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EFFICIENCY OF PUBLIC UNIVERSITIES IN POLAND IN THE FACE OF CHANGES IN THE ACT ON HIGHER EDUCATION

Implementing a reform of higher education, colloquially named as "Constitution for science" carries certain information needs in the area of creating new strategic management of a public university and determining its organizational structure. Efficiency and productivity of higher education in Poland and worldwide inseparably connect with problems of the way of financing and control of source spending. An amendment of a Regulation of a Minister of Science and Higher Education of a way of sharing the grants from a state budget for public and non-public universities in December 2016 which was a sign of changes in the attitude of executing tasks imposed on universities resulted in adjustment processes of public universities and posed questions again: how to manage a university and which managing model is the most effective for a specific university? Both "pro-quality" approach and potential organizational internal changes of universities will cause a necessity of different attitude towards a way of providing information for management decisions. When retaining basic functional aims a controlling approach will play a prominent part at public universities. It is connected with fast development of IT systems implemented at public universities ("one-base" systems of information management) and also with a requirement of more effective management of public funds. Preparation of functional models conditions of public universities adequate to changes becomes one of major tasks and challenges that Polish universities have to face. In this article data from a chosen public university of economic profile was used.

Key words: *higher education reform, distribution of state budget funds between universities, university activity efficiency, information system of the public university.*

Цвьонкала-Малис А., Малис К., Дурбайло-Мровець М. ЕФЕКТИВНІСТЬ ДЕРЖАВНИХ УНІВЕРСИТЕТІВ ПОЛЬЩІ В УМОВАХ ЗМІНИ ЗАКОНОДАВСТВА ПРО ВИЩУ ОСВІТУ

Реалізація реформи вищої освіти, що зветься «Конституція науки», має певні інформаційні потреби у сфері створення нового стратегічного управління державним університетом і визначення його організаційної структури. Ефективність і продуктивність вищої освіти у Польщі та світі нерозривно пов'язані з проблемами фінансування та контролю витрачання ресурсів. Поправка до Постанови Міністерства науки та вищої освіти про розподіл коштів з державного бюджету для державних і приватних університетів у грудні 2016 р. є ознакою змін у ставленні до виконання завдань, покладених на університети, запускає процеси адаптації державних університетів і ставить питання: як саме керувати університетом та яка модель управління є найбільш ефективною для конкретного університету?

Обидва підходи – і «проякісний», і побудований на потенційній внутрішній зміні організації університетів – спричинять необхідність різного ставлення до способу представлення інформації для прийняття управлінських рішень. Контроль як функція менеджменту відіграватиме значну роль у державних вищих навчальних закладах. Це пов'язано з швидким розвитком інформаційних систем, впроваджених у державних вищих навчальних закладах («єдина система управління інформацією»), а також з вимогою більш ефективного управління державними коштами.

Мета статті – визначити інформаційну основу прийняття рішень, необхідну для ефективного управління державним університетом в умовах зміни законодавства про вищу освіту та оцінка функціонування нових правил розподілу бюджетних коштів задля підвищення ефективності освітнього процесу. У статті для аналізу використано дані обраного державного університету економічного профілю.

Ключові слова: *реформа вищої освіти, розподіл кошів державного бюджету між університетами, ефективність діяльності університету, інформаційна система державного університету.*

Introduction. A new act on higher education that is being implemented is another attempt to reform a segment of public universities in Poland. It assumes far-reaching independence in creating conditions for an institution to function with simultaneous focus on quality, internationalisation and consumption of a university results from its activity, both from didactic (staff for an enveloping economy) and research and development (implementations).

All the changes introduced in the algorithm should influence the improvement of the quality of education [2] and a change of action strategy of public universities and help to gain the best model of financing public institutions of higher education as to use their potential in the most effective way.

The aim of this article is to determine a base of management which is necessary for effective management of a public university at a time of changes that are brought by an amendment of an act on higher education and evaluation of functioning of new rules of dividing budget sources as to bring efficiency of an education process.

In this article methods of an analysis of reporting data from public university of an economic profile and non-parametric DEA method are used. The researched period entails 2016-2017.

Amendments in the act and their influence on a level of incomes and expenses of public universities. Amended act on higher education – Constitution for Science[1] assumes an increase of organizational autonomy by increasing a role of a status of a university and a vice-chancellor. A status of an institution defines the rules of an organization and it's functioning including a procedure of appointing and removing organs of an institution and organizing elections. A vice-chancellor presents a new organizational structure of a university and a division of activities. All issues connected with a core and mechanism of organizational units functioning will not be defined by the act.

A new act changes a way of transferring public funds – from grants to subvention. Universities and units that perform a scientific activity will have a right to freely decide about allocating financial means. In the system of financing there were two streams of sources forecast: subventions for keeping up a didactic and research potential. Universities will get one, combined subvention of a research-didactic kind. There will be a consolidation of other, currently functioning streams of financing in the system of science and higher education. Financing special research tools, minister programmes and financial help for students and supporting universities in facilitating education for people with disabilities.

According to assumptions of a new act the current level of financing will stay the same, including annual valorisation and concurrent financing so called pro-quality activities. It will be visible in:
- Financing the best organizational units of universities with a status of National Scientific Leadership Centre (KNOW),
- Increasing the scholarship for postgraduate students for the best 30% of them, additional financing for organizational units of a university that has been given an outstanding evaluation by The Polish Accreditation Committee (PKA) and implementation of internal systems that guarantee

quality of education in connection with State Frames of Qualification (KRK).

A new act on higher education predicts a change in an attitude towards functioning of public institution that is seen in caring for a quality both didactical and in research and development area. It was also implemented in a new way of financing public universities, more precisely, in the change of allocation basic subsidies. First of all, the role of algorithm of subsidies division was reinforced by decreasing a level of so called transfer rate constant which should be accepted. Second of all, pro-quality factors were introduced in an algorithm formula which is a kind of weigh that is adjusted to component parts: student-post graduate and staff. These are factors of availability of faculty (*SSR – Student Staff Ratio*) calculated according to a formula (1)[2]:

$$d_i = \begin{cases} 1,0 & where \ m \leq M \\ \left(\dfrac{M}{m}\right)^2 & where \ m > M \end{cases}. \qquad (1)$$

where:

M – defines a referential number of students and post graduates for each academic teacher, M=13,

m – defines a number of students and post graduates for each academic teacher in i-university and a rate of scientific potential which is calculated according to a formula(2)[3]:

$$Y_i = \frac{1,5Lf_i + 1,0La_i + 0,7Lb_i + 0,4Lc_i}{Lf_i + La_i + Lb_i + Lc_i} \qquad (2)$$

where:

Lf_i – defines a number of scientific units in i-academic institution that has a scientific category A+ ,

La_i – defines a number of scientific units in i-academic institution that has a scientific category A ,

Lb_i – defines a number of scientific units in i-academic institution that has a scientific category B ,

Lc_i – defines a number of scientific units in i-academic institution that has a scientific category C.

The amount of these two factors (availability of academic staff and scientific potential) will influence to a great extent the amount of financial sources that will be received by a public university. At the same time a new algorithm of a basic subsidy division influences the cost incurred in a particular university, more precisely for a costs of education for a unit. In case of a public economic university under research reaching a referential size of a parameter (m) it would involve a rapid decrease (of about 40%) of a number of students and post graduates. Analysing different variants of improving the size of a parameter (m), each of them is connected with the increase of education costs, that is:
- An increase of number of didactic hours connected with employment of academic teachers causes an increase of costs,
- An increase of number of didactic hours for each student with a decreasing number of students causes an increase of costs,

[1] http://e-prawnik.pl/wiadomosci/informacje/reforma-szkolnictwa-wyzszego-i-nauki.html.

[2] Regulation on 7th December 2016, appendix no. 1, act 3.
[3] Regulation on 7th December 2016, appendix no. 1, act 3.

- An increase of didactic hours in total and on average for one student, causes an increase of costs [4].

Efficiency of chosen fields of studies by the example of a public economic university in 2016-2017. In 2017, for the first time, public academic institutions received financing according to a new and pro-quality formula of division. At the same time, it was the first year when universities started 'accommodating' actions to new conditions of financing. It coincided with wide-ranging discussion of an academic community on the project of a new act on higher education within a formula of National Congress of Science. In the following parts an analysis of efficiency of fields of studies will be conducted on the basis of a chosen public economic university in 2016-2017 and all the actions taken to build an optimal model of education in changing conditions. In Table 1 generic and didactic activity costs were presented.

Table 1

Generic and didactic activity costs of a chosen economic university in 2016-2017 (in thousands PLN)

Costs	2017	2016	change (%)
Amortisation	2 332,4	3 760,3	62%
Materials	2 570,3	3 161,4	81%
Energy	4 817,4	4 977,3	97%
Transport services	166,0	168,5	98%
Renovation services	770,6	1 311,9	59%
Remaining services	8 223,1	8 258,2	100%
Remuneration	90 068,2	89 290,8	101%
Insurance	14 987,9	14 718,1	102%
Deduction of Employee Benefit Fund	3 860,1	3 598,1	107%
Remaining benefits	572,3	268,8	213%
Taxes and fees	393,7	466,6	84%
Remaining costs	10 495,6	7 064,7	149%
Sum	139 257,5	137 044,7	102%
Including costs of didactic activity	132 507,5	128 745,0	103%

Source: self-study on the basis of reporting data of a chosen economic university.

On the basis of presented data it can be observed that there was slight increase of costs in total (of about 2%) and cists of a didactic activity (of about 3%) in 2016-2017. At the same time income from a standard subsidy of a chosen university decreased of about 5% due to a high level of a parameter (m), amounting to over 20,0. Management of a university made a decision to decrease a number of students by limiting the number of new students. In Table 2 a number of students (in 2016-2017) according to different fields of studies were presented.

Table 2

Number of students according to fields of studies, level of studies and a type of studies of a chosen economic university in 2016-2017

Field of studies	Number of full-time students			change (%)	Number of extramural students			change (%)
	Level of studies	2017	2016		Level	2017	2016	
Economic analytics	L	155	184	84%	L	1	4	25%
Economic analytics	M	47	53	89%	M	-	-	-
Economy	L	459	495	93%	L	152	160	95%
Economy	M	180	252	71%	M	63	71	89%
Finance and accounting	L	1 463	1 742	84%	L	884	765	116%
Finance and accounting	M	682	830	82%	M	694	772	90%
Land management	M	69	38	182%	M	23	-	-
IT and Econometria	M	-	6	0%	M	-	11	0%
Business IT	L	209	221	95%	L	295	207	143%
Business IT	M	80	116	69%	M	218	125	174%
Logistics	L	274	226	121%	L	315	223	141%
Logistics	M	57	33	173%	M	87	88	99%
International Economics	L	527	567	93%	L	68	41	166%
International Economics	M	166	224	74%	M	20	51	39%
Tourism	L	66	78	85%	L	-	-	-
Tourism	M	-	37	0%	M	-	-	-
Management	L	993	1 032	96%	L	507	386	131%
Management	M	434	591	73%	M	628	731	86%
Management and production engineering	L	1 112	1 228	91%	L	194	216	90%
Management and production engineering	M	195	245	80%	M	248	267	93%
Legal and economic consulting	M	-	-	-	M	89	48	185%
Sum		7 168	8 198	87%		4 486	4 166	108%

Source: self-study on the basis of reporting data from a chosen economic university.

In the researched period of time a number of full time students decreased of about 1.000 people (decrease of 13%), however, the number of extramural students increased of about 320 (increase of 8%). It was

connected with university policy that stated about gradual and constant reduction of a number of students and a the same time levelling off the number of full-time and extramural students. The results of such actions were supposed to be: improvement of a parameter (m) of a researched university, which would mean coming back to a situation when subsidy was allocated according to a formula of an algorithm with an increase of didactic income from fees of extramural studies. In total in the researched period of time the number of students decreased of about 710 people, which is 6%.

For the need of measuring efficiency of fields of studies from a chosen economic university in 2016-2017

efficiency model was created in which inputs are incurred operational costs of didactic activity and the result is a number of students on each field of full-time studies. Operational costs were ascribed to fields on the basis of number of hours in a didactic process. The authors have an opinion that a didactic hour is the best medium of education costs [5; 3]. Filed efficiency of a chosen economic university was measured with the usage of non-parametric DEA method (*Data Envelopment Analysis*). In Table 3 data on inputs and results for particular field of full time studies was presented.

Table 3

Costs and a number of students for particular fields of studies from a chosen economic university in 2016-2017

Field of studies	Level of studies	Full time studies (2017)		Full time studies (2016)	
		Costs (thousands PLN)	Number of students	Costs (thousands PLN)	Number of students
Economic analytics	L	2 220,3	155	2 860,9	184
Economic analytics	M	601,7	47	893,9	53
Economy	L	7 996,4	459	7 080,5	495
Economy	M	2 683,3	180	2 169,1	252
Finance and accounting	L	18 182,2	1 463	21 188,3	1 742
Finance and accounting	M	5 838,7	682	7 034,0	830
Land management	M	1 271,9	69	726,2	38
Business IT	L	3 211,4	209	4 313,2	221
Business IT	M	990,3	80	1 403,2	116
Logistics	L	3 057,7	274	2 744,4	226
Logistics	M	689,4	57	398,1	33
International Economics	L	7 739,0	527	7 240,8	567
International Economics	M	2 191,1	166	2 069,4	224
Tourism	L	1 777,4	66	1 772,3	78
Tourism	M	-	-	323,3	37
Management	L	15 363,5	993	15 977,1	1 032
Management	M	5 014,8	434	5 150,6	591
Management and production engineering	L	20 058,3	1 112	18 384,6	1 228
Management and production engineering	M	5 288,9	195	3 909,7	245

Source: self-study on the basis of reporting data from a chosen economic university.

On the basis of gathered data the efficiency of particular fields was measured taking into consideration the following models:

- Input oriented – fields that achieve 100% are efficient, values lower than 100% indicate that a field of studies is inefficient compared to the best units,
- Results oriented – values higher than 100% indicate that fields of studies with given inputs could gain higher results as of 100% minus the measured value (in %).

In Table 4 Collective results of efficiency measurement were presented for 19 fields of full time studies of an economic university in 2016-2017.

The lowest efficiency was on the level of 32%-38%, which means that inefficient fields of studies gained a result of about 30% of efficient ones. Thus it can be stated that a change of financing conditions implemented in 2016 did not cause an increase of education process efficiency for an economic university under analysis. It was rather a time of adjusting to a new situation than a time of pro-efficient actions.

Conclusion. Efficiency should be treated as one of categories that is used for evaluating the state of action and development of any systems. An idea of efficiency refers to rules of rational management determined in two variants: productivity (maximisation of a result) and saving (minimisation of an input) [6]. There is a condition sine qua non of each unit functioning as it implicates its development.

In a practical conceptualization the essence of efficiency amounts to measuring relations of all results of actions due to which inputs with the usage of quotient or differential formula [1].

For the last year universities in Poland have undertaken actions to improve efficiency of using resources as a way of rational utilizing public funds.

Implementation of referential value of a parameter (M=13) causes that measurement of efficiency – input – becomes useless. Imposed boundary value of 13 totally changes interpretation of these relations which results in that Polish universities will be evaluated on account of financial efficiency understood in a different way than in a situation of other researched units.

Table 4

**Collective results of efficiency measurement in a model for variable returns
to scale and for constant returns to scale in 2016-2017**

Full time studies field	Level of studies	Input: operational costs Result: number of students							
		Input orientation, VRS [%]		Results orientation VRS [%]		Input orientation, CRS [%]		Results orientation, CRS [%]	
		2016	2017	2016	2017	2016	2017	2016	2017
Economic analytics	L	55%	67%	183%	157%	55%	60%	183%	167%
Economic analytics	M	51%	*100%*	197%	*100%*	50%	67%	199%	150%
Economy	L	59%	50%	168%	178%	59%	49%	169%	203%
Economy	M	99%	63%	101%	166%	98%	57%	102%	174%
Finance and accounting	L	*100%*	*100%*	*100%*	*100%*	70%	69%	144%	145%
Finance and accounting	M	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
Land management	M	46%	62%	223%	186%	44%	46%	225%	215%
Business IT	L	44%	60%	230%	174%	43%	56%	230%	179%
Business IT	M	71%	88%	142%	118%	70%	69%	143%	145%
Logistics	L	70%	81%	143%	126%	70%	77%	143%	130%
Logistics	M	81%	99%	139%	101%	70%	71%	142%	141%
International Economics	L	66%	59%	149%	152%	66%	58%	151%	172%
International Economics	M	92%	72%	109%	144%	92%	65%	109%	154%
Tourism	L	38%	43%	267%	287%	37%	32%	268%	315%
Tourism	M	*100%*	b.d.	*100%*	b.d.	97%	b.d.	103%	b.d.
Management	L	64%	70,0%	136%	129%	55%	55%	183%	181%
Management	M	97%	75,6%	103%	134%	97%	74%	103%	135%
Management and production engineering	L	72%	63,0%	127%	132%	57%	47%	177%	211%
Management and production engineering	M	53%	34,5%	188%	316%	53%	32%	188%	317%
Average		71%	72%	153%	156%	68%	60%	161%	180%
Minimum		38%	34%	100%	100%	37%	32%	100%	100%
Maximum		100%	100%	267%	316%	100%	100%	268%	317%

Source: self-study.

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