performance Indicator enables the determination of the rank of individual companies in the observed period (Table 6).

**Table 6.** Values of total performance indicator in the period from 2018 to 2020

<b>Company</b>	<b>2018</b>	<b>Ranking</b>	<b>2019</b>	<b>Ranking</b>	<b>2020</b>	<b>Ranking</b>
Delhaize Serbia, Beograd	6.67	<b>1</b>	6.18	<b>1</b>	5.43	<b>1</b>
Lidl, Nova Pazova	4.40	<b>2</b>	3.94	<b>2</b>	4.64	<b>2</b>
Mercator-s, Novi Sad	3.95	<b>3</b>	3.93	<b>3</b>	3.42	<b>3</b>
Nelt Co.	2.97	<b>4</b>	2.99	<b>4</b>	3.00	<b>4</b>
Phoenix Pharma	2.44	<b>5</b>	2.60	<b>5</b>	2.72	<b>5</b>
Mercata Vt.	1.98	<b>6</b>	1.91	<b>6</b>	2.40	<b>6</b>
Mountain Resort Kopaonik	1.65	<b>7</b>	1.57	<b>7</b>	1.57	<b>7</b>
Solaris Resort Vrnjačka Banja	1.62	<b>8</b>	1.50	<b>9</b>	1.29	<b>12</b>
Mona Hotel	1.51	<b>9</b>	1.51	<b>8</b>	1.40	<b>10</b>
Hotelsko TT Palisad	1.47	<b>10</b>	1.46	<b>10</b>	1.41	<b>9</b>
Hotel Putnik Kopaonik	1.41	<b>11</b>	1.45	<b>11</b>	1.47	<b>8</b>
Tonati, Beograd	1.40	<b>12</b>	1.45	<b>12</b>	1.38	<b>11</b>

**Source:** Authors' calculation using SPSS

Different methods can be used when aggregating weighted indicator values. The method of linear aggregation is used in the paper, because all individual indicators are expressed in the same units of measurement, respecting mathematical properties (Nardo et al., 2008). During the normalization of the indicators, a transformation model is applied, which reduces the values of the

indicators to a scale from 1 to 7, so it is to be expected that the values of the composite indicator are in that range. Based on Table 6, it can be noticed that the maximum value of the indicator for 2018 is 6.67 (Delhaize), and the minimum value is 1.40 (Tonati). The maximum value of the indicator in 2019 is recorded at Delhaize (6.18), and the minimum value of the indicator is maintained at the Hotel Tonati (1.44). In 2020, Delhaize has the highest value again (5.42), and Solaris Resort has the lowest value (1.29). So, in the observed period, the first seven companies do not change their ranking. The change of ranking is recorded at Hotel Mona (2018 - 9, 2019 - 8, 2020 - 9). Solaris Resort takes the eighth position in 2018, the ninth in 2019, while in 2020 it is in the twelfth position. Hotel Putnik records an improvement in the list of observed companies, so in 2020 it is in the eighth position, and 2018 in the eleventh.

Comparing the obtained ranking of companies in Table 2 and Table 6, it can be noticed that Delhaize and Solaris occupy the same position. In fact, the first five companies have the same ranking based on the analysis of individual values and the values of the obtained composite indicator. However, it is much easier, simpler and faster to make a decision based on an aggregate indicator.

The proposed composite indicator summarizes corporate performance. The main positive advantage compared to a set of individual indicators is that the model summarizes corporate sustainability and allows for a quick and clear comparison. Also, the composite indicator model facilitates detailed analysis and easier visualization of all performance indicators along with their benchmarks. It is possible to make comparisons over time, rank and benchmark companies. In this way, partial and hidden information is eliminated. It is possible to simultaneously assess the total performance, including the difference in performance between companies in one view, all of which facilitates the interpretation of results without losing information due to the reduction in the number of indicators (Hudrliková, 2013). A composite performance indicator is a comprehensive approach, as it also contains an essential element of corporate sustainability, i.e. corporate governance (Zhou et al., 2012).

There are two perspectives on composite indicators (Sharpe, 2004): *proponents of composite indicators* who think aggregation of individual indicators is important because it allows for a better, easier and simpler view of a multidimensional phenomenon and *opponents of composite indicators* who point out that a set of individual indicators is sufficient for studies of a certain phenomenon and that they should not be combined due to the presence of subjectivity in the weighting of indicators.

In any case, based on the above, we can see that composite indicator can be a very useful tool for decision making. There is no generally accepted methodology for creating a composite indicator, but the methodology is very flexible and adapts to specific situations in practice (Saisana & Tarantola, 2002).

## 5. CONCLUSION

Continuous market research is a basic prerequisite for creating new services and achieving consumer satisfaction and competitive advantage in the market. Therefore, the service sector must frequently evaluate performance and change goal setting. One way of evaluation is the use of composite indicators. Composite indicators are useful for assessing various phenomena that cannot be covered by a single indicator. However, as indicators are aggregated to calculate the value of the composite indicator, it can also be used to assess economic performance.



The objective of the paper has been to form a composite indicator using multivariate analysis to examine the extent to which composite indices are appropriate for measuring performance. The obtained results justify the use of composite indicators for easier assessment of companies' business and decision-making. The obtained ranking using individual variables for measuring performance (operating income, total assets, equity and return on assets) and the obtained composite indicator indicate that companies occupy the same ranking. In the sample of 12 companies from the service sector in the period from 2018 to 2020, Delhaize and Tonati occupy the same position (first and last). The maximum value of the composite indicator for 2018 is 6.67 (Delhaize), and the minimum value is 1.40 (Tonati). The maximum value of the indicator in 2019 is again recorded at Delhaize (6.18), and the minimum value of the observed companies is maintained at Tonati (1.44). In 2020, Delhaize has the highest value again (5.42), and Solaris Resort has the lowest value (1.29). So, in the observed period, the first five companies do not change their ranking. The change of ranking is recorded at Hotel Mona (2018 - 9, 2019-8, 2020-9). Solaris Resort takes the eighth position in 2018, the ninth in 2019, while in 2020 it is in the twelfth position. Hotel Putnik records an improvement in the list of observed companies, so in 2020 it is in the eighth position, and 2018 in the eleventh. In fact, the first five companies (Delhaize Serbia, Belgrade, Lidl, Nova Pazova, Mercator-s, Novi Sad, Nelt Co., Phoenix Pharma) have the same ranking based on the analysis of individual values and the values of the obtained composite indicator. Based on aggregate indicators decisions are made easier, simpler and faster.

As composite indicators focus on important business issues of companies and offer a full picture of the assessment of business and financial position of companies, it is likely that they will continue to be used in various fields. A careful approach needs to be established when selecting indicators that can be used to measure performance in the service sector and create a composite indicator.

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