

Intellectual Capital of Medical and Health Sciences and the Efficiency of its Formation at Scientific Institutions

Inese Spica, Sarmite Jegere, Ernests Spics and Lada Kalinina

Scientific Institution Business Competence Centre, Riga, Latvia

inese.spica@gmail.com

sarmite.jegere@inbox.lv

ernests.spics@gmail.com

ms.lada.kalinina@gmail.com

Abstract: The formation of intellectual capital (IC) of medical and health sciences at scientific institutions (SIs) is highly topical for all people on the world. The object of the research is formation of IC of medical and health sciences at SIs while the subject of the research is the comparative analyses of the efficiency of the involvement of academic staff and PhD students in the formation of IC of medical and health sciences at SIs of Latvia. The objective of the research is to study the involvement of academic staff and PhD students in the formation of IC of medical and health sciences at SIs in Latvia in the period from 2013 to 2018. The following tasks were determined to reach the objective: to study the formation of IC of medical and health sciences at SIs; to identify the concept of the efficiency of the involvement of academic staff and PhD students in the formation of IC of medical and health sciences; to calculate main indicators thereof, and, to carry out the comparative analysis of indicators characterising the efficiency of the involvement of academic staff and PhD students in the formation of IC of medical and health sciences at SIs in Latvia. Research methods used in the paper are content analysis, economic analysis, and economic experiment.

Keywords: Efficiency indicators, Intellectual capital, Scientific institutions, Medical and health sciences

1. Introduction

Every six years, the Ministry of Education and Science of the Republic of Latvia (MoES) organises an international evaluation of SIs registered in Latvia. The previous International Evaluation of Scientific Institutions' Activity (IESIA) in Latvia covered the period from 2006 to 2011. The last IESIA refers to the period from 2013 to 2018. In order to establish the dynamics of efficiency indicators of academic staff involved in the formation of IC in medical and health sciences at SIs of Latvia (MoES, 2021), the authors were used secondary output data of findings across the set of evaluation of SIs of medical and health sciences per period from 2013 to 2018 offered by "Technopolis-group" (TG).

Consequently, it provides an opportunity for the authors to calculate the IC indicators in medical and health sciences at SIs of Latvia and to compare their dynamics during the period from 2013 to 2018. The authors analyzed secondary data from the above period because newer data was not available.

Data of the comparative analysis will help to develop support programs to increase the efficiency of involvement of the academic staff in the IC formation. In addition, the comparative analysis will reveal whether the score of medical and health sciences at SIs of Latvia in the IESIA of TG coincides with the place of SIs of Latvia in the ratings of IC indicators, and whether the overall score of SIs of Latvia also reflects the efficiency of the involvement of the academic staff of SIs of Latvia in the IC formation.

Hypothesis: The overall score of SIs shows the efficiency of the IC formation at SIs of Latvia.

2. Theoretical Background

Spica et al (2017a) state that IC is an economic category, the spiritual value created by the human potential, and it can be accumulated and converted into the value of other capitals. By investigating certain information about the management of education, we can increase the capacity and significance of the country's total economic capital movement. Rondeau et al (2022) remind that peer reviewed publications remain a traditional form of academic productivity. Spica et al (2017a; 2017b) have worked out four indicators of the efficiency of the formation of IC in the higher education establishment (HEE): (1)The efficiency of the involvement of academic staff in the formation of IC per year in percentages (AIK); (2)The efficiency of the involvement of academic staff with a Doctorate degree in the formation of IC per year in percentages (DIK); (3)The efficiency of the involvement of students in the formation of IC per year in percentages (SIK); (4)Mutual efficiency of the involvement members of the academic staff with Doctorate degrees and the academic staff without Doctorate degrees in the formation of IC per year in times, (DE).

3. Methodology

In order to calculate the AIK, DIK, SIK, and DE of the HEE Spica et al (2017a; 2017b) have worked out four formulas: (1) $AIK = (ZPS : AS) \times 100$; (2) $DIK = (ZPS : DS) \times 100$; (3) $SIK = (ZPS : SS) \times 100$; (4) $DE = DIK : AIK$. Where: ZPS represents the number of scientific publications of the HEE per year; AS represents the number of academic staff in full-time jobs per year; DS represents the number of academic staff with Doctorate degrees holding in full-time jobs per year; SS represents the number of students per year.

The authors modified the above mentioned formulas for the purposes of the study. Namely, they calculate IC efficiency indicators for total numbers of full time equivalent (FTE) academic and research personnel (KIK), for FTE academic personnel (AIK), for FTE academic and research personnel (PIK) and for PhDs completed at SIs (SIK). In addition, all the said IC efficiency indicators were calculated for different forms of IC such as total number of self-reported outputs of IC (KS), articles in peer reviewed scientific edited journals and conference proceedings included in WoS or SCOPUS (WS), articles in peer reviewed edited journals, and conference proceedings not included in WoS or SCOPUS (RS), monographs (MS), and Latvian patent (LPS), and European patent and International patents (EPS). The authors calculated mutual efficiency indicators (PE) regarding involvement of the FTE academic and research personnel (PS) and the FTE academic personnel (AS) in the formation of IC in times.

In the present research, the authors used the following data from the IESIA: output data on the number of FTE academic personnel (AS), the number of FTE academic and research personnel (PS), the total number of FTE academic and research personnel (KS), the number of PhDs completed (SS), the number of articles in peer reviewed scientific edited journals and conference proceedings included in WoS or SCOPUS (WS), the number of articles in peer reviewed scientific edited journals and conference proceedings not included in WoS or SCOPUS (RS), the number of monographs (MS), the number of Latvian patents (LPS), and the number of European and International patents (EPS), and total number of self-reported outputs (KS) in period from 2013 to 2018 per SI of medical and health sciences in Latvia. Authors revised the above WS, RS, MS, LPS, EPS and KS for the year.

The number of scientific publications and patents are the main results of the IC formation at SIs of medical and health sciences. TG analysed 8 public SIs of medical and health sciences of Latvia.

During the period analysed in the IESIA, there were 8 such SIs in Latvia: Latvian Biomedical Research and Study Centre (LBRSC); Limited liability company "Riga East University Hospital" (REUH); Pauls Stradins Clinical University Hospital Research Institute (PSCUHRI); Latvian Institute of Organic Synthesis (LIOS); Latvian Academy of Sport Education (LASE); Riga Stradins University Platform of Medicine (RSU/MP); Riga Stradins University Public Health Platform (RSU/PHP); University of Latvia Medicine and Health Science Cluster (UL/MHSC).

In this study, one scientific publication or one patent are accepted as one unit of IC. Further, using the modified formulas 1; 2; 3; and 4, were calculated: KIK, AIK, PIK, SIK, PE. Then, according to the results obtained through the author's calculations, a corresponding rating place was assigned to each SI of Latvia per year and each of the above indicators KIK, AIK, PIK and SIK.

Each place in the rating was then assessed with an appropriate score, where the lowest score is 1 point, while the highest score is 5 points. Thus, the SI, which took first place in - KIK, AIK, PIK and SIK received 5 points in the ranking, took second place - received 4 points, took third place - received 3 points, took fourth place - received 2 points, and took fifth to eighth place - received 1 point.

The above mentioned assessment system allows to compare the quantitative efficiency indicators of SIs of medical and health science in Latvia calculated by the authors to IESIA overall assessment criterion - quality of the SI research performance. The relevant TG Panel was the score of research performance of each SI using a scale where score 5 means an outstanding level of research, score 4 means a very good level of research, score 3 means a good level of research, score 2 means an adequate level of research, and score 1 means a poor level of research (MoES, 2021).

The score assigned to the overall assessment by the relevant TG Panel was based on the assessment of five sub elements A to E, where element A characterises the quality of the research, element B - the impact on the development of the specific field of science, element C - the economic and social impact of the research, element D - the research environment and infrastructure of the institution, element E - the institution development potential. The Panel was provided with scores against each sub-element and the overall score and was also provided with narrative descriptions of their scores, the overall score and the sub-elements (MoES, 2021).

The follow-up authors compared the results of their own estimates of SIs quantitative indicators to the qualitative indicators of the relevant TG Panel, and calculated the difference between the indicators and the changes. For this purpose, the authors calculated the average score of indicators for each SI recording the efficiency of the IC formation and compared these scores to scores of the research quality of each SI and overall score developed by the TG Panel.

4. Results

It follows from the IESIA that in Latvia, 5 SIs of medical and health sciences have corresponding fields of science in basic medicine, 4 SIs corresponding fields of science in health biotechnology, clinical medicine, health sciences, 3 SIs corresponding fields of science in other medical sciences. In turn, such corresponding fields of sciences as biological sciences; educational sciences; sports sciences are operated by 1 SI in each field of science.

According to the authors' estimates, from the IESIA data show that the total number of self-reported outputs of SIs of medical and health science in Latvia is taken in the largest proportion by the WS - 68,14%, which is followed by the RS - 24,57%, the MS - 2,66%, the LPS - 3,34%, the EPS - 1,29%.

To calculate the efficiency of the involvement of academic and research staff in the WS formation, the authors used formulas that were developed and applied already before and are modified now:

$$AIK = (WS : AS) \times 100 \tag{1}$$

$$PIK = (WS : PS) \times 100 \tag{2}$$

$$KIK = (WS : KS) \times 100 \tag{3}$$

$$SIK = (WS : SS) \times 100 \tag{4}$$

$$PE = PIK : AIK \tag{5}$$

Table 1: The efficiency of the involvement of academic and research staff in the WS formation at SIs of medical and health sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
LBRSC	0	0	0	70	7	1	70	6	1	0,5	0	336	2	4	1,7
REUH	0	0	0	20256	1	5	20256	1	5	2,5	0	494	1	5	3,3
PSCUHRI	0	0	0	485	2	4	485	2	4	2,0	0	188	5	1	1,7
LIOS	0	0	0	52	8	1	52	7	1	0,5	0	209	4	2	1,0
LASE	21	4	2	82	6	1	17	8	1	1,5	3,8	75	8	1	1,3
RSU/MP	426	2	4	252	4	2	158	4	2	3,0	0,6	171	6	1	2,3
RSU/PHP	519	1	5	472	3	3	247	3	3	4,0	0,9	127	7	1	3,0
UL/MHSC	230	3	3	199	5	1	107	5	1	2,0	0,9	284	3	3	2,3
Average	456			160			118				0,4	209			

These indicators of SIs and their place in the rating of SIs of medical and health sciences in Latvia as well as its scores are summarized in Table 1. The table of the SIs indicators, ratings, and score was drawn up by authors. The summarized indicators show that in general, in Table 1, the figure rests in the range from 20256% to 17% in

respect of the SIs in Latvia. The highest indicators are PIK and KIK in the REUH, while the lowest indicators is KIK in the LASE. Comparing the figures collected in Table 1, the authors conclude that the AIK indicator rests in the range from 21% to 519%. The lowest SIK indicators of 75% is for the LASE, the highest SIK indicator of 494% is for the REUH. The PS of the SIs of medical and health sciences are 0,6 times to 3,8 times efficient in the WS formation.

In Table 1, the authors created the rating and score of the SIs of medical and health sciences in Latvia based on the AIK, PIK, KIK, SIK indicators of the efficiency of the academic research personnel and PhDs involvement in the WS formation. According to the AIK indicator, the first place, and highest score is taken by the RSU/PHP; according to the PIK, KIK and SIK indicators, the first place, and highest score are taken by the REUH.

The authors compared the SIK indicators of all students of HEE in Latvia to SIK indicators of PhDs students of SIs of medical and health sciences in Latvia, and found that SIK indicators of the PhDs students were considerably higher. It follows from the study by Spica et al (2018) that the highest SIK indicators were held by Daugavpils University (1,45% in 2013) and the University of Latvia (1,82% in 2014). Meanwhile, between 2013 and 2018, the highest annual SIK indicator for PhDs students of SIs of medical and health sciences in Latvia was held by the REUH and represented 494%.

When analysing the results obtained by SIs in the IC formation in the field of medical and health sciences, the same methodology was used as in the fields of social sciences, and, humanities and art sciences. Thus, the quantitative results of SIs in these fields can be compared. One of the main criteria for the quantitative evaluation of SIs is the efficiency of the involvement of the SIs staff in the formation of WoS and SCOPUS publications.

The comparison of the results of the three fields of science leads to conclusion that the highest score of the KIK indicator in the field of social sciences is 278% (Spica et al, 2022) while the highest score of the KIK indicator in field of medical and health sciences is 20256%, and, the highest score of the KIK indicator in field of humanities and art sciences is 53% (Spica et al, 2023). In addition, it should be noted that the highest score of the KIK indicator in the field of humanities and art sciences is 382 times lower than the highest score in the field of medical and health science, and, the highest KIK indicator in field of social sciences is 73 times lower.

A similar trend is observed when comparing the efficiency of the involvement PhD degree holders in the formation of WoS and SCOPUS publications in the three above-referred fields of science. Here, the highest rate of the SIK indicator in social sciences is 667% (Spica et al, 2022) while in medical and health sciences the highest rate is 494%, and, the highest rate of the SIK indicator in humanities and art science is 450% (Spica et al, 2023). In turn, the lowest rate of the SIK indicator in the field of medical and health sciences is 75%; the lowest rate of the SIK indicator in the field of social sciences is 58% (Spica et al, 2022); the lowest rate of the SIK indicator in the field of humanities and art science is 13% (Spica et al, 2023). This means that the lowest rate in the field of medical and health sciences, however, is almost 6 times higher than the lowest rate in the field of humanities and art science, and, almost 1 times higher than the lowest rate in the field of social sciences.

In Table 2 authors calculate efficiency of the involvement of academic and research staff in the RS formation, the authors used formulas 6; 7; 8; 9; 10:

$$AIK = (RS : AS) \times 100 \quad (6)$$

$$PIK = (RS : PS) \times 100 \quad (7)$$

$$KIK = (RS : KS) \times 100 \quad (8)$$

$$SIK = (RS : SS) \times 100 \quad (9)$$

$$PE = PIK : AIK$$

In Table 2, in respect of SIs of medical and health science in Latvia, the figure rests in the range from 3% to 7992%. The highest indicator are the PIK and KIK in the REUH, but the lowest indicators are the PIK and KIK in the LBRSC and LIOS.

The AIK indicators were collected only for the 4 SIs of medical and health sciences, and the authors conclude that the highest AIK indicator of 165% is held by the RSU/MP while the lowest AIK indicator of 39% belongs to the LASE; the highest SIK indicator of 195% is held by the REUH, while the lowest SIK indicator of 12% belongs to LIOS.

Table 2: The efficiency of the involvement of academic and research staff in the RS formation at SIs of medical and health sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
LBRSC	0	0	0	3	7/8	1	3	7/8	1	0,5	0	14	7	1	0,7
REUH	0	0	0	7992	1	5	7992	1	5	2,5	0	195	1	5	3,3
PSCUHRI	0	0	0	469	2	4	469	2	4	2,0	0	182	2	4	2,7
LIOS	0	0	0	3	7/8	1	3	7/8	1	0,5	0	12	8	1	0,7
LASE	39	4	2	150	3	3	31	5	1	2,5	3,8	138	3	3	2,7
RSU/MP	165	1	5	98	4	2	61	3	3	3,5	0,6	66	4	2	3,0
RSU/PHP	99	2	4	90	5	1	47	4	2	2,5	0,9	24	6	1	2,0
UL/MHSC	40	3	3	35	6	1	19	6	1	2,0	0,9	50	5	1	1,7
Average	164			58			43				0,4	75			

Table 3: The efficiency of the involvement of academic and research staff in the MS formation at SIs of medical and health sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
LBRSC	0	0	0	0	7	1	0	7	1	0,5	0	1	7	1	0,7
REUH	0	0	0	641	1	5	641	1	5	2,5	0	16	2	4	3,0
PSCUHRI	0	0	0	33	3	3	33	2	4	1,5	0	13	3	3	2,0
LASE	5	3	3	18	4	2	4	5	1	1,0	3,8	17	1	5	3,3
RSU/MP	21	2	4	12	5	1	8	4	2	2,5	0,6	8	5	1	2,0
RSU/PHP	43	1	5	39	2	4	21	3	3	1,0	0,9	11	4	2	3,7
UL/MHSC	4	4	2	4	6	1	2	6	1	0,5	0,9	5	6	1	1,3
Average	18			6			5				0,4	8			

In Table 3 authors calculate efficiency of the involvement of academic and research staff in the formation of MS, the authors used formulas 11; 12; 13; 14; 15:

$$AIK = (MS : AS) \times 100 \quad (11)$$

$$PIK = (MS : PS) \times 100 \tag{12}$$

$$KIK = (MS : KS) \times 100 \tag{13}$$

$$SIK = (MS : SS) \times 100 \tag{14}$$

$$PE = PIK : AIK \tag{15}$$

In Table 3 the figure rests in the range from 0% to 641% in respect of the SIs in Latvia. The highest indicator are PIK and KIK in the REUH, but the lowest indicators are PIK and KIK in the LBRSC.

In Table 4 authors calculate efficiency of the involvement of academic personnel and research personnel in the formation of LPS, the authors used formulas 16; 17; 18; 19; 20:

$$AIK = (LPS : AS) \times 100 \tag{16}$$

$$PIK = (LPS : PS) \times 100 \tag{17}$$

$$KIK = (LPS : KS) \times 100 \tag{18}$$

$$SIK = (LPS : SS) \times 100 \tag{19}$$

$$PE = PIK : AIK \tag{20}$$

Table 4: The efficiency of the involvement of academic and research staff in the LPS formation at SIs of medical and health sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
LBRSC	0	0	0	19	2	4	19	2	4	2,0	0	92	1	5	3,0
REUH	0	0	0	256	1	5	256	1	5	2,5	0	6	4	2	2,3
PSCUHRI	0	0	0	7	4	2	7	3	3	1,0	0	3	7	1	1,0
LIOS	0	0	0	3	6	1	3	5	1	0,5	0	11	2	4	1,7
LASE	1	4	2	5	5	1	1	8	1	1,0	3,8	4	5	1	1,0
RSU/MP	17	1	5	10	3	3	6	4	2	4,0	0,6	7	3	3	3,7
RSU/PHP	2	3	3	2	8	1	1	7	1	2,0	0,9	1	8	1	1,7
UL/MHSC	3	2	4	2	7	1	1	6	1	2,5	0,9	3	6	1	2,0
Average	22			8			6				0,4	10			

In Table 4 the figure rests in the range from 1% to 256% in respect of the SIs in Latvia. Comparing the figures collected in Table 4, the authors conclude that the highest PIK and KIK score is held by the REUH, while the lowest AIK and KIK score belongs to the LASE, the lowest SIK score go to the RSU/PHP.

In Table 5 authors calculate efficiency of the involvement of academic personnel and research personnel in the formation of EPS, the authors used formulas 21; 22; 23; 24; 25:

$$AIK = (EPS : AS) \times 100 \tag{21}$$

$$PIK = (EPS : PS) \times 100 \tag{22}$$

$$KIK = (EPS : KS) \times 100 \tag{23}$$

$$SIK = (EPS : SS) \times 100 \tag{24}$$

$$PE = PIK : AIK \tag{25}$$

Table 5: The efficiency of the involvement of academic and research staff in the EPS formation at SIs of medical and health sciences in Latvia per year in period from 2013 to 2018

SI	AIK (%)	AIK rating	AIK score	PIK (%)	PIK rating	PIK score	KIK (%)	KIK rating	KIK score	Average of AIK & PIK score	PE in times	SIK (%)	SIK rating	SIK score	Average of AIK & PIK & SIK score
LBRSC	0	0	0	3	2	4	3	2	4	1,0	0	13	2	4	2,7
LIOS	0	0	0	6	1	5	6	1	5	0,5	0	22	1	5	3,3
RSU/MP	2	1	5	1	3	3	1	3	3	4,0	0,6	1	3	3	3,7
UL/MHSC	0	2	4	0	4	2	0	4	2	3,0	0,9	1	4	2	2,7
Average	9			3			2				0,4	4			

Table 6: The Comparison of the results of qualitative and quantitative evaluation of Latvian SIs in the field of medical and health sciences using the IC form for period from 2013 to 2018

SI	Quality score by TG (QTG)	Overall score by TG (OTG)	Total average score of AIK & PIK using IC form (TAAP)	Difference of score (QTG-TAAP)	Difference of score (OTG-TAAP)	Total average score of AIK & PIK & SIK using IC form (TAAPS)	Diference of score (QTG-TAAPS)	Difference of score (OTG-TAAPS)
LBRSC	4	4	0,5	3,5	3,5	1,7	2,3	2,3
REUH	2	2	2,5	-0,5	-0,5	3,3	-1,3	-1,3
PSCUHRI	3	3	2,0	1,0	1,0	2,3	0,7	0,7
LIOS	5	5	0,5	4,5	4,5	0,7	4,3	4,3
LASE	1	2	1,5	-0,5	0,5	1,3	-0,3	0,7
RSU/MP	4	4	3,0	1,0	1,0	2,3	1,7	1,7
RSU/PHP	4	3	4,0	0,0	-1,0	3,0	1,0	0,0
UL/MHSC	3	3	2,0	1,0	1,0	2,0	1,0	1,0

Of the 8 Latvian SIs in the field of medical and health sciences, only the 4 SIs have the EPS. In Table 5 the figure rests in the range from 0% to 22% in respect of the SIs in Latvia; the highest SIK score is held by the LIOS while the lowest AIK, PIK, and KIK score belongs to the UL/MHSC.

In the all tables, the average indicators PE are the same, and the average SIK indicators are the highest, while the average KIK indicators; the average AIK indicators are the highest, while the average PIK indicators.

The comparison of the results of the three fields of science leads to conclusion that the highest average rate of the PE indicators is 1,8 (Spica et al, 2022) in social sciences, the second highest average rate of the PE indicators is 1,7 (Spica et al, 2023) in humanities and art sciences, and, the lowest average rate of the PE indicators is 0,4 in medical and health sciences. In addition, it should be noted that the highest average rate of the PE in the field of social sciences is almost five times higher than the lowest average rate in the field of medical and health sciences.

Table 7: The Comparison of the results of qualitative and quantitative evaluation of Latvian SIs in the field of medical and health sciences using the overall IC for period from 2013 to 2018

SI	Quality score by TG (QTG)	Overall score by TG (OTG)	Total average score of KIK using IC overall (TAKO)	Difference of score (QTG-TAKO)	Difference of score (OTG-TAKO)	Total average score of KIK & SIK using IC overall (TAKOS)	Difference of score (QTG-TAKOS)	Difference of score (OTG-TAKOS)
LBRSC	4	4	2,2	1,8	1,8	2,6	1,4	1,4
REUH	2	2	4,0	-2,0	-2,0	3,6	-1,6	-1,6
PSCUHRI	3	3	3,0	0,0	0,0	2,4	0,6	0,6
LIOS	5	5	1,6	3,4	3,4	2,0	3,0	3,0
LASE	1	2	0,8	0,2	1,2	1,4	-0,4	0,6
RSU/MP	4	4	2,4	1,6	1,6	2,2	1,8	1,8
RSU/PHP	4	3	1,8	2,2	1,2	1,4	2,6	1,6
UL/MHSC	3	3	1,2	1,8	1,8	1,4	1,6	1,6

5. Conclusions

The study of the authors did not result in confirmation of their hypothesis. When comparing the qualitative ratings of TG group to the quantitative assessments performed by the authors, it can be concluded that they differ from minus 2,0 points to plus 4,5 points in total. The hypothesis is accepted *pro tem* for other branches of SIs of Latvia.

The study shows that the AIK, KIK, PIK, and SIK of SIs of medical and health sciences in Latvia were lower than the results compiled by the relevant TG Panel except one SIs of these sciences, and, except for the PSCUHRI, where QTG, OTG, TAKO scores coincided.

The authors is encouraged to supplement the methodology for international evaluation of scientific institutions with efficiency indicators in order to improve the quality of the evaluation.

The scientific novelty of the research: 1)comparative analysis of indicators characterising the efficiency of the involvement of academic staff and PhD students in the formation of IC of medical and health sciences at SIs in Latvia; 2)modified the formulas of efficiency of the involvement of academic staff and PhD students in the formation IC of medical and health sciences; 3)system of efficiency indicators of IC formation at SIs.

References

- Latvijas Republikas Izglītības un zinātnes ministrija (2021) "International Evaluation of Scientific Institution Activity, Latvia", *Report by the Technopolis group per period 2013.-2018 , Riga, 5th March*
- Rondeau, K., Dillon, J., Mansour, N. and Daniels, J. (2022) "Managing Knowledge and Identity across the Boundary of Academic and Commercial Science", *Proceedings of the 17th European Conference on Innovation and Entrepreneurship, Pafos, Cyprus, 15-16 September*, pp. 432-440.
- Spica, I., Berzina, B., Spics, E., Spica, R.K. and Ponnis, P. (2023) "Intellectual Capital of Humanities and Art Sciences and the Efficiency of its Formation at Scientific Institutions", *Proceedings of the 24th European Conference on Knowledge Management, Lisbon, Portugal, 7-8 September*, pp. 1246 -1254.
- Spica, I., Berzina, B., Spics, E. and Spica, R.K. (2022) "Intellectual Capital of Social Sciences and the Efficiency of its Formation at Scientific Institutions", *Proceedings of the 17th European Conference on Innovation and Entrepreneurship, Pafos, Cyprus, 15-16 September*, pp. 512 - 520.
- Spica, I., Garleja, R., Berzina, B. and Spics, E. (2018) "The Involvement of Students in the Formation of Intellectual Capital in Latvia", *Proceedings of the 19th European Conference on Knowledge Management, Padua, Italy, 6-7 September*, pp. 811 -820.
- Spica, I., Garleja, R. and Berzina, B. (2017a) "Intellectual Capital as the Performance Indicator of the University Studies", *Proceedings of the 9th European Conference on Intellectual Capital, Lisbon, Portugal, 6-7 April*, pp. 312 -320.
- Spica, I., Garleja, R. and Berzina, B. (2017b) "The Efficiency of the Involvement of Academic Staff in the Formation of Intellectual Capital in Latvia", *Poster of the 9th European Conference on Intellectual Capital, Lisbon, Portugal, 6-7 April*.