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# RANKING PRIVATE HIGHER EDUCATION INSTITUTIONS BASED ON TOPSIS METHOD

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Review paper

**Abstract:** The national economy of each country and its long-term development depend on the quality of the human resources. The higher education sector is one of the most important factors in building a high-quality workforce. It is exactly because of the importance of higher education institutions that countries used to have a key role in their financing, regulation and supervision. However, the commercialisation of the higher education sector has led to the abolition of the monopoly held by public higher education institutions, i.e. to the opening of private institutions. Recently, the ranking of higher education institutions has been gaining importance. This study used the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) to rank order the private higher education institutions in the Republic of Serbia in 2021. The study was carried out using 16 criteria, mostly accounting ones, to rank the private institutions. It involved 10 private universities, together with their member faculties, 10 private colleges of academic studies, and 16 colleges of applied studies. The obtained ranking results are beneficial to the institutions in terms of their business improvement aimed at staying ahead of the competition, and meeting the stakeholder needs.

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## 1. Introduction

In recent decades, when making decisions, special attention is paid to Multi-attribute or multi-criteria decision problem (MADM or MCDM). Today, this tool is

often used when solving complex problems, esspecialy in condition of considering multiple attributes while selecting the optimal alternative (Feng, et al., 2022). Multi-criteria analysis enables decision-making in conflicting conditions, when there are several alternatives and criteria, some of which should be maximized and some of which should be minimized. Researches usually use AHP (Analytic Hierarchy Process) and TOPSIS (Technique for Order Preference by Simmilarity to Ideal Solution) method when establishing evaluation models (Wang et al. 2022).

The higher education sector plays a key role in the development of the national economy of a country. It is exactly because of the importance of higher education institutions that countries used to have the main role in their financing, regulation and supervision. However, the commercialisation of the higher education sector has led to the abolition of the monopoly held by public higher education institutions, i.e. to the opening of private institutions (Ashour & Kleimann, 2024; Buckner, 2017; Pucciarelli & Kaplan, 2016; Sanoff, 2007). Recent years, the increase of competition among universities on a local and global basis reveals for the individuals and institutions the need of ranking universities, considering many different comparable criteria with regard to universities. (Bağdatlı, et al., 2017). Due the important role of higher education it is necceserry to evaluate the performance of higher education institutions. (Moradi, 2022).

## 2. Literature rewiev

The TOPSIS method represents one of the methods of multi-attribute decision-making in a complex and uncertain environment. TOPSIS was developed by Hwang & Yoon in 1981 (Lai et al., 1994). This method is used to analyse the distance of alternatives from the ideal and anti-ideal solution, and favors the alternative that has the shortest Euclidean distance from the ideal, and at the same time the longest distance from the anti-ideal solution.

Due to its simplicity and ease of use, the TOPSIS method has been used in many areas. It has proved to be efficient in ranking higher education institutions on the basis of accounting information and therefore can be a useful tool for providing their stakeholders (potential and current students and suppliers) with the information about their current situation in terms of liquidity, profitability and size. Many authors have used this method to rank higher education institutions based on various criteria.

Chakraborty (2022) ranked the universities on the Times Higher Education List using five criteria: teaching, research, citation metrics, industry income, and international outlook. Within the teaching criterion, five indicators were combined: the research on the reputation of a university, which was carried out by means of a survey, the ratio of the number of teaching staff members to the number of students, the ratio of the number of doctoral students to that of undergraduate students, the

ratio of the number of doctoral students to the number of teaching staff members, and the institutional income from tuition fees. Within the framework of the research criterion, three indicators were combined: the research on the university reputation, research income, and research productivity (the number of papers published in academic journals indexed in Elsevier's Scopus database). The citation metrics were calculated as the average number of citations of published papers. The commercial income was determined based on the amount of income generated by the institutions by means of scientific research work. The international outlook comprised three criteria: the share of international students in the total number of students, the number of international staff members in the total number of staff, and international collaboration measured by the share of publications with at least one international co-author in the total number of publications.

Hao Qi et al (2022) ranked 30 higher education institutions in China based on the following criteria: number of teaching staff (academicians), number of published scientific works (core papers), key disciplines (number of study programmes that are significant for the development of the institutions), national- level majors (number of study programmes that have been declared as priorities), number of master's degree programmes, and number of doctoral degree programmes.

Wang, Nguyen & Phan (2022) ranked 45 private universities in Vietnam based on seven criteria: teaching staff (number of teachers engaged), non-teaching staff (number of non-teaching staff members), facilities used for training and scientific research purposes (exact number of square meters used for teaching and research activities – amphitheatres, auditoriums, laboratories, etc.), number of students (enrolled in the current academic year), number of graduated students in the current academic year, percentage of students who get a job one year upon graduation, and revenue from tuition fees.

Zhang et al. (2021) established the evaluation index system of higher education development level using the combination of a weighting method and TOPSIS to calculate the score of higher education development level in 19 countries. A total of 16 secondary indicators were used for the horizontal and vertical comparative analysis, covering the period of 20 years.

Şahinbaş & Keskin (2022) used TOPSIS to rank nearly 1,500 higher education institutions worldwide based on 8 key indicators. Midodashvili et al (2020) ranked five educational programmes at Gori State Teaching University based on 11 indicators, covering the period of 5 years.

Different criteria are used to rank higher education institutions based on quality. The commonly used ones include: number of students (enrolled or graduated) (Gibbons et al, 2015), number of staff (teaching and non-teaching) (Fu et al. 2023; Civera et al. 2020), and financial indicators (income from tuition fees or other business income) (Belenkuyu & Karadag, 2024).

## 3. Research methodology and data

The aim of the research is to describe the basic steps of the use of the TOPSIS method in ranking private higher education institutions in the Republic of Serbia based on accounting data. The subject of the research is the TOPSIS-based ranking of all private higher education institutions in the Republic of Serbia in 2021.

### *3.1. AHP method*

The characteristic vector method is used to assess the importance of the mentioned criteria, which is the basis of the Analytical Hierarchy Process, a method developed by Thomas Saaty (Saaty, 1980).

The basic idea of the AHP method is that instead of ranking all criteria by importance at the same time, criteria are compared two by two and weight coefficients are calculated.

For each pair of criteria rating the relative "priority"of the criteria is done by assigning a weight between 1 (equal importance) and 9 (extreme importance) to the more important criterion, whereas the reciprocal of this value is assigned to the other criterion in the pair, given in Table 1.

**Table 1. Saaty's scale of relative importance**

| Intensity | Definition |
|---|---|
| 1 | Equal importance |
| 3 | Moderate importance |
| 5 | Strong importance |
| 7 | Demonstrated importance |
| 9 | Extreme importance |
| 2,4,6,8 | Mean values between two adjacent assessments |

*Source:* Saaty, 1980

For criteria $x_i$ and $x_j$, the decision maker assesses whether:

$x_i$ is equally important as $x_j$, which means that it is $\frac{w_i}{w_j} = 1$ (1)

$x_i$ is preferred over $x_j$, which means that $\frac{w_i}{w_j} > 1$ (2)

or $x_j$ is preferred over $x_i$, which means that it is $\frac{w_i}{w_j} < 1$ (3)

where $w_i$- importance of criterion $x_i$.

Instead of directly evaluating the values of $w_i$, i = 1, 2, ..., n, the decision maker evaluates $\binom{n}{2}$pairs of criteria and preferences into the matrix of importance coefficients, $A = [a_{ij}]_{nxn}$, where $a_{ij} = w_i/w_j$:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} (4)$$

Numerical evaluations of the comparison of pairs of elements at a given level of the hierarchy are entered into the comparison matrix, which is reciprocal, i.e. the elements from the upper triangle are symmetrically reciprocal to the elements from the lower triangle, while the elements on the main diagonal are equal to 1.

### *3.2. TOPSIS method*

The first step of the TOPSIS method is the normalization of the data, which is performed using the linear transformation of the scale. The linear transformation of the scale is calculated according to the formula:

$$r_{ij} = \frac{x_{ij} - x_r^{**}}{x_j^{*} - x_j^{**}};\ r_{ij} = 1 - \frac{x_{ij} - x_r^{**}}{x_j^{*} - x_j^{**}} (5)$$

where x*j – the maximum value of the feature for a given criterion,
x**j – the minimum value of the feature for a given criterion.

The next step in the ranking process is to calculate the weighted normalized data.

The next step is the calculation of ideals and anti-ideals. The ideal (A+) and anti-ideal (A-) are calculated using the following formula:

$$A_+ = (\max n_{ij} \mid j \in V), (\min n_{ij} \mid j \in V') \quad (6)$$

$$A_- = (\min n_{ij} \mid j \in V), (\max n_{ij} \mid j \in V') \quad (7)$$

where

V = (j = 1, 2, ..., m | j belongs to the criteria that are maximized)

V' = (j = 1, 2, ..., m | j belongs to the criteria that are minimized).

The calculation of the Euclidean distances from the ideals and anti-ideals is the next step of the analysis. The Euclidean distances are calculated according to the following formula:

$$d(A_1, A_2) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + .. + (x_n - y_n)^2} \quad (8)$$

The penultimate step of the analysis is the determination of the relative proximity of the alternatives to the ideal solution. The relative proximity is calculated using the following formula:

$$RC(A_i) = \frac{d(A^-, A_1)}{d(A^-, A_i) + d(A^+, A_i)} \quad (9)$$

The last step is the ranking of institutions itself based on their relative proximity to the ideal solution.

### *3.3. Data*

The data about 10 accredited private universities, together with the faculties that are members of these universities, and have the status of a legal entity, 10 accredited private colleges of academic studies, and 16 accredited colleges of applied studies, are given in Table 2 in appendix.

The table lists the universities, and faculties operating within the universities as legal entities. As for universities, viewed from the accreditation perspective, there are three types of accreditation:

- Integrated universities – they imply that studies are accredited at the level of the university itself, and its organisational structure consists of departments;
- Faculties that operate within a university without the status of a legal entity – as a form of integrated universities, but have to gain accreditation. However, since they do not have the status of a legal entity, they are not obliged to submit financial reports;
- Faculties that operate within a university as legal entities, i.e. those that operate 'autonomously', and therefore submit financial reports.

In the Republic of Serbia, only one private university is fully integrated – the University of Novi Pazar; some universities comprise only faculties with the status of a legal entity, and do not offer accredited study programmes at the university level ('Business Academy' University, 'Union' University, 'MB' University), while other universities include faculties with and without the status of a legal entity, as well as study programmes accredited at the university level.

With regard to financial reports, only legal entities are required to submit annual financial reports, while the financial results of faculties without the status of a legal entity and study programmes offered at the university level are included in the financial reports of the university within which they operate. It is not possible to perform the 'consolidation' of financial reports at the university level because in that case the negative financial result of one faculty would be nullified by the positive results of other faculties operating within the same university. Therefore, only the faculties that operate within a university with the status of a legal entity, as

well as universities themselves, were taken into consideration in this research, while the results of the performance of the faculties without the status of a legal entity, as well as those of the study programmes offered at the university level, and integrated universities were already included in the financial reports of the universities.

The ranking was made based on the criteria listed in Table 3 in appendix.

The data taken from the official financial reports of the institutions, presented in the table above from no. 3 through no. 15 are the most significant data for the analysis of assets, equity and liabilities, i.e. the success of the institutions' performance. In addition to the accounting data used for the purpose of ranking, the accredited number of students and the number of employees were also taken into account as they definitely influence the quality measurement of these institutions. The ability of the institutions to attract a certain number of students affects the results that the institutions will achieve, and also indirectly affects the size of the assets that these institutions have at their disposal. On the other hand, if the institutions do not provide a sufficient number of employees (teaching and non-teaching staff), they will not be able to adequately produce a 'quality product' – graduated students who will be able to quickly get involved in the production process.

The criteria that should be maximized are primarily the number of employees, and the number of students. It is definitely important that a higher education institution hires a greater number of employees compared to the number of students as it increases the quality of teaching, as well as the possibility of an individual approach to students.

The next three criteria which are also desirable to maximize are: total assets (assets), permanent assets, and current assets. Permanent assets, which in higher education institutions mainly consist of fixed assets, indicate the institutions' ability to provide the adequate space and equipment for teaching, primarily computer and other laboratories, and as such represent one of the business success indicators. It is also desirable to maximize current assets, especially cash and cash equivalents, which make up the most significant part of these assets. Total assets, calculated as the sum of permanent assets and current assets, are also desirable to maximize for the above-mentioned reasons.

The following three criteria, which make up the structure of liabilities, need to be separated as far as their influence is concerned. Equity, as an institution's own source of financing, should be maximized primarily because it comprises retained earnings in addition to the capital, which show the success of its business operations in previous years. It is desirable to minimize long-term provisions and liabilities, as well as short-term provisions and liabilities, because they constitute borrowed sources, and as such need to be minimized.

Operating income, as the main income from the basic activity for which institutions are registered, must be maximized, whereas operating expenses, as well as all other types of expenses, must be minimized.

The positive operating result, as one of the key indicators of the success of higher education institutions, must be maximized, while negative operating result must be minimized.

The financial income, as well as the financial result (profit or loss) should be maximized, and financial expenses should be minimized. Given that higher education institutions are not founded with the primary goal of collecting and placing free funds, as is the case with financial institutions, these criteria are not as important as the previously mentioned ones.

The net profit, as a comprehensive indicator of the success of the entire business, needs to be maximized.

The current ratio, as the basic indicator of the capacity to settle due short-term obligations, must be maximized.

Descriptive statistics of data is given in Table 4 in appendix.

## 4. Research results and discussions

The ranking of private higher education institutions in the Republic of Serbia is based on 16 criteria, as indicated in Table 3.

The first step in ranking is calculating the weights for each of the criteria used in the ranking were calculated using the AHP Priority Calculator. Decision Matrix is presented in Table 5, given in appendix.

Based on the determination of the importance of the criteria and the intensity of the importance using Satie's scale, the weights for each of the criteria were calculated, based od principal eigenvector of the decision matrix, as shown in Table 6.

Based on conducted AHP method for calculating the weights for each of the criteria and TOPSIS method for ranking private institutions based on their relative proximity to the ideal solution as given in Table 7 in appendix.

The best-ranked private higher education institution is Singidunum University, which has 12 out of 16 observed criteria with the highest value. This institution has the highest number of employees, the highest accredited number of students, the largest property, generated income, and the best financial result.

The second-ranked institution is the Faculty of Media and Communications, which operates as part of Singidunum University, and has the highest value of most of the observed criteria after Singidunum University.

**Table 6. Weights for the criteria based on pairwise comparisons**

| No | Category | Priority | Rank |
|---|---|---|---|
| 1. | Number of employees | 7.1% | 6 |
| 2. | Accredited number of students | 18.0% | 1 |
| 3. | Permanent assets | 4.3% | 9 |
| 4. | Current assets | 2.8% | 12 |
| 5. | Total assets | 4.2% | 10 |
| 6. | Equity | 4.6% | 8 |
| 7. | Long-term provisions and liabilities | 3.1% | 11 |
| 8. | Short-term provisions and liabilities | 2.1% | 13 |
| 9. | Operating income | 9.8% | 4 |
| 10. | Operating expenses | 7.8% | 5 |
| 11. | Operating profit or loss | 11.4% | 3 |
| 12. | Financial income | 1.0% | 15 |
| 13. | Financial expenses | 1.0% | 15 |
| 14. | Profit or loss from financing | 1.1% | 14 |
| 15. | Net profit or net loss | 17.0% | 2 |
| 16. | Current Ratio | 4.7% | 7 |

*Source:* authors

The third-ranking institution is the College of Professional Studies of Information Technologies, which has the third-highest value of the observed criteria in the income statement.

The information about the implemented ranking of the institutions is significant both for the institutions themselves and for various stakeholders who are interested in the operations of these institutions. The institutions themselves can see where they stand in relation to the competition, and how they can improve their financial and accounting operations. The users of the services (students) can use the results of the ranking to choose the institutions that have the best performance. As for the potential suppliers, the information on the ranking of the institutions serves as the indicator of the security of the collection of their receivables.

## 5. Conclusion

Based on the available data, the ranking of the private higher education institutions in the Republic of Serbia was performed. The ranking criteria included as follows: the data on the accredited number of students, the number of employees, as well as data from the financial reports (balance sheet, and profit and loss account) of the private higher education institutions in 2021.

The ranking was carried out using the TOPSIS method, which has been used in various areas of business, including the rankings of higher education institutions.

After the normalization of the data, the weights were calculated for each of the criteria using the AHP Priority Programme. The criteria with the highest weights were: the accredited number of students, net profit/loss, and operating profit/loss. These are certainly the most important criteria with regard to the financial strength of institutions, i.e. their earning power.

The weighted normalized data served as the basis for the calculation of the ideal and anti-ideal, and in the next step, the Euclidean distance from the ideal and anti-ideal was calculated. The calculated relative proximity of the alternatives to the ideal solution served as the basis for the ranking of the institutions.

The future research on the ranking of institutions using the TOPSIS method could include the ranking of private higher education institutions in the neighbouring countries (Bosnia and Herzegovina, Macedonia, Croatia, Slovenia and Montenegro), as well as their comparison with public higher education institutions. Furthermore, it is important to analyse the rankings over a certain period of time (three or five years) in order to find out whether the rank order of individual institutions improved or worsened during the observed period.

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## Appendix

**Table 2. List of private higher education institutions**

| No | Name of HEI | Faculty Name |
|---|---|---|
| Private universities | | |
| 1. | 'Alpha BK' University | |
| | | Academy of Arts in Belgrade |
| 2. | 'Educons' University | |
| | | Faculty of Sports and Psychology |
| | | Faculty of Project and Innovation Management |
| 3. | 'Megatrend' University | |
| | | Faculty of Management |
| | | Faculty of Business |
| | | Faculty of International Economics |
| | | Faculty of Culture and Media |
| | | Faculty of Arts and Design |
| | | Faculty of Civil Aviation |
| 4. | 'Metropolitan' University | |
| | | FEFA |
| | | Faculty of Applied Ecology |
| 5. | 'Business Academy' University | |
| | | Faculty of Law for Commerce and Judiciary |
| | | Faculty of Economics and Engineering Management |
| | | Faculty of Dentistry |
| | | Faculty of Applied Management, Economics and Finance |
| | | Faculty of Pharmacy |
| | | Faculty of Social Sciences |
| | | Faculty of European Legal and Political Studies |
| | | Faculty of Contemporary Arts |
| 6. | Singidunum University | |
| | | Faculty of Medical, Legal and Business Studies |
| | | Faculty of Media and Communications |
| 7. | 'Union' University | |
| | | Faculty of Law |
| | | Faculty of Computer Science |
| | | Belgrade Academy of Banking - |

| | | |
|---|---|---|
| | | Faculty of Banking, Insurance and Finance |
| | | Faculty of Legal and Business Studies 'Dr Lazar Vrkatić' |
| 8. | 'Union - Nikola Tesla' University | |
| | | Faculty of Business Studies and Law |
| | | Faculty of Management |
| | | Faculty of Law, Security and Management 'Konstantin Veliki' |
| | | Faculty of Diplomacy and Security |
| | | Faculty of Information Technologies and Engineering |
| | | Faculty of Sports |
| | | Faculty of Applied Sciences |
| | | Faculty of Engineering Management |
| 9. | 'MB' University | |
| | | Faculty of Business and Law |
| | | Academy of Classical Painting |
| 10. | University of Novi Pazar | |
| Colleges of Academic Studies | | |
| 1. | College of Business Economics and Entrepreneurship | |
| 2. | College Academy of Art and Conservation of the Serbian Orthodox Church | |
| 3. | College of Modern Business | |
| 4. | College 'Academy of Business Economy' | |
| 5. | College of Academic Studies 'DOSITEJ' | |
| 6. | College of Economics and Management studies | |
| 7. | College of Maritime Academic Studies | |
| 8. | College of Social Work | |
| 9. | College of Communications | |
| Colleges of Professional Studies | | |
| 1. | College of Professional Studies of Information Technologies | |
| 2. | College of Professional Studies 'Sports Academy' | |
| 3. | College of Professional Studies – Football Academy Belgrade | |
| 4. | College of Organisational Professional Studies 'Eduka' | |
| 5. | College of Professional Studies – International Center of Professional Studies - ICEPS | |
| 6. | College of Business Professional Studies Čačak | |
| 7. | College of Professional Studies of Economy and Administration | |
| 8. | College of Business Professional Studies 'Prof. Dr Radomir Bojković' | |
| 9. | College of Professional Studies of Management and Business Communications | |
| 10. | College of Professional Sports and Health Studies | |

| | |
|---|---|
| 11. | The High Medical College of Professional Studies 'Milutin Milanković' |
| 12. | College of Professional Health and Sanitary Studies 'VISAN' |
| 13. | College of Professional Studies for Criminology and Security |
| 14. | College of Professional Studies of Business 'BUSINESS' |
| 15. | The Medical College of Professional Studies 'St Vasilije Ostroški' |
| 16. | Medika College for Vocational Studies in Healthcare |

*Source:* National Entity for Accreditation and Quality Assurance in Higher Education, (2023). Accreditation Outcomes for Institutions of Higher Education and Study Programmes in Serbia

**Table 3. Ranking criteria**[1]

| No | Name of Parameter |
|---|---|
| 1. | Number of employees – the number of teaching and non-teaching staff members employed at higher education institutions as of 31/12/2021 |
| 2. | Accredited number of students – the number of students accredited by the National Entity for Accreditation and Quality Assurance in Higher Education |
| 3. | Permanent assets – the value of fixed assets in the balance sheet at position ADP0002, obtained as the sum of intangible assets, immovables, facilities and equipment, long-term financial investments, receivables and long-term active accrued expenses as of 12/31/2021 |
| 4. | Current assets – the value of current assets in the balance sheet at position ADP0030, obtained as the sum of inventories, receivables from sales, short-term receivables, short-term financial investments, cash and cash equivalents, and short-term accrued expenses as of 31/12/2021 |
| 5. | Total assets – the total value of assets in the balance sheet at position ADP0059, obtained as the sum of permanent - and current assets as of 31/12/2021 |
| 6. | Equity – the institutions' own source of financing in the balance sheet at position ADP0401, obtained as the sum of the capital, share premium, retained earnings minus losses as of 31/12/2021 |
| 7. | Long-term provisions and liabilities – provisions and liabilities due in more than a year in the balance sheet at position ADP0415, obtained as the sum of long-term provisions, long-term liabilities, and long-term deferred expenses as of 31/12/2021 |

[1] The data on the accredited number of students were taken from National Entity for Accreditation and Quality Assurance in Higher Education
The data on the number of employees were taken from the website of the Serbian Business Registers Agency, where the official financial reports for 2021 were published:
https://www.apr.gov.rs/%d0%bf%d0%be%d1%87%d0%b5%d1%82%d0%bd%d0%b0.3.html
accessed on 17/03 and 18/03/2023
The data from the balance sheets and income statements of private higher education institutions for the year 2021 were taken from the website of the Serbian Business Registers Agency https://www.apr.gov.rs/%d0%bf%d0%be%d1%87%d0%b5%d1%82%d0%bd%d0%b0.3.html
accessed on 17/03 and 18/03/2023

| | |
|---|---|
| 8. | Short-term provisions and liabilities – provisions and liabilities due in less than a year in the balance sheet at position ADP0431, obtained as the sum of short-term provisions, short-term liabilities, prepayments, deposits and guarantees, operating liabilities, other short-term liabilities, and short-term deferred expenses on 31/12/2021 |
| 9. | Operating income – the income generated from the activities for which the institutions are registered in the profit and loss account at position ADP1001, obtained as the sum of income from the sale of goods, income form products sold and services provided, revenue from undertaking for own purposes, increase in inventories, i.e. subtracting the decrease in inventories of work in progress and unfinished products and finished products in the period 01/01-31/12/2021 |
| 10. | Operating expenses – expenses incurred in connection with the income in the profit and loss account at position ADP1013, obtained as the sum of costs of goods sold, raw material costs, fuel and energy costs, salaries, wages and other personal indemnities, depreciation costs, production services costs, provision costs and intangible costs in the 01/01-31/12/2021 period |
| 11. | Operating profit or loss – the positive or negative difference between operating income and operating expenses in the profit and loss account at position ADP1025 or ADP1026 in the 01/01-31/12/2021 period |
| 12. | Financial income – the income generated from the placement of free funds in the profit and loss account at position ADP1027 in the 01/01-31/12/2021 period |
| 13. | Financial expenses – company expenses incurred on the basis of the costs of borrowed capital in the profit and loss account at position ADP1032 in the 01/01-31/12/2021 period |
| 14. | Profit or loss from financing – the positive or negative difference between the financial income and financial expenses in the profit and loss account at position ADP1037 or AOP1038 in the 01/01-31/12/2021 period |
| 15. | Net profit or net loss – the positive or negative difference between the total income and total expenses minus the tax on profit in the profit and loss account at position ADP1055 or ADP1056 in the 01/01-31/12/2021 period |
| 16. | Current ratio – the indicator of liquidity obtained as the quotient of current assets and short-term provisions and liabilities |

*Source:* authors

**Table 4. Descriptive statistics of data**

| | Average | Median | Min | Max | Standard deviation |
|---|---|---|---|---|---|
| Number of employees | 46,34 | 32,50 | 0,00 | 249,00 | 38,69 |
| Accredited number of students | 322,77 | 245,50 | 0,00 | 2.116,00 | 311,87 |
| Permanent assets | 89.010.700,00 | 4.212.000,00 | 0,00 | 1.820.498.000,00 | 279.719.834,70 |
| Current assets | 118.138.614,29 | 36.320.500,00 | 74.000,00 | 2.548.076.000,00 | 327.538.761,02 |
| Total assets | 207.592.928,57 | 58.196.500,00 | 74.000,00 | 4.368.574.000,00 | 560.460.610,16 |
| Equity | 119.506.685,71 | 21.303.500,00 | 0,00 | 2.963.891.000,00 | 364.686.999,85 |
| Long-term provisions and liabilities | 17.382.185,71 | 0,00 | 0,00 | 390.916.000,00 | 59.227.781,93 |
| Short-term provisions and liabilities | 70.756.157,14 | 17.878.000,00 | 439.000,00 | 987.962.000,00 | 163.941.117,33 |
| Operating income | 125.498.771,43 | 72.934.500,00 | 0,00 | 1.163.744.000,00 | 178.762.363,67 |
| Operating expenses | 101.575.685,71 | 61.109.500,00 | 1.738.000,00 | 842.625.000,00 | 135.456.432,67 |
| Operating profit or loss | 18.967.842,86 | 1.842.000,00 | -11.711.000,00 | 321.119.000,00 | 52.584.247,24 |
| Financial income | 236.414,29 | 4.500,00 | 0,00 | 2.682.000,00 | 585.337,94 |
| Financial expenses | 791.228,57 | 50.500,00 | 0,00 | 22.637.000,00 | 2.868.415,97 |
| Profit or loss from financing | -554.528,57 | -10.500,00 | -22.603.000,00 | 2.029.000,00 | 2.842.680,54 |
| Net profit or net loss | 16.939.500,00 | 1.108.500,00 | -11.125.000,00 | 331.302.000,00 | 49.632.779,73 |
| Current ratio | 5,35 | 1,43 | 0,02 | 130,03 | 16,19 |

*Source:* autors

**Table 5. Decision Matrix**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1.00 | 1.00 | 5.00 | 1.00 | 1.00 | 6.00 | 4.00 | 0.25 | 1.00 | 0.25 | 9.00 | 9.00 | 9.00 | 0.33 | 0.50 |
| 2 | 1.00 | 1 | 5.00 | 7.00 | 4.00 | 6.00 | 8.00 | 8.00 | 2.00 | 5.00 | 4.00 | 9.00 | 9.00 | 9.00 | 0.50 | 7.00 |
| 3 | 1.00 | 0.20 | 1 | 2.00 | 0.50 | 1.00 | 0.50 | 2.00 | 0.33 | 0.50 | 1.00 | 6.00 | 6.00 | 6.00 | 0.33 | 0.50 |
| 4 | 0.20 | 0.14 | 0.50 | 1 | 0.33 | 0.50 | 1.00 | 1.00 | 0.25 | 0.20 | 0.25 | 7.00 | 7.00 | 7.00 | 0.12 | 0.50 |
| 5 | 1.00 | 0.25 | 2.00 | 3.00 | 1 | 0.50 | 2.00 | 2.00 | 0.25 | 0.20 | 0.25 | 6.00 | 6.00 | 6.00 | 0.20 | 0.50 |
| 6 | 1.00 | 0.14 | 1.00 | 2.00 | 2.00 | 1 | 2.00 | 4.00 | 0.33 | 0.50 | 0.25 | 5.00 | 5.00 | 5.00 | 0.50 | 0.50 |
| 7 | 0.14 | 0.12 | 2.00 | 1.00 | 0.50 | 0.50 | 1 | 1.00 | 0.33 | 0.50 | 0.33 | 4.00 | 4.00 | 4.00 | 0.20 | 1.00 |
| 8 | 0.25 | 0.12 | 0.50 | 1.00 | 0.50 | 0.25 | 1.00 | 1 | 0.20 | 0.20 | 0.20 | 3.00 | 3.00 | 3.00 | 0.20 | 0.20 |
| 9 | 4.00 | 0.50 | 3.00 | 4.00 | 4.00 | 3.00 | 3.00 | 5.00 | 1 | 1.00 | 0.50 | 5.00 | 5.00 | 5.00 | 0.50 | 4.00 |
| 10 | 1.00 | 0.20 | 2.00 | 5.00 | 5.00 | 2.00 | 2.00 | 5.00 | 1.00 | 1 | 0.50 | 5.00 | 5.00 | 5.00 | 0.17 | 4.00 |
| 11 | 4.00 | 0.25 | 1.00 | 4.00 | 4.00 | 4.00 | 3.00 | 5.00 | 2.00 | 2.00 | 1 | 8.00 | 8.00 | 8.00 | 0.50 | 5.00 |
| 12 | 0.11 | 0.11 | 0.17 | 0.14 | 0.17 | 0.20 | 0.25 | 0.33 | 0.20 | 0.20 | 0.12 | 1 | 1.00 | 0.50 | 0.14 | 0.20 |
| 13 | 0.11 | 0.11 | 0.17 | 0.14 | 0.17 | 0.20 | 0.25 | 0.33 | 0.20 | 0.20 | 0.12 | 1.00 | 1 | 0.50 | 0.14 | 0.20 |
| 14 | 0.11 | 0.11 | 0.17 | 0.14 | 0.17 | 0.20 | 0.25 | 0.33 | 0.20 | 0.20 | 0.12 | 2.00 | 2.00 | 1 | 0.11 | 0.20 |
| 15 | 3.00 | 2.00 | 3.00 | 8.00 | 5.00 | 2.00 | 5.00 | 5.00 | 2.00 | 6.00 | 2.00 | 7.00 | 7.00 | 9.00 | 1 | 6.00 |
| 16 | 2.00 | 0.14 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 2.00 | 0.25 | 0.25 | 0.20 | 5.00 | 5.00 | 5.00 | 0.17 | 1 |

*Source:* authors

**Table 7. Ranking of institutions**

| No | Name of HEI | RC | Rang |
|---|---|---|---|
| 1. | Singidunum University | 0.77362219 | 1 |
| 2. | Faculty of Media and Communications | 0.48735627 | 2 |
| 3. | College of Professional Studies of Information Technologies | 0.32656004 | 3 |
| 4. | 'Metropolitan' University | 0.28793063 | 4 |
| 5. | Faculty of Law for Commerce and Judiciary | 0.28478405 | 5 |
| 6. | College Academy of Art and Conservation of the Serbian Orthodox Church | 0.28441189 | 6 |
| 7. | College of Professional Studies – International Center of Professional Studies – ICEPS | 0.28429835 | 7 |
| 8. | 'Union – Nikola Tesla' University | 0.28112182 | 8 |
| 9. | 'Educons' University | 0.27638280 | 9 |
| 10. | Faculty of International Economics | 0.27417786 | 10 |
| 11. | Faculty of Economics and Engineering Management | 0.26621401 | 11 |
| 12. | Faculty of Pharmacy | 0.25979017 | 12 |
| 13. | Faculty of Business and Law | 0.25902252 | 13 |
| 14. | Faculty of Diplomacy and Security | 0.25273968 | 14 |
| 15. | College of Professional Health and Sanitary Studies 'VISAN' | 0.25235043 | 15 |
| 16. | Faculty of Applied Management, Economics and Finance | 0.25182322 | 16 |
| 17. | Faculty of Legal and Business Studies 'Dr Lazar Vrkatić' | 0.24435797 | 17 |
| 18. | Faculty of Contemporary Arts | 0.24133506 | 18 |
| 19. | Faculty of Computer Science | 0.23880095 | 19 |
| 20. | Faculty of Management | 0.23683689 | 20 |
| 21. | Faculty of Sports and Psychology | 0.23622669 | 21 |
| 22. | Faculty of Culture and Media | 0.23392044 | 22 |
| 23. | 'Megatrend' University | 0.22649435 | 23 |
| 24. | 'Alpha BK' University | 0.22620424 | 24 |
| 25. | College of Social Work | 0.22300725 | 25 |
| 26. | Faculty of Business | 0.22129326 | 26 |
| 27. | University of Novi Pazar | 0.22066384 | 27 |
| 28. | Faculty of Applied Sciences | 0.21914898 | 28 |
| 29. | Faculty of Social Sciences | 0.21783064 | 29 |
| 30. | College of Professional Sports and Health Studies | 0.21499179 | 30 |
| 31. | Faculty of Business Studies and Law | 0.21497501 | 31 |
| 32. | Faculty of Management | 0.21310622 | 32 |
| 33. | Belgrade Academy of Banking – Faculty of | 0.21263727 | 33 |

| | | | |
|---|---|---|---|
| | Banking, Insurance and Finance | | |
| 34. | College of Professional Studies of Management and Business Communications | 0.21235703 | 34 |
| 35. | Faculty of European Legal and Political Studies | 0.21228742 | 35 |
| 36. | Academy of Arts in Belgrade | 0.21188481 | 36 |
| 37. | College of Professional Studies of Economy and Administration | 0.21180488 | 37 |
| 38. | College of Academic Studies 'DOSITEJ' | 0.21103461 | 38 |
| 39. | College of Business Professional Studies Čačak | 0.21070218 | 39 |
| 40. | Faculty of Information Technologies and Engineering | 0.21035325 | 40 |
| 41. | Faculty of Medical, Legal and Business Studies | 0.20920919 | 41 |
| 42. | College 'Academy of Business Economy' | 0.20900713 | 42 |
| 43. | College of Economics and Management studies | 0.20872499 | 43 |
| 44. | The High Medical College of Professional Studies 'Milutin Milanković' | 0.20869546 | 44 |
| 45. | College of Professional Studies for Criminology and Security | 0.20825086 | 45 |
| 46. | Faculty of Project and Innovation Management | 0.20785676 | 46 |
| 47. | Faculty of Strategic and Operational Management | 0.20775454 | 47 |
| 48. | Faculty of Civil Aviation | 0.20770100 | 48 |
| 49. | The Medical College of Professional Studies 'St Vasilije Ostroški' | 0.20730466 | 49 |
| 50. | College of Organisational Professional Studies 'Eduka' | 0.20722315 | 50 |
| 51. | College of Professional Studies - Football Academy Belgrade | 0.20699637 | 51 |
| 52. | Faculty of Applied Ecology | 0.20686010 | 52 |
| 53. | Faculty of Sports | 0.20656150 | 53 |
| 54. | Faculty of Arts and Design | 0.20610049 | 54 |
| 55. | College of Maritime Academic Studies | 0.20604075 | 55 |
| 56. | College of Communications | 0.20580151 | 56 |
| 57. | Medika College for Vocational Studies in Healthcare | 0.20559231 | 57 |
| 58. | Faculty of Law | 0.20534041 | 58 |
| 59. | College of Professional Studies of Business 'BUSINESS' | 0.20529781 | 59 |
| 60. | College of Business Professional Studies 'Prof. Dr Radomir Bojković' | 0.20446668 | 60 |
| 61. | College of Modern Business | 0.20353280 | 61 |
| 62. | 'MB' University | 0.20351346 | 62 |
| 63. | 'Union' University | 0.20329443 | 63 |
| 64. | 'Business Academy' University | 0.20267059 | 64 |

| | | | |
|---|---|---|---|
| 65. | FEFA | 0.20196862 | 65 |
| 66. | College of Professional Studies 'Sports Academy' | 0.20175448 | 66 |
| 67. | Academy of Classical Painting | 0.20161884 | 67 |
| 68. | Faculty of Law, Security and Management 'Konstantin Veliki' | 0.20154677 | 68 |
| 69. | Faculty of Dentistry | 0.18831779 | 69 |
| 70. | College of Business Economics and Entrepreneurship | 0.18454314 | 70 |

*Source:* authors

## RANGIRANJE PRIVATNIH VISOKOŠKOLSKIH USTANOVA NA OSNOVU TOPSIS METODE

**Apstrakt:** Nacionalna ekonomija svake zemlje i njen dugoročni razvoj zavise od kvaliteta ljudskih resursa. Sektor visokog obrazovanja predstavlja jedan od najvažnijih činilaca u izgradnji visokoobrazovane i konkurentne radne snage. Upravo zbog značaja visokoškolskih ustanova, države su tradicionalno imale ključnu ulogu u njihovom finansiranju, regulisanju i nadzoru. Međutim, komercijalizacija sektora visokog obrazovanja dovela je do ukidanja monopola koje su imale javne visokoškolske ustanove i otvaranja prostora za osnivanje i rad privatnih ustanova. U poslednje vreme, rangiranje visokoškolskih ustanova dobija sve veći značaj. Ovo istraživanje koristi TOPSIS metodu (Tehnika za rangiranje po sličnosti sa idealnim rešenjem) kako bi se izvršilo rangiranje privatnih visokoškolskih ustanova u Republici Srbiji za 2021. godinu. U istraživanju je korišćeno 16 kriterijuma, uglavnom računovodstvenih, za procenu i rangiranje ustanova. Obuhvaćeno je 10 privatnih univerziteta sa njihovim članicama, 10 privatnih visokih škola akademskih studija i 16 visokih strukovnih škola. Dobijeni rezultati rangiranja mogu biti od značaja za unapređenje poslovanja ovih ustanova, očuvanje konkurentnosti i zadovoljenje potreba svih zainteresovanih strana.

**Ključne reči:** privatne visokoškolske ustanove, rangiranje, TOPSIS metoda

## Authors' biographies

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