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**RATING OF THE QUALITY OF EDUCATION  
BASED ON THE DYNAMIC NORMATIVE MODEL**

*In this paper, the issues of improvement of models and methods of quality assessment of educational services in higher educational institutions are considered. The authors offer a new system and integrated approach to rating assessment of education quality, based on the dynamic normative model.*

*Keywords: quality of education, rating assessment, normative model, system.*

Нурлан Сайлаубеков, Салтанат Багітова, Оксана Киричок  
**ОЦІНЮВАННЯ ЯКОСТІ ОСВІТИ НА ОСНОВІ  
ДИНАМІЧНОЇ НОРМАТИВНОЇ МОДЕЛІ**

*У статті вивчено питання вдосконалення моделей і методів оцінювання якості освітніх послуг у вищих навчальних закладах. Запропоновано нову систему і комплексний підхід до рейтингового оцінювання якості освіти, заснованого на динамічній нормативній моделі.*

*Ключові слова: якість освіти, рейтингова оцінка, нормативна модель, система.*

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**ОЦЕНКА КАЧЕСТВА ОБРАЗОВАНИЯ НА ОСНОВЕ  
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*В статье изучен вопрос совершенствования моделей и методов оценки качества образовательных услуг в высших учебных заведениях. Предложена новая система и комплексный подход к рейтинговой оценке качества образования, основанной на динамической нормативной модели.*

*Ключевые слова: качество образования, рейтинговая оценка, нормативная модель, система.*

### Introduction

Today, in the conditions of a wide choice of universities and competition growth in a labor market, there is a problem of a choice of university. The quality of service offered cannot be directly observed before you start studying. This makes comparing universities extremely difficult, or practically impossible (Zulkefli, Uden, 2013; Becket, Brookes, 2008). The majority of entrants are guided by the results of estimates of known rating agencies. Entrants are interested in quality of teaching, the employers – in quality of learning, and the university management – in profitability of the university.

There are various ratings of universities, such as British TOP-200 (QS), TOP 100 (Times Higher Education), Shanghai TOP-500 etc. Various criteria of a university assessment are used by drawing up these ratings, sometimes difficult measurable quantitatively, for example, the academic reputation of university (Akinfieva, 2012). In some ratings the key emphasis is made to the criteria which are indirectly influencing the quality of education.

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Based on the materials of domestic and foreign scientists (Sviridova, Sazonova, 2011; Vasilyeva, 2010; Kara, 2011; Polozov, 2011) on the development of estimates of education quality, the authors made the following conclusions on methodological principles which need to be considered in developing a rating assessment:

- a principle of integrity which means an existence of explainable relations of indicators in model;
- principle of complexity which means that the model has to display the various parties of educational activity of a university;
- principle of a model's norm. Its application in a model means that growth rates of the indicators characterizing the various parties of educational activity of establishment are in certain dependence among themselves. The normative model objective is an achievement of the most optimal condition by a university.

The method developed in this research realizes these principles taking into account various aspects of educational activity, such as quality of teaching, quality of learning and profitability of educational activity.

For calculation of quantitative indices of education quality at universities we will use the method presented in the previous work (Jumadilova, Sailaubekov, Dildebaeva, 2013). Indicators of education quality are the following:

- on the quality of teaching indicators' set: Number of teaching staff with scientific degree, Number of teaching staff from companies, Number of teaching staff published in cited journals, Number of patents, Number of publications, Number of publications in cited journals, Number of teaching staff total.
- on the quality of learning indicators' set: Number of the employed graduates, Number of graduates with high level of income, Number of graduates who became employers, Number of graduates total, Number of students getting scholarships from companies, Number of students total, Number of students successfully passed external assessment of educational achievements (EAEA).
- on the profitability indicators' set: SR – sales revenue; GP – gross profit; PPE – property, plant and equipment; B – balance; ShE – shareholders' equity; ShTD – short-term debt; PP – pretax profit; LTL – long-term liabilities; NP – net profit; COGS – cost of goods sold.

**1. Assessment of a state of university on the quality of teaching indicators' set**

The normative model of an assessment of quality of teaching is presented in Table 1.

**Table 1. Normative Model for Assessing the Quality of Teaching Indicators' Set**

N	Indicators	1	2	3	4	5	6	7	Sum
1	Number of teaching staff with scientific degree	0	0	-1	-1	-1	-1	1	5
2	Number of teaching staff from companies	0	0	-1	-1	-1	-1	1	5
3	Number of teaching staff published in cited journals	1	1	0	1	1	-1	1	6
4	Number of patents	1	1	-1	0	0	-1	1	5
5	Number of publications	1	1	-1	0	0	-1	1	5
6	Number of publications in cited journals	1	1	1	1	1	0	1	6
7	Number of teaching staff total	-1	-1	-1	-1	-1	-1	0	6
	Total								38

Developed by the authors.

Indicative data on two universities A and B are taken as information base (Tables 2 and 3).

**Table 2. The Growth Rate of the Quality of Teaching Indicators in the Basic and Reporting Periods for the University A**

Indicators	2009	2010	2011	2010/2009	2011/2010
Number of teaching staff with scientific degree	235	217	240	0,9234	1,1060
Number of teaching staff from companies	21	24	27	1,1429	1,1250
Number of teaching staff published in cited journals	18	27	34	1,5000	1,2593
Number of patents	7	11	8	1,5714	0,7273
Number of publications	493	610	520	1,2373	0,8525
Number of publications in cited journals	17	21	24	1,2353	1,1429
Number of teaching staff total	615	559	600	0,9089	1,0733

Developed by the authors.

**Table 3. The Growth Rate of the Quality of Teaching Indicators in the Basic and Reporting Periods for the University B**

Indicators	2009	2010	2011	2010/2009	2011/2010
Number of teaching staff with scientific degree	590	645	875	1,0932	1,3566
Number of teaching staff from companies	89	92	75	1,0337	0,8152
Number of teaching staff published in cited journals	75	79	83	1,0533	1,0506
Number of patents	13	17	15	1,3077	0,8824
Number of publications	980	1330	1100	1,3571	0,8271
Number of publications in cited journals	50	47	50	0,9400	1,0638
Number of teaching staff total	1300	1250	1300	0,9615	1,0400

Developed by the authors.

Below is the assessment of the quality of teaching indicators' set ( $A_{QT}$ ) which characterizes the extent of approach of the actual matrix to normative in the basic and reporting periods:

$$A_{QT}(2010) = 0,79, A_{QT}(2011) = 0,63$$

$$A_{QT}(2010) = 0,53, A_{QT}(2011) = 0,63.$$

## 2. Assessment of a state of university on the quality of learning indicators' set

The normative model of an assessment of quality of learning is presented in Table 4, and growth rates of indicators of quality of learning in the basic and reporting periods are in Tables 5 and 6.

**Table 4. Normative Model for Assessing the Quality of Learning Indicators' Set**

	Indicators	1	2	3	4	5	6	7	8	Sum
1	Number of the employed graduates	0	-1	-1	1	1	0	0	0	4
2	Number of graduates with high level of income	1	0	-1	1	1	0	0	0	4
3	Number of graduates who became employers	1	1	0	1	1	0	0	0	4
4	Number of graduates total	-1	-1	-1	0	-1	-1	0	0	5
5	Number of students getting scholarships from companies	-1	-1	-1	1	0	1	0	0	5
6	Number of students total	0	0	0	1	-1	0	1	-1	4
7	Number of teaching staff total	0	0	0	0	0	-1	0	0	1
8	Number of students successfully passed EAEA	0	0	0	0	0	1	0	0	1
	Total									28

Developed by the authors.

**Table 5. The Growth Rate of the Quality of Learning Indicators in the Basic and Reporting Periods for the University A**

Indicators	2009	2010	2011	2010/2009	2011/2010
Number of the employed graduates	1985	2020	2120	1,0176	1,0495
Number of graduates with high level of income	320	280	340	0,8750	1,2143

Continuation of Table 5

Number of graduates became employers	46	49	52	1,0652	1,0612
Number of graduates total	3050	2670	2800	0,8754	1,0487
Number of students getting scholarships from companies	118	113	125	0,9576	1,1062
Number of students total	12300	11100	12000	0,9024	1,0811
Number of teaching staff total	615	559	600	0,9089	1,0733
Number of students successfully passed EAEA	11285	8930	9650	0,7913	1,0806

Developed by the authors.

Table 6. The Growth Rate of the Quality of Learning Indicators in the Basic and Reporting Periods for the University B

Indicators	2009	2010	2011	2010/2009	2011/2010
Number of the employed graduates	3080	3120	3525	1,0130	1,1298
Number of graduates with high level of the income	475	540	620	1,1368	1,1481
Number of graduates became employers	59	73	87	1,2373	1,1918
Number of graduates total	4340	4580	4700	1,0553	1,0262
Number of students getting scholarships from companies	147	151	173	1,0272	1,1457
Number of students total	16800	14500	16000	0,8631	1,1034
Number of teaching staff total	1300	1250	1300	0,9615	1,0400
Number of students successfully passed EAEA	15120	13340	14470	0,8823	1,0847

Developed by the authors.

Below the assessment of the quality of learning indicators' set ( $A_{QL}$ ) in the basic and reporting periods is calculated:

$$A_{QL}(2010) = 0,64, A_{QL}(2011) = 0,71.$$

$$A_{QL}(2010) = 0,64, A_{QL}(2011) = 0,86.$$

### 3. Assessment of a state of university on the profitability indicators' set

The normative model of an assessment of profitability is presented in Table 7, and growth rates of profitability indicators in the basic and reporting periods are in Tables 8 and 9.

Table 7. Normative Model for Assessing the Profitability Indicators' Set

Indicators	1	2	3	4	5	6	7	8	9	10	Sum
GP	0	1	1	1	1	1	0	1	0	1	7
SR	-1	0	1	1	1	1	-1	1	-1	1	9
PPE	-1	-1	0	1	0	0	-1	1	-1	0	6
B	-1	-1	-1	0	-1	1	-1	1	-1	0	8
ShE	-1	-1	0	1	0	0	-1	1	-1	0	6
ShTD	-1	-1	0	-1	0	0	0	1	-1	0	5
PP	0	1	1	1	1	0	0	1	0	1	6
LTL	-1	-1	-1	-1	-1	-1	-1	0	-1	0	8
NP	0	1	1	1	1	1	0	1	0	1	7
COGS	-1	-1	0	0	0	0	-1	0	-1	0	4
Total											66

Developed by the authors.

Table 8. The Growth Rate of the Profitability Indicators in the Basic and Reporting Periods for the University A

Indicators	2009	2010	2011	2010/ 2009	2011/ 2010
GP	1193970	1511993	1395360	1,2664	0,9229
SR	3105706	3344017	3390134	1,0767	1,0138

Continuation of Table 8

PPE	1246253	1461863	1682675	1,1730	1,1510
B	6134474	7127462	7636753	1,1619	1,0715
ShE	4178101	5071533	5654609	1,2138	1,1150
ShTD	1956373	2055929	1982144	1,0509	0,9641
PP	762786	756474	583076	0,9917	0,7708
LTL	0	0	0	1,0000	1,0000
NP	762786	756474	583076	0,9917	0,7708
COGS	1911736	1832024	1994774	0,9583	1,0888

Developed by the authors.

**Table 9. The Growth Rate of the Profitability Indicators in the Basic and Reporting Periods for the University B**

Indicators	2009	2010	2011	2010/2009	2011/2010
GP	1298603	1920969	1774644	1,4793	0,9238
SR	3108327	3639402	3604843	1,1709	0,9905
PPE	4933951	2135544	2129931	0,4328	0,9974
B	5687503	3770827	4223103	0,6630	1,1199
ShE	4362343	2585894	2985654	0,5928	1,1546
ShTD	1325160	1184933	1237449	0,8942	1,0443
PP	241170	862503	399760	3,5763	0,4635
LTL	0	0	0	1,0000	1,0000
NP	241170	862503	399760	3,5763	0,4635
COGS	1809724	1718433	1830199	0,9496	1,0650

Developed by the authors.

Below the assessment on the profitability indicators' set ( $A_p$ ) in the basic and reporting periods is calculated:

$$A_p(2010) = 0,58, A_p(2011) = 0,24.$$

$$A_p(2010) = 0,79, A_p(2011) = 0,15.$$

In order to determine which indicators in the reporting period had a positive or negative impact on the evaluation of a generalized quality status, a factor analysis has been conducted ( Tables 10 and 11).

**Table 10. Factor Analysis of the Assessment of quality of teaching for University A in the Reporting Period**

Indicators	1	Conformity		Deviations	Impact on			
		2010	2011		2011	Increase of sustainability		Value of sustainability
				absolute		%	absolute	%
Number of teaching staff with scientific degree	1	5	3	2	-0,05	-8,33	0,05	14,29
Number of teaching staff from companies	2	5	3	2	-0,05	-8,33	0,05	14,29
Number of teaching staff published in cited journals	3	4	5	1	0,03	4,17	0,03	7,14
Number of patents	4	3	2	3	-0,03	-4,17	0,08	21,43
Number of publications	5	4	2	3	-0,05	-8,33	0,08	21,43
Number of publications in cited journals	6	3	5	1	0,05	8,33	0,03	7,14
Number of teaching staff total	7	6	4	2	-0,05	-8,33	0,05	14,29
Total		30	24	14	-0,16	-25,00	0,37	100

Developed by the authors.

**Table 11. Factor Analysis of the Assessment of quality of teaching for University B in the Reporting Period**

Indicators	1	Conformity		Deviations	Impact on			
		2010	2011	2011	Increase of sustainability		Value of sustainability	
					absolute	%	absolute	%
Number of teaching staff with scientific degree	1	3	1	4	-0,05	-8,33	0,11	28,57
Number of teaching staff from companies	2	4	4	1	0,00	0,00	0,03	7,14
Number of teaching staff published in cited journals	3	2	5	1	0,08	12,50	0,03	7,14
Number of patents	4	3	3	2	0,00	0,00	0,05	14,29
Number of publications	5	3	3	2	0,00	0,00	0,05	14,29
Number of publications in cited journals	6	0	5	1	0,13	20,83	0,03	7,14
Number of teaching staff total	7	5	3	3	-0,05	-8,33	0,08	21,43
Total		20	24	14	0,11	16,67	0,37	100

Developed by the authors.

The factor analysis of the quality of learning and profitability of educational activity indicators' sets for two considered universities is conducted.

Changes of assessment of education quality of University A for 2011 comparing to 2010 look as follows:

- on the quality of teaching indicators' set – decrease by 25%;
- on the quality of learning indicators' set – growth by 10%;
- on the profitability indicators' set – decrease by 137,5%.

Changes of assessment of education quality of University B for 2011 comparing to 2010 look as follows:

- on the quality of teaching indicators' set – growth by 16,7%;
- on the quality of learning indicators' set – growth by 25%;
- on the profitability indicators' set – decrease by 420%.

Recommendations about improvement of education quality for University A:

- to increase the number of patents by 80% and publications by 55%;
- to increase the number of the employed graduates by 10% and graduates-employers by 9%;
- to increase sales revenue by 18%, profit by 56% and to reduce cost of goods sold by 36%.

Recommendations about the improvement of education quality for University B:

- to increase the number of patents by 55%, publications by 65%, publications in rating editions by 28%, and also the quantity of PPS with publications in rating editions by 30%;
- to increase the number of the employed graduates by 2% and the number of students, successfully passed EAEA by 6%;
- to increase sales revenue by 17%, profit by 149% and to reduce cost of goods sold by 63%.

The dynamic normative model shows a standard ratio of growth rates of various indicators (Pogostinskaya, Pogostinskiy, 1999). After the calculation of coefficients of education quality for the three indicators' sets, it is necessary to determine a quantitative index of the general education level of universities (a rating assessment).

Priority of the above indicators' sets is defined by an expert method.

On the basis of preferences a ranking of estimates on indicators' sets has been made, that is

$$K_1 > K_2 > K_3, \quad (1)$$

where  $K_i$  – an assessment of quality on one of the above mentioned three blocks of indicators;

> – preference of the previous indicator's set.

Then, according to the ranking, the matrix of pair comparisons (Table 12) is provided. Preference of one indicator's set against another is marked "1" on the line.

**Table 12. The matrix of pair comparisons of university's quality indicators' sets**

<sup>1</sup>	Indicators' Set	1	2	3	Sum	Weight $\lambda_i$
1	Teaching quality	1	1	1	3	0,5
2	Learning quality	0	1	1	2	0,33
3	Profitability	0	0	1	1	0,17
					6	1

Developed by the authors.

For the analyzed university the value of its rating assessment is determined by a formula:

$$R = \mu_1 * K_1 + \mu_2 * K_2 + \mu_3 * K_3, \quad (2)$$

where  $R$  – a university rating;

$\mu$  – a weight index;

$K_i$  – an assessment of quality on sets of indicators.

Calculation of total of a rating assessment of Universities A and B is given in Tables 13 and 14.

**Table 13. Calculation of rating assessment of the University A**

<sup>1</sup>	Indicators' Set	Weight, $\mu$	Assessment of quality, $K_i$		Rating assessment	
			2010	2011	2010	2011
1	Teaching quality	0,5	0,64	0,71	0,32	0,36
2	Learning quality	0,33	0,79	0,63	0,26	0,21
3	Profitability	0,17	0,58	0,24	0,10	0,04
Total:		1	-	-	0,68	0,60

Developed by the authors.

**Table 14. Calculation of rating assessment of the University B**

<sup>1</sup>	Indicators' Set	Weight, $\mu$	Assessment of quality, $K_i$		Rating assessment	
			2010	2011	2010	2011
1	Teaching quality	0,5	0,64	0,86	0,32	0,43
2	Learning quality	0,33	0,53	0,63	0,17	0,21
3	Profitability	0,17	0,79	0,15	0,13	0,03
Total:		1	-	-	0,63	0,66

Developed by the authors.

Thus, rating assessments of universities will make:

University A:  $R_{2010}=0.68$  and  $R_{2011}=0.60$

University B:  $R_{2010}=0.63$  and  $R_{2011}=0.66$ .

In (Sailaubekov, 2008) the following classification of rating assessments (Table 15) is offered.

Table 15. Classification of the universities' rating assessments

Class	Value of a rating	Class	Value of a rating
A (high)	0,75 -1,0	+	0,95-1,0
			0,9-0,95
		-	0,85-0,9
B (medium)	0,55-0,75	+	0,75-0,85
			0,65-0,75
		-	0,55-0,65
C (low)	0-0,55		0 - 0, 55

Developed by the authors.

According to the given classification of rating assessments the University A upon transition from the basic period (2010) to the reporting period (2011) changed a rating from "B" to "B-" and the University B – from "B-" to "B".

**Conclusion**

Thus, based on the conducted researche it is possible to draw the following conclusions:

1. normative models of an assessment of quality of training, quality of education and profitability are constructed on the basis of growth rates of indicators.
2. the factor analysis of estimates on the above sets is carried out.
3. calculation of total of the rating assessment, allowing to give the generalized assessment of activity of educational institution is carried out.
4. the received results can be used in the field of improvement of educational activity of higher educational institutions.

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