PhD STUDIES IN TRANSITION CONDITIONS – THE BASIS FOR THE EDUCATIONAL SYSTEM AND ECONOMIC DEVELOPMENT: A CASE STUDY SERBIA

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Abstract

The quality of PhD studies is a key factor in an educational system that depends on human resources development as the basis for society's development in the 21st century. This paper used the Multiple Criteria Decision Support (MCDS) and voting methods in the SWOT environment, along with the hybrid SWOT-AHP method, to assess the quality of PhD studies in Serbia. Through expert analysis within the SWOT-AHP hybrid model, the determinants of SWOT subfactors and possible strategic options were defined, and the prioritization of defined strategies was determined, with the application of which all the current weaknesses of PhD studies in Serbia can be eliminated, and the path to reaching the level of quality defined by EU standards can be defined. This study aims to direct the scientific public's attention to the declining trend in the quality of PhD studies in Serbia and its consequences.

Keywords: PhD studies, quality, outcomes, SWOT, AHP

1. INTRODUCTION

In modern conditions of civilization development and the changes taking place at the global level, school systems, and especially universities, are given a key role in human resources development – the most important resource for society development in the 21st century (Akhavan, 2005; Živković & Nikolić, 2016), from which many dimensions of quality of life depend (Potter et al., 2012). In the agenda of the United Nations (UN) until 2030 (UN, 2018a,b), priority is given to system changes

at all levels of education, which play a key role in the overall development of each country (Kolbachev et al., 2015; Li et al., 2020). The UN has defined eight Millennium Development Goals (MDGs), representing a challenge for all nations (Živković & Panić, 2020a,b).

The European Union (EU) started the harmonization of the higher education architecture system in the EU with the Sorbonne Declaration, which continued with the Bologna Declaration in 1999, when 29 countries from Europe established the foundations of the European Higher Education Area (EHEA), which in 2006 promoted the European System of Higher Education (EU Commission, 2016). 49 universities from 25 different countries accepted the Salzburg Principles for Doctoral Education (EUA, 2005), which determined conclusions and recommendations for doctoral programs for the European Knowledge Society when implementing the Bologna Process at the PhD level. The University of Belgrade, Serbia, has also accepted all the principles of the Bologna process. The European Standards and Guidelines for Quality Assurance in the European Education Areas (EEA) (Prisicariu & Vilcea, 2015) are used to ensure the quality of PhD studies, candidates, and international cooperation in supervising and moving students and professors around in the EU's single educational space.

In the science world, the rule "Publish or perish" applies, and the measurement of scientific and academic achievement is the existence of a scientific life (Lane, 2010). The first stage of verifying the quality of scientific work is publishing the results in impact factor (IF) journals, while the second stage is determining the impact of the published results by counting the number of citations (Živković & Panić, 2020b). Because of that, international standards were introduced at the final level of the educational process of PhD studies that all activities be evaluated by the number of published papers in journals with IF.

Recently, special attention has been paid to PhD studies due to their influence on the overall development of the country's economy (Byrne et al., 2013; Guillaumet & Tomàs, 2022), especially in countries that have gone through a transition process (Prisicariu & Vilcea, 2015; Manea & Itagan, 2015) or are currently undergoing (Ezzahra et al., 2015; Živković & Panić, 2020a,b). The motivation of PhD students for scientific work is especially considered. Bunge (2003) defines research as a "methodical search for knowledge". The Organization for Economic Cooperation and Development (OECD) defines research and experimental work (R&D) as "creative and systematic work undertaken to increase the stock of knowledge, including knowledge of humankind, culture and society, and to devise new applications of available knowledge" (OECD, 2015). These facts indicate the complexity of PhD studies, which requires adequate knowledge of the professor both in terms of the material they convey so that the student accepts new knowledge, as well as the pedagogy of motivating students to love the training process for receiving new knowledge, as well as the subsequent transfer of acquired knowledge to others (Tinkler & Jackson, 2004).

During the PhD process, it is undeniable that the quality of students (input) has to be at an enviable level (Asadolahi & Nushi, 2021). Additionally, the mentor plays a crucial role in introducing the PhD student to

the challenging process of accepting new knowledge and working methods while the student adopts the specifics of research methods through the justification of the methods used and meticulous analysis of results (Tinkler & Jachson, 2004).

The supervisor or mentor is the main motivating factor for the PhD student to overcome all obstacles to acquiring adequate knowledge and skills that the PhD program requires. PhD studies end with the defence of a doctoral dissertation, with prior publication of the results in relevant scientific journals as a form of verification. According to Denicolo et al. (2018), "The goal of the doctorate is much more than a report about the conduct and outcome of novel research; it is the development of a person who is capable of independently conducting novel research and then using that research to move their academic field forward and benefit society".

In the educational space of the USA and Canada, special attention is paid to the motivation of students for PhD studies and to love the work they are doing, considering that significant scientific results are achieved by PhD students at this level (Litalien et al., 2024). The number of PhD students at USA universities in 2004 – 2017 increased by 44%, and a growth of 4% per year is forecasted in 2017 – 2029 (Hussar & Bailey, 2024). Also, there is a growth of about 1% per year of students from OECD countries (Litalien et al., 2024), which indicates the importance of PhD studies and the interest of students in the most developed educational area in the world.

In countries with a transition economy, such as Serbia, PhD studies are used for the formal acquisition of a diploma, which is a necessary and sufficient condition for a teaching position at the faculty or a research position in an institute, regardless of the resulting knowledge and skills during the PhD studies. In most cases, supervisors do not possess the skills mentioned above, so they cannot transfer them to students, and purchasing diplomas at the PhD level is not uncommon. Given that some people with purchased diplomas occupy high positions in the state apparatus, it is logical that the state is not interested in the quality of any education, especially not at the PhD level (Živković & Panić, 2020b).

To complete PhD studies in Serbia, by selecting a doctoral dissertation, it is necessary to publish a paper in a journal with IF. In many cases, predatory journals are used (about which there were many scandals), so it is difficult to determine the level of achieved results, especially the share PhD students in it. Due to the above reasons, research on the quality of PhD studies in Serbia is desirable and is the subject of analysis in this paper.

2. LITERATURE REVIEW

The methodology of SWOT analysis makes it possible to define future strategies from the aspect of their priorities based on the internal analysis of the company and its environment, as well as the content of individual SWOT factors. For that purposese, the Analytic Hierarchy Process (AHP) is most often used or a hybrid AHP-SWOT model called A'WOT (Kangas et al., 2016, 2017). The idea of Multiple Criteria Decision Support (MCDS) and the voting method in the SWOT framework was used to systematically assess SWOT factors from the aspect of the hierarchical AHP process (Nikolić et al., 2015).

The hybrid SWOT-AHP method, with the

application of MCDS and the voting method, gives the possibility of obtaining relevant results (Kangas et al., 2016; Rahimirad & Sadabadi, 2023). The methodology above is successfully used in many areas, such as tourism (Kajanus et al., 2004; Nikolić et al., 2015), manufacturing companies (Görener et al., 2012; Veličkovska, 2022; Popescu & Gasparotti, 2022), agriculture (Dlbokić et al., 2017; Etongo et al., 2023), forestry (Kurttila et al., 2000; Kangas et al., 2001), etc. There are other hybrid models for processing this type of result, such as SWOT-FAHP (Şen & Çınar, 2010), SWOT-ANP (Yüksel & Dagdeviren, 2007), SWOT-FANP (Sevkli et al., 2012) and other combinations (Živković & Nikolić, 2016), which are not adequately represented in the literature.

3. RESEARCH FRAMEWORK

Serbia accepted all provisions for the development and unification of all levels of studies in the EU and formed the National Accreditation Body for the accreditation of all academic studies, the corresponding laws (Law on Scientific Research, 2015) and standards (NAT, 2024), which define the necessary conditions for accreditation of teaching programs and institutions for all levels of study. For the PhD level, the National Standard of Serbia (NSS) predicts that a teacher at the PhD level should have at least three papers in the last ten years in IF journals (SCI, SCIe, SSCI, and AHCI). At least 50% of teachers in permanent employment meet this requirement. The mentor should have at least five papers in journals with IF for the last ten years in his mentoring field (maximum of five candidates per mentor at the same time). The PhD candidate should publish at least one

paper from his dissertation in journal with IF where he is the first author. These criteria refer to the faculties of natural, medical and technical sciences, while for social and humanities (S&H), as well as for architecture and urbanism (technical sciences) and in the field of art, the above requirements can be replaced by papers in national journals, and other publications, such as paper at a conference (Official Gazette, 67/2021; NAT, 2021). The accreditation process has been carried out continuously since 2008.

The much lower criteria in the S&H area and the two technical sciences areas are justified by the fabricated hypothesis that there are no journals to publish in these areas, which are just excuses. For example, the number of journals with IF from the SSCI list for law in 2023 is 154, political science 165, economics 381, management 227, linguistics 194, architecture 55, urban planning 44, while for metallurgical (79) and mining engineering (20), but for researchers from these fields is not a problem for publication.

Due to the diploma supplement accepted in Serbia, according to EU standards (EU Commission, 2016), from which the names of professors in individual subjects can be seen and their competencies can be easily determined, many graduate students from certain faculties are not happy to be seen in companies in the EU. Also, the continuation of education at EU universities at the PhD level for students from Serbia has recently become questionable, except for a few faculties where the quality of teaching is still considered.

In transition countries such as Serbia, the development of the private sector is gaining importance, which is also happening in the education sector with the opening of institutions at all levels, from primary to

university education, with questionable qualifications of teaching staff. State authorities are not interested in the development of the educational system. The low allocation of funds from the state budget contributes to a continuous decrease in the quality of output at all levels of the educational process, along with attempts to undermine the autonomy of universities. The consequence of this situation is the provision of significant subsidies to foreign investors to open production plants with a low level of required employee knowledge. The development of the educational system, education and science as a whole is not the focus of the interests of state authorities (Živković & Panić, 2020b). It is a fact that adequately educated people with the highest level of knowledge in the world have a significant influence, among other things, on the society development and relations in a given country, which in non-democratic regimes is not in the interest of the country (Denicolo et al., 2018).

In Serbia, there are currently nine state and ten private universities, where acquiring a PhD diploma formally creates future professors for the faculties of these universities. Also, there are 81 high vocational schools (58 state and 23 private). Serbia is a country with $6.5 \cdot 10^6$ inhabitants.

Recently, in Serbia, plagiarized doctorates of the highest civil servants have been reported, as well as purchased diplomas at private and state universities (the focus is the University of Kragujevac) (Serbia Today, 2017; Daily newspaper Blic, 2021; Sremsko-Mitrovački portal, 2022; Podrinjske, 2024). This leads to very poor results that such "experts" achieve in practice, given that they are generally entrusted with responsible jobs in state-owned enterprises that are rapidly collapsing. Also, the Accreditation Body of Serbia suspected that the doctoral degrees for about 2,000 professors at private faculties are problematic. Still, that action has since died without concrete results (Serbia Today, 2017). Also, in numerous cities throughout Serbia, many schools at all levels of study operate illegally without accreditation, where diplomas for different levels of study are obtained in multiple classrooms without laboratories and qualified teachers. For example, in the city of Bor, with 40,000 inhabitants, two private schools offer diplomas in the "house of knowledge" with 11 specialities for all level of education and mechanical and marine engineering, electrical and energy engineering, architecture, economy, law and trade,... State authorities are not interested in the actions of ambitious private entrepreneurs in education, and the consequences for society with such personnel are already obvious.

Regardless of the formal harmonization of higher education in Serbia with EU standards, in practical application, many things do not work, even at prestigious universities. There are very few cases of internationalization in the preparation and defence of doctoral dissertations, so the level of acquired competencies in relation to EU universities is not comparable. The newly created PhD experts (professors) begin to train others, which continuously reduces the level of higher education and resulting knowledge at the universities in Serbia. Certainly, the reconstruction of the PhD level of studies should be the first step towards rehabilitating higher education in Serbia. In this way, competent professors who would train the new generations correctly and create personnel comparable to personnel from the EU educational area would create all conditions for Serbia's entry into the EU.

In recent times, with the strong desire to

create as many PhD graduates as possible, mentorships have become questionable because mentors are not even educated in the field in which the dissertation is being done, even a complete committee that evaluates the quality of the doctoral dissertation. The candidate often does not even know the terminology he uses in his dissertation. With this approach to creating future educators who will teach others at universities in Serbia, it is increasingly certain that "the beginning of the end of a nation is the moment when the unlearned begin to teach others" (Živković, 2024).

Mentoring work with a PhD student has a predominant influence on the outcomes of PhD studies (Amador-Campos et al., 2023) through continuous education and supervision when PhD students learn from the mentors the skills of research work and the path to the world of science, and when they start with their first publications in journals with IF (Ezzahra et al., 2015). This influences research and publication of scientific results to become the meaning of their lives. As a result of this education, PhD students can teach others (Marder et al., 2021; Guillaumet & Tomàs, 2022). The current situation in Serbia, with few exceptions, is that mentorships are formal and accepted from fields where nothing has ever been published. PhD students are expected to bring already published papers with mandatory coauthorship from the mentor (often in available predatory journals). PhD diplomas obtained in this way are a necessary and sufficient condition for the position of assistant professor at a faculty or higher school, which puts the Serbian education system in an unenviable position with a tendency of continuous decline in the quality of outcomes at all levels of study (Oolbekkink-Marchand et al., 2022). The

worst scenario is when they become mentors to new PhD students, who are more and more at universities in Serbia (Manea & Iatagan, 2015).

The largest number of universities in Serbia is constituted according to the traditional model, without integrated universities, where many faculties have many study programs with different content and scope. In these conditions, larger departments "suffocate" younger and smaller ones who often have better quality personnel and better scientific results, not allowing them to develop unhindered because, in such conditions, the shortcomings of large departments become more visible. The centralist and undemocratic management system from the top of the state is transferred to the universities, where different opinions can be heard less and less.

Table 1 shows an overview of the number of defended dissertations in Serbia during the three-year period 2020-2022. In this period, the number of defended dissertations is 2,794 – 143 annually per million inhabitants (NaRDUS, 2024).

The results shown in Table 1 indicate that in the considered period, the number of defended PhDs dissertations in Serbia is 931 per year, of which 83 are at private universities. The share of defended PhDs dissertations at the University of Belgrade is 53%, which indicates its predominant position in the educational area of Serbia. At the same time, there is an obvious tendency for the number of defended dissertations to decrease in the considered period. In 2021, the number of defended dissertations was 30% lower (probably due to the impact of the coronavirus), and in 2022, compared to 2020, it was 3.95% lower.

Table 2 shows the position of universities in Serbia (US) in the top 1,000 on the ARWU

Table 1. Overview of doctoral dissertations defended at universities in Serbia in the period 2020 – 2022

University	Number of faculties	Number of doctoral dissertations defended			In total
		2020	2021	2022	
University of Belgrade	32	671	150	662	1,483
University of Novi Sad	13	250	66	232	548
University of Kragujevac	12	95	23	76	194
University of Niš	12	90	21	73	184
State University in Novi Pazar	8*	-	-	1	1
Criminal police academy	4*	-	-	5	5
Defense University	1	3	7	8	18
University of Arts	4	47	12	41	100
University of Priština in K. Mitrovica	10	1	6	6	13
Union University**	3	9	9	6	24
Union N. Tesla University**	5	3	5	9	17
University of Novi Pazar**	6*	-	4	5	9
European University**	3	-	-	-	-
Alfa Bk**	4	20	21	22	63
Edukos**	11	7	7	4	18
Megatrend**	7	-	-	-	-***
Metropoliten**	3	8	-	-	8
Business Academy**	5	15	14	13	42
Singidunum**	4	21	18	28	67
In total	147	1,240	363	1,191	2,794

* Number of departments in an integrated university
** Private universities
*** There is no data on defended dissertations on the Repository of Doctoral Dissertations portal, but on the portal of the Faculty of Management in Zaječar, part of Megatrend University, two dissertations were defended in this period – one in 2020 and one in 2021, and three more dissertations in 2022 were highlighted for public inspection.

list in 2023. The University of Belgrade is 301–400, and the University of Novi Sad is 901–1,000. Out of 19 universities on the ARWU list in 2023 by fields (56 fields), only universities are in Belgrade (13), Novi Sad (4), Niš (1), and Kragujevac (1), which indirectly indicates the quality of PhD studies in Serbia.

These facts indicate that at the Serbian universities on the ARWU list, in total and by narrower disciplines, there are quality scientific workers recognized in the world, which is a basic prerequisite for quality university education at all levels. Also, the number of journals on the SCI, SCIe, and SSCI list from Serbia is 25 and 45 on the newly formed ESCI list, where researchers

from the mentioned universities dominate most of the management positions. There are 90 scientific journals published in Serbia (in 2022) in the SJR – SCOPUS scientific journal database: Q_1 (8), Q_2 (8), Q_3 (44), and Q_4 (30). These facts indicate that in Serbia, at state universities, there is significant potential for developing science as a basic prerequisite for quality outcomes in PhD studies. The sporadic cooperation of the diaspora with some faculties in Serbia should certainly be considered. Also, a significant number of scientific workers from Serbia are on the prestigious list of the most cited people in the world, defined by Stanford University. In relation to the number of inhabitants in Serbia, this number is by far

Table 2. Ranking universities from Serbia on the ARWU list (overall ranking) and ranking by narrow scientific fields in 2023

Field	University	Rank
Overall university ranking	University of Belgrade	301–400
Top 1,000 universities	University of Novi Sad	901–1,000
Natural Science		
Mathematics	University of Belgrade	301–400
	University of Niš	401–500
Physics	University of Belgrade	201–300
Ecology	University of Belgrade	401–500
Engineering		
Food Science &Technology	University of Belgrade	51–75
	University of Novi Sad	151–200
Textile Science and Engineering	University of Belgrade	401–500
Life Science		
Agricultural Science	University of Belgrade	301–400
	University of Novi Sad	401–500
Veterinary Science	University of Belgrade	201–300
Medical Science		
Clinical Medicine	University of Belgrade	201–300
	University of Kragujevac	201–300
Public Health	University of Belgrade	301–400
	University of Novi Sad	401–500
Density& Oral Science	University of Belgrade	201–300
Pharmacy & Pharmaceutical Sciences	University of Belgrade	301–400
Social Science		
Education	University of Belgrade	401–500
Psihology	University of Belgrade	301–400
Hospiltality & Tourism Management	University of Novi Sad	201–300

* Ranking of universities in the world in the top 1,000, as well as among the first 500 in the scientific field: Natural Science (8 narrower scientific fields); Engineering (23); Life science (4), Medical Science (6) and Social Science (15)

the largest in the region. However, the state's inadequate attitude towards education as a whole, due to the reduced quality of education outcomes at all levels of study, has major consequences for the development of the country as a whole, given the continuity of the spontaneous process of decline in the quality of education outcomes in Serbia at all levels, especially at the PhD level.

4. RESEARCH METHODOLOGY AND RESULTS DISCUSSION

The methodology of SWOT analysis was used to investigate the quality of PhD studies in Serbia. The situation was analyzed in a sample of four state universities (Belgrade, Novi Sad, Kragujevac, and Niš) and six private ones (Business Academy, Union, Union N. Tesla, Alfa BK, Educos, and Singidunum) to determine the quality of PhD

Table 3. TOWS matrix for scanning the quality of PhD studies in Serbia and defining possible strategies for further action

TOWS marix	Strengths (S) S_1: The quality of scientific workers at some state universities S_2: The quality of scientific journals published in Serbia S_3: International reputation of some state universities S_4: The connection of part of the scientific elite of the diaspora with the mother country	Weaknesses (W) W_1: Different criteria for scientific fields W_2: Insufficient international mobility of teachers and students W_3: Inadequate competencies of teachers and mentors W_4: Inadequate attitude of the state towards science and education
Opportunities (O) O_1: PhD students from Serbia at elite foreign universities O_2: Involvement of visiting professors from elite universities in PhD studies O_3: International arbitration in the accreditation of PhD programs	*SO strategies* SO_1: The strategy of the state's turn in policy towards science and education SO_2: The strategy of creating strategic partnerships with elite universities in the world	*WO strategies* WO_1: The strategy of introducing the same criteria for all scientific fields and at all faculties
Threats (T) T_1: The emergence of plagiarized PhD dissertations and purchased diplomas T_2: Becoming professors with PhD diplomas without adequate knowledge T_3: Appointment to positions in the state administration with PhD diplomas without adequate knowledge T_4: Bad reputation of graduated PhD students in the world	*ST strategies* ST_1: Strategy for developing the quality of PhD studies according to EU standards	*WT strategies* WT_1: Strategy for reviewing the quality of PhD diplomas issued in the last ten years

studies in Serbia. Table 1 shows the structure of the analyzed universities, with the number of faculties and the number of defended dissertations in 2020, 2021, and 2022, given that the Repository of Doctoral Dissertations for 2023 is not final.

To define SWOT factors, a written form of brainstorming was used in which 28 randomly selected experts (professors) and 15 PhD students (from state and three private universities) participated in several rounds. In the first round, the first ideas for each SWOT factor were collected. In the second round, the other team members' proposals were familiarised, and the list of original ideas was expanded. To determine the final SWOT analysis with relevant sub-factors within each factor, weighting parameters were assigned in three rounds (scale 1–5) until the number of sub-factors in each SWOT factor was not reduced to a probability of significance above 75% (weighting parameters higher than 3.75). An expert team of five experts defined possible strategies within the TOWS matrix (Živković & Nikolić, 2016). The results obtained on the TOWS matrix are given in Table 3.

The AHP-SWOT methodology (Kurttila et al., 2000; Kangas et al., 2001; Nikolić et al., 2015) was used to determine the order of implementation of the defined strategies to change the current quality of PhD studies. Figure 1 shows the structure of the AHP model based on the results shown in the TOWS matrix. The prioritization of defined strategies is based on the fact that each strategy has its life cycle in which, when it achieves maximum results, stagnation occurs in the growth of realized benefits, the application of the next optional strategy begins, and so on until the end of the cycle to achieve the final desired results for the considered issue.

Based on the evaluations of the expert team, the importance of each SWOT factor in the model, their interdependence and importance in relation to the main goal was determined. Also, the significance and overall significance of the SWOT sub-criteria in relation to the main goal was determined. Saaty's scale (Saaty, 1990) was used to determine the significance of SWOT criteria and sub-criteria by calculating the mean arithmetic values of expert ratings and showing them as such in the final result. Tables 4 and 5 show the expert evaluation of the pairwise comparison of SWOT groups and the significance of the criteria and sub-criteria of the SWOT analysis, respectively, according to the MCDS procedure (Kangas et al., 2016).

The results shown in Table 4 indicate the presence of major weaknesses in the system of PhD studies in Serbia (W=0.469), which cause, also at the same level, threats from the environment (T=0.412), with evident strengths that are "de facto" suppressed (S=0.076), with little chance of change (O=0.043), if the weaknesses and threats are not significantly reduced.

After the complete AHP procedure, in which five experts participated, Table 5 shows the values obtained for the importance of the SWOT criteria and sub-criteria based on the evaluation by the experts, which was carried out in an online format with each expert individually.
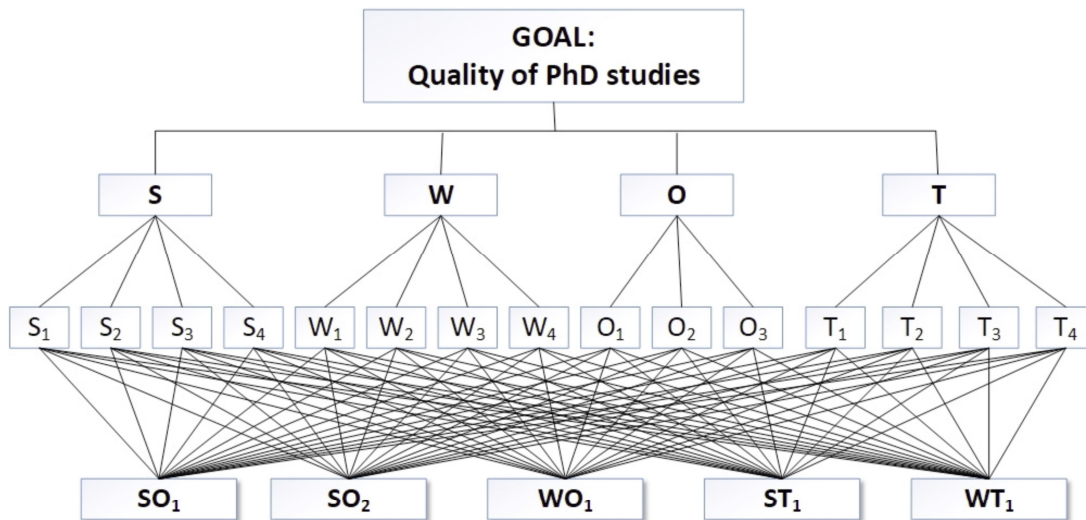

Figure 1. AHP model for the best strategy selection

Table 4. The comparison of the significance of the SWOT factors

SWOT groups	S	W	O	T	Importance of the SWOT factor
Strengths (S)	1	1/9	3	1/7	0.076
Weaknesses (W)		1	9	1	0.469
Opportunities (O)			1	1/7	0.043
Threats (T)				1	0.412
Consistency ratio in relation to the main goal			CR = 0.06		

Table 5. Significance of SWOT criteria and sub-criteria

SWOT groups	Importance of the SWOT criteria	SWOT sub-criteria		Local importance of SWOT sub-criteria	Global importance of SWOT sub-criteria
Strengths (S)	0.076	S_1	The quality of scientific workers at some state universities	**0.391**	**0.030**
		S_2	The quality of scientific journals published in Serbia	0.301	0.023
		S_3	International reputation of some state universities	0.055	0.004
		S_4	The connection of part of the scientific elite of the diaspora with the mother country	0.253	0.002
Weaknesses (W)	**0.469**	W_1	Different criteria for scientific fields	0.260	0.122
		W_2	Insufficient international mobility of teachers and students	0.047	0.022
		W_3	Inadequate competencies of teachers and mentors	0.280	0.131
		W_4	Inadequate attitude of the state towards science and education	**0.413**	**0.034**
Opportunities (O)	0.043	O_1	PhD students from Serbia at elite foreign universities	0.100	0.004
		O_2	Involvement of visiting professors from elite universities in PhD studies	0.114	0.005
		O_3	International arbitration in the accreditation of PhD programs	**0.786**	**0.034**
Threats (T)	0.412	T_1	The emergence of plagiarized PhD dissertations and purchased diplomas	0.191	0.079
		T_2	Becoming professors with PhD diplomas without adequate knowledge	0.091	0.038
		T_3	Appointment to positions in the state administration with PhD diplomas without adequate knowledge	0.065	0.027
		T_4	Bad reputation of graduated PhD students in the world	**0.653**	**0.269**

The results from Table 5 indicate the decreasing importance of SWOT factors in the sequence W(0.469) → T(0.412) → S(0.076) → O(0.043). The dominant significance of the SWOT sub-criteria based on local importance is O_3(0.786) →T_4(0.653) → W_4(0.413) → S_1(0.391). Sub-criterion O_3 (International arbitration in the accreditation of PhD programs) has a predominant influence on the final results of improving the quality of PhD studies in Serbia. The global significance of the sub-criteria has the following values: T_4(0.269) → W_4(0.194) → O_3(0.034) → S_1(0.030), which indicates the possible sequence of influence of certain sub-factors on the beginning of changes in the quality of the considered PhD studies in Serbia.

In the next step of the AHP procedure, an expert assessment of the weight of the

SWOT sub-criteria on the alternative strategies defined in the TOWS matrix (Table 3) was performed. All the binary relations of SWOT criteria and sub-criteria were determined, including different strategic alternatives within the same binary SWOT relation. The weight importance of the predicted strategies was determined in relation to the defined SWOT sub-criteria, which made it possible to define the priorities of the defined strategies based on normalized weighting factors in the following sequence: $SO_1 \rightarrow SO_2 \rightarrow ST_1 \rightarrow WO_1 \rightarrow WT_1$.

The declining quality of PhD studies in Serbia is not in question, and it is primarily caused by the state's inadequate attitude towards science and education. For this reason, in raising the level of PhD studies in Serbia, the first step is implementing strategy SO_1 (The strategy of the state's turn in policy towards science and education), which is in the state's best interest. This turnaround implies the application of all EU standards to the entire education system without exception, a significant increase in the rate of allocation of funds from the budget for science and education, with complete autonomy of universities and scientific institutes. Years back, about 1% of GDP was allocated for education, with a tendency to decrease, which makes the educational system in Serbia incompatible with the system in the EU. According to the relevant EU institutions, this allocation should be at least 3% of GDP (Dumciuviene, 2015; Živković & Panić, 2020). Applying this strategy would stop the downward trend in the quality of all levels of education, especially the PhD level, where changes can be implemented more quickly than at lower study levels.

With the stated turn of the state towards science and education, after the establishment of a stationary position, universities in Serbia would become recognizable in the environment and desirable for cooperation, which enables the implementation of the following strategy SO_2 (The strategy of creating strategic partnerships with elite universities in the world). Strategic partnerships with the best universities in the world (top 100 on the ARWU list) imply the fastest and most efficient way of transferring knowledge and experience from the best in the world to universities in Serbia, which requires an appropriate material base and level of equipment.

By applying the SO_2 strategy, a climate would be created where the predominant indicator in science and all education in Serbia is the quality of the results these institutions create and the basis for their further growth and development, which the state will always support. For example, the results of the PISA test in Serbia are unsatisfactory. At the same time, the same age group of students (a small number) are winning gold medals at Olympiads in various fields without visible support from the state, which, in the changed conditions, would not have been possible with the previous application of the strategies above.

After raising the quality of all levels of studies according to EU standards and creating a climate in society that science and education are the most important development resources of the country, the conditions are met for the implementation of strategy ST_1 (Strategy for developing the quality of PhD studies according to EU standards). This strategy implies the continuous introduction of all EU standard provisions for PhD studies, without any specifics and special situations in any part of

Serbia's science and education system.

During the process of harmonizing the criteria and rules of PhD studies in Serbia with EU standards, an important step is the implementation of strategy WO_1 (The strategy of introducing the same criteria for all scientific fields and at all faculties), which will be a big threshold that many faculties, especially from the private sector, will not be able to reach. This strategy raises the scientific level in the S&H sciences, as well as in architecture and urbanism, to a much higher level than the current one and equalizes with the level in other fields, such as medicine, natural sciences and technical sciences.

Implementing the strategies above has its life cycle. It requires time for implementation, which, if the state is interested, will cause a lot of turbulence in Serbia's educational and scientific space. After the expected turbulence subsides, the conditions are met for the implementation of strategy WT_1 (Strategy for reviewing the quality of PhD diplomas issued in the last ten years from the moment of application of this strategy). This strategy implementation is necessary for completing the process of increasing the quality of PhD studies in Serbia, which should contribute to the result that all those with inadequate PhD diplomas are removed from positions in the system of science, education and state bodies so as not to hinder the influence of new personnel with adequate knowledge on the development of society as a whole. The limits of this study arise from dynamic changes in Serbia's educational system, which arise as a consequence of the downward trend in the quality of PhD studies. Thus, the presented results change over time.

5. CONCLUSION

Serbia's basic educational resources within the Universities of Belgrade, Novi Sad, Niš, and Kragujevac indicate that they have recognizable scientific potential worldwide. They have achieved positions on the ARWU list and citations in the Stanford University categorization. Also, high school students from Serbia are achieving significant results at many knowledge Olympiads worldwide. However, this level exists only in a small part of Serbia's educational space.

By accepting the EU directives for PhD studies (a certain number of papers in journals with IF is necessary for teachers, mentors and candidates), the laws in Serbia make concessions for the S&H area, as well as for architecture and urbanism in technical sciences, which is an unacceptable practice. International arbitration in the accreditation of PhD studies should enable the level of these studies to be equalized with the best in the EU educational area.

For the Serbia education system to be the carrier of the country's economic development, it is necessary to carry out a transformation, first of all, at the PhD level of study to create quality teachers for all study levels by changing the attitude of the state policy towards education. This should enable partnership with the best universities in the world, the application of EU standards, and the unification of the quality of the results of all higher schools and universities. To achieve those above, it is necessary to unify the quality of the teaching staff at all levels of study and all universities, which enables quality PhD studies.

The abovementioned changes in attitudes towards science and education are the basis for Serbia's future path towards the EU,

which will inevitably cause many turbulences in the current system in these areas. The positive outcome of the change in the quality of PhD studies depends on the state's readiness for dramatic changes in already-built relationships.

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ДОКТОРСКЕ СТУДИЈЕ У ТРАНЗИЦИОНИМ УСЛОВИМА – ОСНОВА ОБРАЗОВНОГ СИСТЕМА И ЕКОНОМСКОГ РАЗВОЈА: СТУДИЈА СЛУЧАЈА СРБИЈА

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Извод

Квалитет докторских студија је кључни фактор образовног система у Србији од којег зависи развој људских ресурса, као основе за развој друштва у 21. веку. За процену квалитета докторских студија у Србији у овом раду, коришћена је вишекритеријумска подршка одлучивању (MCDS) и метода гласања у SWOT окружењу, уз примену хибридне SWOT-AHP методологије. Експертском анализом у оквиру SWOT-AHP хибридног модела, дефинисане су одреднице SWOT субфактора и могуће стратешке опције и утврђена приоритизација дефинисаних стратегија, чијом применом се могу отклонити све постојеће слабости докторских студија у Србији и дефинисати пут ка достизању нивоа квалитета дефинисаног ЕУ стандардима. Ова студија има за циљ да усмери пажњу научне јавности на тренд опадања квалитета докторских студија у Србији и његове последице.

Кључне речи: докторске студије, квалитет, исходи, SWOT, AHP

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