



TECHNOLOGIES OF INDUSTRY 4.0 FOR A QUALITY MODEL OF EDUCATION OF LAWYERS- CRIMINOLOGISTS TO ENSURE THE SECURITY OF THE BIOSOCIAL ESSENCE OF A PERSON WITHIN THE FORMATION OF A SOCIALLY ORIENTED SOCIETY

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ABSTRACT

This paper is aimed at determining the prospects for an increase in the quality of teaching lawyers-criminologists with the help of engineering support by technologies of Industry 4.0 to ensure the security of the biosocial essence of a person within the formation of a socially oriented society. The performed modelling of the econometric dependence of the safety index on the human development index showed that the quality of services to ensure the security of the biosocial essence of a person is by 50.61% explained by the quality of education of lawyers-criminologists. The main conclusion of this paper is that the education of lawyers-criminologists plays an important role in the support for the security of the biosocial essence of a person. Based on this, a new – educational – approach to ensuring the security of the biosocial essence of a person was proposed. The advantage of the educational approach is a more targeted influence on offenders and the preventive effect of the security of the biosocial essence of a person. The key conclusion as a result of this research is that technologies of Industry 4.0 are necessary for the modern model of an increase in the quality of teaching lawyers-criminologists to ensure the security of the biosocial essence of a person within the creation of a socially oriented society. The practical significance of this paper consists in the fact that the proposed new – educational – approach to ensuring the security of the biosocial essence of a person allows raising the effectiveness of the quality of the model of education of lawyers-criminologists and increasing the quality of the services to ensure the security of the biosocial essence of a person, thus stimulating the accelerated formation of a socially oriented society.



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1. INTRODUCTION

Building a socially oriented society is the priority of the modern economic systems' development in the Decade of Action and in the long term. The sense of a socially

oriented society is that human is the most important beneficiary of social development: the entire society serves the interest of each person (Boisvert, 2022). This is the essential difference between a socially oriented society and the previous form of the social mode, which

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implied the person's serving the interests of the society and the use of human resources for social development (Popkova and Sergi, 2021; Popkova and Sergi, 2022).

Socially oriented society develops in the direction of the increase in the quality of the population's life, one of the main aspects of which is ensuring the security of the biosocial essence of a person (Jaguaco et al., 2022). Security of the biosocial essence of a person is treated as a systemic view of law enforcement in the unity of ensuring physical security (fight against crime), information security (fight against cybercrimes) and security of social communications and interactions on the whole (Garg et al., 2022; Suyadi et al., 2022).

To ensure the security of the biosocial essence of a person, it is necessary to build a quality model of education for lawyers-criminologists, since they are the ones who perform the functions of ensuring this security in practice. The problem is that the existing approach to ensuring the security of biosocial essence ensures only limited results, not allowing for full security. The drawbacks of the existing approach are, first, insufficient attention to the quality of teaching of lawyers-criminologists.

Second, insufficient use of Industry 4.0 technologies, which appeared due to the Fourth Industrial Revolution and which play an important role in the increase in the quality of products in many sectorial markets. Striving to improve this approach, the paper is aimed at identifying the prospects for raising the quality of teaching of lawyers-criminologists with the help of the engineering support of Industry 4.0 technologies to ensure the security of the biosocial essence of a person within the creation of a socially oriented society.

The paper's originality is due to the offer of a new – educational – approach to ensuring the security of the biosocial essence of a person, which advantage is the increased contribution to the formation of a socially oriented society. The author's approach is based on a more quality model of education of lawyers-criminologists due to the increased quality of education, which guarantees the further provision of more quality services on the security of the biosocial essence of a person. This paper's contribution to the literature is also connected with the disclosure of cause-and-effect relationships of the engineering support of Industry 4.0 technologies for the quality of education of lawyers-criminologists.

The structure of this research is as follows. This introduction is followed by the literature review and gap analysis, which includes the following: 1) identification of the conceptual framework and subject domain of the research; 2) description of the existing approach to ensuring the security of the biosocial essence of a person; 3) gap analysis and setting of the research question and hypothesis. After this, research materials and methods are provided.

Then, in the results, the four following research tasks are solved: 1) modelling the role of education of lawyers-criminologists in ensuring the security of the biosocial essence of a person; 2) determine the role of the engineering support by technologies of Industry 4.0 for the quality of education of lawyers-criminologists; 3) developing the educational approach to ensuring security of the biosocial essence of a person; 4) disclosing the prospects for the improvement of the quality of education of lawyers-criminologists with the engineering support of Industry 4.0 technologies. The discussion contains a comparative analysis of the existing and proposed new approach to ensuring the security of the biosocial essence of a person. The conclusion sums up the research.

2. LITERATURE REVIEW AND GAP ANALYSIS

2.1. Conceptual framework and subject domain of the research

The subject domain of the research in this paper is organisational and managerial relationships that emerge in the process of formation of an effective model of the quality of education of lawyers-criminologists for ensuring the security of the biosocial essence of a person within the formation of a socially oriented society. An effective model of the quality of education for lawyers-criminologists is understood as a model that fully ensures the security of the biosocial essence of a person (Lopez-Gavira et al., 2021).

Security of the biosocial essence of a person is treated as a systemic view of the physical security of humans as a species and the security of social interactions of people in modern society given the entire range of the manifestations of these interactions (Zhang et al., 2019). A socially oriented society is treated as a society in which favourable conditions for the lives of people are created, and the course toward the increase in the population's quality of life is adopted and implemented (Shek, 2021).

The engineering support of Industry 4.0 technologies for the quality of education of lawyers-criminologists is understood as the level of adaptation to the specifics of provision of educational services, activity of the use of Industry 4.0 technologies in education, and the influence of these technologies on the quality of teaching lawyers-criminologists (Akande & Atiku, 2022; Jamaludin et al., 2020).

The key indicators of the quality of teaching lawyers-criminologists include the level of human development, level of training of digital personnel, and the level of personnel training (Fauzi, 2022; Nafiu et al., 2022; Nanjundeswaraswamy et al., 2022; Unegbu et al., 2022). The potential factors of the engineering support by technologies of Industry 4.0 for the quality of

education of lawyers-criminologists include robotization of higher education, development of distant education (based on e-participation), and the use of Big Data and their analytics with the help of AI in higher education (Butt et al., 2020; Jain and Jain, 2022).

2.2. The existing approach to ensuring the security of the biosocial essence of a person

The existing approach to ensuring the security of the biosocial essence of a person within the formation of a socially oriented society can be called regulatory, for it is based on the regulation of labour of lawyers-criminologists. The model of education of lawyers-criminologists, which is used within the existing approach, is oriented towards the accelerated training of a maximum possible number of lawyers-criminologists, i.e., the improvement of the quantitative characteristics of education (Ryan, 2021; Shalini, 2021; Younes and Alsharqawi, 2021).

The source of the security of the biosocial essence of a person in the existing approach is the regulation of labour of lawyers-criminologists, i.e., tightening of the norms of detection of crimes against the security of the biosocial essence of a person (Albert et al., 2021; Albina et al., 2022). A method of ensuring the effectiveness of the quality of the approach is the quantitative increase in the number of solved crimes against the security of the biosocial essence of a person (Sancllemente, 2022; Shaw, 2021). The contribution of the approach to the formation of a socially oriented society consists in the support for the security of the biosocial essence of a person (Cousins, 2021; Song and Tong, 2022).

2.3. Gap analysis, research questions and research hypotheses

The literature review revealed a high level of scientific elaboration of the subject domain of this research, which allows stating that the level of elaboration of the given problem is high. However, the prospects for the improvement of the approach to ensure the security of the biosocial essence of a person within the formation of a socially oriented society are not clear. In particular, the role of education of lawyers-criminologists in the support of the security of the biosocial essence of a person is unclear, which is a literature gap. Also, it is unknown how the technological profile of higher education changes under the conditions of the Fourth Industrial Revolution. In particular, it is unclear to which extent Industry 4.0 technologies are important for the management of the quality of personnel training among lawyers-criminologists.

This leads to the following research question (RQ1): What is the role of education of lawyers-criminologists in the support of security of the biosocial essence of a person? Based on the existing literature, which notes

the important role of education in the knowledge economy (Ashour, 2021; Cavicchi, 2021) and the central role of education in the concept of a socially oriented society (Chaleta et al., 2021; Dryjanska et al., 2022; Xie and Rice, 2021), this paper proposed the first hypothesis (H₁): education of lawyers-criminologists plays an important role in the support for the security of the biosocial essence of a person.

In this paper, the second research question is also posed. RQ₂: What is the influence of engineering support with the help of Industry 4.0 technologies on the quality of education of lawyers-criminologists? Based on the existing literature - Dias et al. (2022), Maganga and Taifa, 2023; Ranjith Kumar et al., 2022; Sharma, 2023; Yüksel and Ersöz, 2023) – in which the significant contribution of Industry 4.0 technologies on the quality of higher education services is stated, the following second hypothesis is proposed here. H₂: the engineering support with the help of Industry 4.0 technologies has a large positive influence on the quality of education of lawyers-criminologists.

To fill the discovered gap and to search for an answer to the set RQs and test hypotheses H₁ and H₂, the econometric modelling of creation of a model of increase in the quality of training of lawyers-criminologists based on Industry 4.0 technologies to ensure the security of the biosocial essence of a person within the creation of a socially oriented society is performed. The modelling is aimed at determining the cause-and-effect relationships of training of lawyers-criminologists with the results in the sphere of ensuring the security of biosocial essence and the factors of engineering support with the help of Industry 4.0 technologies.

3. EXPERIMENTAL DESIGN

The methodology of this paper is based on the method of regression analysis. To achieve the set goal, the four following tasks are solved. 1st task: determining the role of education of lawyers-criminologists in ensuring the security of the biosocial essence of a person. To solve the first task, the method of regression analysis is used to model the econometric dependence of the safety index (Numbeo, 2022) on the factors of the quality of training of lawyers-criminologists: the human development index (World Population Review, 2022), digital/technological skills and employee training (IMD, 2023) in the form of multiple linear regression.

2nd task: determining the role of the engineering support by technologies of Industry 4.0 for the quality of education of lawyers-criminologists. To solve the second task, the method of regression analysis is used to model the econometric dependence of the indicators that characterise the quality of training of lawyers-criminologists: the human development index, digital/technological skills and employee training, on

the factors of the engineering support by technologies of Industry 4.0: robots in education and R&D, e-participation, and the use of big data and analytics (IMD, 2023). The research model is a system of equations of linear regression and has the following form:

$$\begin{cases} SI = a_{SI} + b_{SI1} * HDI + b_{SI2} * DTS + b_{SI3} * ELT; \\ HDI = a_{HDI} + b_{HDI1} * RED + b_{HDI2} * EPC + b_{HDI3} * BDA; \\ DTS = a_{DTS} + b_{DTS1} * RED + b_{DTS2} * EPC + b_{DTS3} * BDA \\ ; \\ ELT = a_{ELT} + b_{ELT1} * RED + b_{ELT2} * EPC + b_{ELT3} * BDA, \end{cases} \quad (1)$$

where SI – the safety index (Numbeo, 2022) as the indicator of the efficiency of ensuring the security of the biosocial essence of a person, measured in points 1-200; HDI – human development index (World Population Review, 2022), as the indicator of the quality of education and, in particular, training of lawyers-criminologists, measured in fractions of 1;

DTS – digital/technological skills (IMD, 2023), as the indicator of the quality of education and, in particular, training of digital personnel among lawyers-criminologists, measured in positions from 1 (best) to 63;

ELT – employee training (IMD, 2023), as the indicator of the quality of education and, in particular, training of lawyers-criminologists, measured in positions from 1 (best) to 63;

RED – robots in education and R&D (IMD, 2023), as an Industry 4.0 technology that potentially influences the quality of training, measured in positions from 1 (best) to 63;

EPC – e-participation (IMD, 2023), as an Industry 4.0 technology that potentially influences the quality of training, measured in positions from 1 (best) to 63;

BDA – use of big data and analytics (IMD, 2023), as an Industry 4.0 technology that potentially influences the quality of training, measured in positions from 1 (best) to 63;

a – constant;

b – coefficient of regression with factor variables.

If there is no statistically significant and/or positive connection, certain factor variables can be excluded from regression equations in the research model (1). The reliability of all regression equations is assessed by determining its correspondence to the conditions of the Gauss-Markov Theorem. For this, the F-test and t-test are performed.

The logic of testing the first proposed hypothesis (H_1) is to determine whether the results of ensuring the security of the biosocial essence of a person depends on the factor of education, i.e., education of lawyers-criminologists. If a positive dependence (coefficients of regression $b_{SI1} > 0$; $b_{SI2} < 0$; $b_{SI3} < 0$), is discovered, hypothesis H_1 is deemed proven.

The logic of testing the second hypothesis (H_2) is to determine whether engineering support with the help of Industry 4.0 technologies influences the quality of

education of lawyers-criminologists. That is, does the quality of education of lawyers-criminologists depend on the factors of robots in education and R&D, e-participation, and the use of big data and analytics? If a positive dependence (coefficients of regression $b_{HDI} < 0$; $b_{DTS} > 0$; $b_{ELT} > 0$) is discovered, hypothesis H_2 is deemed proven.

The research sample includes 55 countries for which statistics are available (not gaps in the data) for the human development index (World Population Review, 2022) and safety index, as an element of the quality of life index (Numbeo, 2022) and the indicators of IMD (2023). The statistics are for 2022, reflecting the situation as a result of 2021. The factual base of the research is provided in Appendix.

3rd task: developing an educational approach to ensuring the security of the biosocial essence of a person. To solve the third task, a set of author's recommendations to improve ensuring the security of the biosocial essence of a person through an increase in the quality of education of lawyers-criminologists with the engineering support of Industry 4.0 technologies is offered.

4th task: discovering the prospects for an increase in the quality of education of lawyers-criminologists with the engineering support of Industry 4.0 technologies with the help of the educational approach. For this, based on the obtained system of equations in the research model (1), the expected consequences of the change in the quality of education of lawyers-criminologists with the fullest engineering support of Industry 4.0 technologies (RED=1, EPC=1, BDA=1) are forecasted. Also, the resulting targeted result in the form of the change in the safety index, which characterises the successfulness of ensuring the security of the biosocial essence of a person within the creation of a socially oriented society is forecasted.

4. RESULTS

4.1. Role of education of lawyers-criminologists in ensuring security of the biosocial essence of a person

To determine the role of education of lawyers-criminologists in the security of the biosocial essence of a person, the statistical data, which were collected for this research, were processed with the help of regression analysis. This allowed obtaining the following econometric model:

$$SI = 18.9491 + 61.5200 * HDI - 0.2413 * DTS - 0.1171 * ELT \quad (2)$$

According to model (2), an increase in the level of human development (in which main attention is paid to education) by 0.1 leads to an increase in the level of

security of the biosocial essence of a person (safety index) by 6.1520 points. An increase in the level of digital/technological skills by 1 position leads to an increase in the level of security of the biosocial essence of a person (safety index) by 0.2413 points.

An increase in the level of employee training by 1 position leads to an increase in the level of security of the biosocial essence of a person (safety index) by 0.1171 points. The role of education of lawyers-criminologists in the security of the biosocial essence of a person is described more thoroughly in the details of regression analysis (Table 1).

Table 1. The role of education of lawyers-criminologists in the support for the security of the biosocial essence of a person

Regression statistics						
Coefficient of correlation (R ²)	Standard error	Number of observations (n)	Number of degrees of freedom	k ₁ =m	k ₂ =n-m-1	Level of significance
0.6306	11.8858	55	54	3	51 (55-3-1)	0.01
ANOVA						
	df	SS	MS	F-obs.	F-crit.	Significance F
Regression	3	4,755.7500	1,585.2500	11.2212	4.1906	9.1*10 ⁻⁶
Residual	51	7,204.9.53	141.2727	The f-test was passed		
Total	54	11,960.6553				
Parameters of the regression model						
	Coefficients	Standard error	t-Stat	P-Value	Lower 95%	Upper 95%
Constant	18.9491	21.2420	0.8921	0.3766	-23.6959	61.5941
HDI	61.5200	22.3159	2.7568*	0.0081	16.7189	106.3211
DTS	-0.2413	0.1058	-2.2802**	0.0268	-0.4538	-0.0288
ELT	-0.1171	0.1071	-1.0936***	0.2793	-0.3320	0.0978

* t-test was passed at the significance level of 0.01, where t-crit.=2.6610;
 ** t-test was passed at the significance level of 0.05, where t-crit.=2.0049;
 *** t-test was passed at the significance level of 0.30, where t-crit.=1.0465.
 Source: Author.

As shown in Table 1, the change in the safety index among countries of the sample is by 63.06% explained by the differences in the quality of education among them. Model (2) conforms to the highest level of significance: 0.01. At it, the critical value of F is 4.1906. The observed F is 11.2212, which exceeds F-table; therefore, the F-test was passed. At 54 degrees of freedom at the significance level of 0.01, the critical value of t is 2.6610; at the significance level of 0.05, the critical value of t is 2.0049; at the significance level of 0.30, the critical value of t is 1.0465.

At the factor variable of HDI, the observed t is 2.7568; it exceeds the table value at the significance level of 0.01. At the factor variable of DTS, observed t is -2.2802 – in absolute value, it exceeds the table value at the significance level of 0.05. At the factor variable of ELT, the observed t is -1.0936 – in absolute value, it exceeds the table value at the significance level of 0.30. Thus, the t-test was passed for all three factor variables. That is why, model (2) is characterised by high precision and reliability.

Therefore, ensuring the security of the biosocial essence of a person within the formation of a socially oriented society requires the creation of a quality model of education for lawyers-criminologists. This model must imply an increase in the level of education of lawyers-criminologists due to the high level of education, which is not ensured in the existing regulatory approach. That is why, as an alternative, a new – educational – approach to ensuring the security of the biosocial

essence of a person is offered, in which the focus is made on an increase in the quality of education of lawyers-criminologists

4.2. Engineering support of industry 4.0 technologies for the quality of education of lawyers-criminologists

To determine the value of the engineering support by technologies of Industry 4.0 for the quality of education of lawyers-criminologists, the statistical data that were collected for this research were further processed with the help of the regression analysis method. The result of factor analysis of the human development index on the engineering of Industry 4.0 technologies is demonstrated by the following econometric model:

$$HDI=0.9548-0.0009*RED-0.0011* *EPC-0.0010*BDA \tag{3}$$

According to model (3), an increase in the activity of the use of robots in education and R&D by 1 position leads to an increase in the level of human development (human development index) by 0.0009. An increase in the level of e-participation by 1 position leads to an increase in the level of human development (human development index) by 0.0011.

An increase in the activity of the use of Big Data and analytics by 1 position leads to an increase in the level of human development (human development index) by

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0.0010. The influence of the engineering of Industry 4.0 technologies in the human development index, as the indicator of the quality of education of lawyers-

criminologists, is described in details of regression analysis (Table 2).

Table 2. Influence of the engineering of Industry 4.0 technologies on the quality of education of lawyers-criminologists (human development index)

<i>Regression statistics</i>						
Coefficient of correlation (R ²)	Standard error	Number of observations (n)	Number of degrees of freedom	k ₁ =m	k ₂ =n-m-1	Level of significance
0.4408	0.0753	55	54	3	51 (55-3-1)	0.05
<i>ANOVA</i>						
	df	SS	MS	F-obs.	F-crit.	Significance F
Regression	3	0.0698	0.0233	4.1108	2.7862	0.0111
Residual	51	0.2894	0.0057	The f-test was passed		
Total	54	0.3592				
<i>Parameters of regression model</i>						
	Coefficients	Standard error	t-Stat	P-Value	Lower 95%	Upper 95%
Constant	0.9548	0.0285	33.4862	2.2*10 ⁻³⁶	0.8976	1.0120
RED	-0.0009	0.0007	-1.2897*	0.2030	-0.0024	0.0005
EPC	-0.0011	0.0007	-1.6853**	0.0980	-0.0025	0.0002
BDA	-0.0010	0.0006	-1.7071**	0.0939	-0.0022	0.0002

* t-test was passed at the significance level of 0.25, where t-crit. is 1.1628;

** t-test was passed at the significance level of 0.10, where t-crit. is 1.6736.

Source: Author.

As shown in Table 2, the change in the human development index among countries of the sample is by 44.08% explained by differences in the factors of the engineering of Industry 4.0 technologies. Model (3) conforms to the level of significance of 0.05. At it, the critical value of F is 2.7862. Observed F is 4.1108 – it exceeds the table value, therefore, the F-test was passed. At 54 degrees of freedom at the significance level of 0.10, the critical value of t is 1.6736; at the significance level of 0.25, the critical value of t is 1.1628.

At the factor variable of RED, observes t is -1.2897 – in absolute value, it exceeds the table value at the significance level of 0.25. At the factor variable of EPC, observed t is -1.6853 – in absolute value, it exceeds the table value at the significance level of 0.10. At the factor variable of BDA, observed t is -1.7071 – in absolute value, it exceeds the table value at the

significance level of 0.10. Thus, the t-test was passed for all three factor variables. That is why, model (3) is characterised by high precision and reliability.

The result of the factor analysis of digital/technological skills from the engineering of Industry 4.0 technologies is demonstrated by the following econometric model:

$$DTS=7.4178+0.7596*BDA \quad (4)$$

According to model (4), an increase in the activity of the use of Big Data and analytics by 1 position, digital/technological skills grow by 0.7596 positions. The influence of the engineering of Industry 4.0 technologies on digital/technological skills, as the indicator of the quality of education of lawyers-criminologists, is described in details of regression analysis (Table 3).

Table 3. Influence of the engineering of Industry 4.0 technologies on the quality of education of lawyers-criminologists (digital/technological skills)

<i>Regression statistics</i>						
Coefficient of correlation (R ²)	Standard error	Number of observations (n)	Number of degrees of freedom	k ₁ =m	k ₂ =n-m-1	Level of significance
0.7198	13.1361	55	54	1	53 (55-1-1)	0.01
<i>ANOVA</i>						
	df	SS	MS	F-obs.	F-crit.	Significance F
Regression	1	9,832.5240	9,832.5240	56.9816	7.1386	5.9*10 ⁻¹⁰
Residual	53	9,145.4760	172.5562	The f-test was passed		
Total	54	18,978.0000				
<i>Parameters of the regression model</i>						
	Coefficients	Standard error	t-Stat	P-Value	Lower 95%	Upper 95%
Constant	7.4178	3.7071	2.0010	0.0505	-0.0176	14.8532
BDA	0.7596	0.1006	7.5486*	5.9*10 ⁻¹⁰	0.5577	0.9614

* t-test was passed at the significance level of 0.01, where t-crit. is 2.6610.

Source: Author.

As shown in Table 3, the change in digital/technological skills among countries of the sample is by 71.98% explained by differences in the factors of the engineering of Industry 4.0 technologies. Model (4) conforms to the highest level of significance: 0.01. At it, the critical value of F equals 7.1386. Observed F equals 56.9816 – it exceeds the table value, therefore, the F-test was passed.

At 54 degrees of freedom at the significance level of 0.01, the critical value of t equals 2.6610. At the factor variable of BDA, observed t equals 7.5486 – in the absolute value, it exceeds the table value at the significance level of 0.01. Thus, the t-test was passed. That is why, model (4) is characterised by high precision and reliability.

The result of the factor analysis of employee training from the engineering of Industry 4.0 technologies is demonstrated by the following econometric model:

$$HDI=3.4692+0.2851*RED+0.6540*BDA \quad (5)$$

According to model (5), an increase in the activity of the use of robots in education and R&D by 1 position leads to an increase in employee training by 0.2851 positions. An increase in the activity of the use of Big Data and analytics by 1 position leads to an increase in the level of employee training by 0.6540 positions. The influence of the engineering of Industry 4.0 technologies on the level of employee training as the indicator of the quality of education of lawyers-criminologists is described in details of regression analysis (Table 4).

Table 4. Influence of the engineering of Industry 4.0 technologies on the quality of education of lawyers-criminologists (employee training)

Regression statistics						
Coefficient of correlation (R ²)	Standard error	Number of observations (n)	Number of degrees of freedom	k ₁ =m	k ₂ =n-m-1	Level of significance
0.6708	14.0073	55	54	2	52 (55-2-1)	0.01
ANOVA						
	df	SS	MS	F-obs.	F-crit.	Significance F
Regression	2	8,349.1227	4,174.5614	21.2766	5.0382	1.8*10 ⁻⁷
Residual	52	10,202.6227	196.2043	The f-test was passed		
Total	54	18,551.7455				
Parameters of the regression model						
	Coefficients	Standard error	t-Stat	P-Value	Lower 95%	Upper 95%
Constant	3.4692	5.1680	0.6713	0.5050	-6.9012	13.8396
RED	0.2851	0.1191	2.3933**	0.0203	0.0460	0.5241
BDA	0.6540	0.1073	6.0952*	1.4*10 ⁻⁷	0.4387	0.8694

* t-test was passed at the significance level of 0.01, where t-crit. is 2.6610;
 ** t-test was passed at the significance level of 0.05, where t-crit. is 2.0049.
 Source: Author.

As shown in Table 4, the change in the level of employee training among countries of the sample is by 67.08% explained by differences in the factors of the engineering of Industry 4.0 technologies. Model (5) conforms to the highest level of significance: 0.01. At it, the critical value of F equals 5.0382. Observed F equals 21.2766 – it exceeds the table value, therefore, the F-test was passed. At 54 degrees of freedom at the significance level of 0.01, the critical value of t equals 2.6610; at the significance level of 0.05, the critical value of t equals 2.0049.

At the factor variable of RED, observed t equals 2.3933 – it exceeds the table value at the significance level of 0.05. At the factor variable of BDA, observed t equals 6.0952 – it exceeds the table value at the significance level of 0.01. Thus, the t-test was passed for all two factor variables. That is why, model (5) is characterised by high precision and reliability.

Therefore, the results obtained demonstrate a strong positive influence of the engineering of Industry 4.0 technologies on the quality of education of lawyers-

criminologists. Thus, the basis of the educational approach to ensuring the security of the biosocial essence of a person should be serious engineering support of Industry 4.0 technologies for the quality of education of lawyers-criminologists.

4.3. Educational approach to ensuring the security of the biosocial essence of a person

The educational approach to ensuring the security of the biosocial essence of a person implies an increase in the quality of professional training of lawyers-criminologists with the help of their education. To implement the educational approach, the following author’s recommendations are offered:

- Increase in the quality of education of lawyers-criminologists for the maximum development of their professional competencies;
- Management of the quality of services of the security of the biosocial essence of a person through HRM of lawyers-criminologists. For this, an increase in the human potential of lawyers-criminologists in the sphere of

- detection of crimes against the security of the biosocial essence of a person with the help of life-long learning is offered;
- Development and unlocking the human potential of lawyers-criminologists, which ensures a more targeted influence on violators and provide a preventive effect, which, collectively, will raise the quality of the services to ensure the security of the biosocial essence of a person;
- Active training of digital personnel among lawyers-criminologists, which will allow them to better ensure cyber security of the biosocial essence of a person and to actively use the leading Industry 4.0 technologies to ensure the general security of the biosocial essence of a person;
- Strengthening the engineering support for the quality of training of lawyers-criminologists with Industry 4.0 technologies, namely: robotization of higher education, development

of distant education (based on e-participation), and the use of Big Data and their analytics with the help of artificial intelligence in higher education. The complex implementation of the proposed authors' recommendations will allow for better support of the security of the biosocial essence of a person in the context of the formation of a socially oriented society.

4.4. Prospects for raising the quality of education of lawyers-criminologists with engineering support of industry 4.0 technologies

The prospects for the improvement of results in the sphere of ensuring the security of the biosocial essence of a person with the help of the educational approach are determined with the engineering support of Industry 4.0 technologies based on models (2)-(5) and are shown in Figure 1.

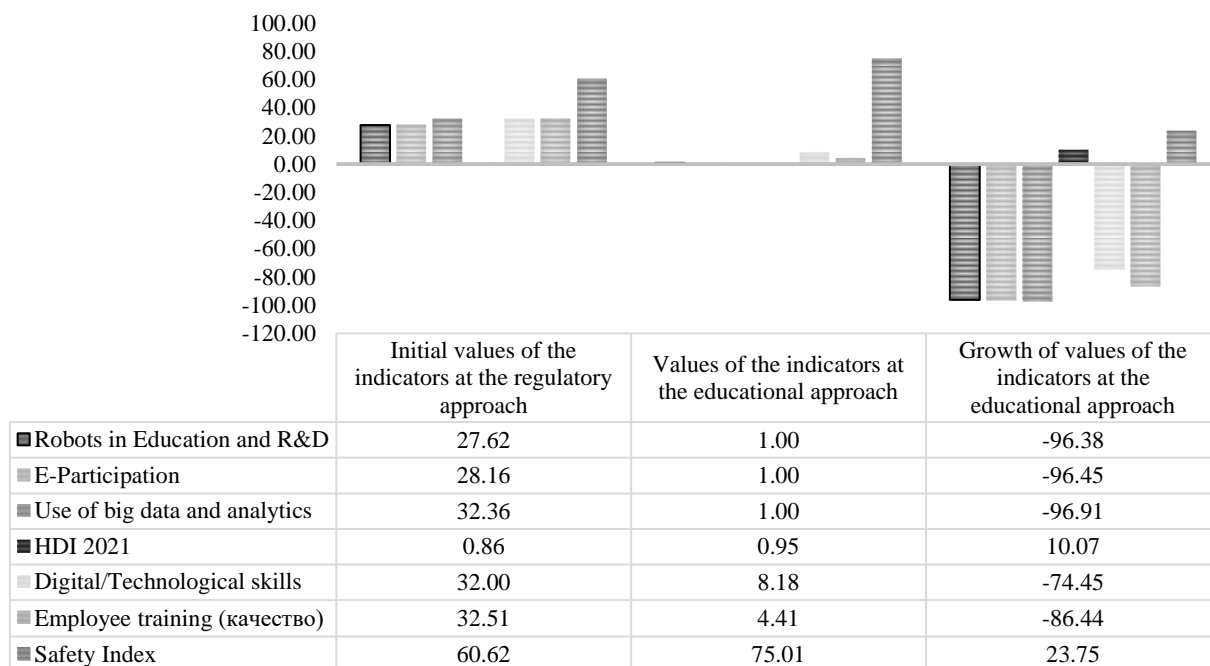


Figure 1. Prospects for increasing the results in the sphere of security of the biosocial essence of a person with the help of the educational approach.

Source: Author.

As shown in Figure 1, at the regulatory approach, the human development index is at the level of 0.86 (on average for the sample). At that, digital/technological skills are at the 32nd position, and the level of employee training – at the 33rd position (arithmetic mean is 32.51). At that, the safety index equals 60.62 points. Industry 4.0 technologies are not used sufficiently in education, their engineering support is education is insufficient. Thus, robots in education and R&D at (on average) 28th position (arithmetic mean: 27.62), e-participation – 29th (arithmetic mean: 28.16), and the use of Big Data and analytics – 32nd (arithmetic mean: 32.36).

The educational approach implies an increase in the activity of the use of robots in education and R&D to the 1st position (+96.38%), e-participation – 1st position (+96.45%), and the use of Big Data and analytics – to 1st position (+96.91%). This will ensure an increase in the human development index up to the 1st (+20.68% in the future), an increase in digital/technological skills up to the 8th position (+74.45%), and an increase in the level of employee training up to the 4th position (+86.44%). This will allow the growth of the safety index up to 75.01 points (+23.75%).

The above prospects demonstrated the advantages of the educational approach compared to the regulatory approach. Based on this, the educational approach to the security of the biosocial essence of a person is preferable and recommended for practical implementation. The basis of the discovered advantages for the quality of education of lawyers-criminologists is the improved – fuller – engineering support of Industry 4.0 technologies, which plays a decisive role in the successful practical implementation of the developed educational approach.

5. DISCUSSION

This paper contributes to the literature on the topic of quality management in education by substantiating the key role of the quality of training of lawyers-criminologists in ensuring the security of the biosocial essence of a person, as well as through proving the

important role of the engineering support for the quality of training of lawyers-criminologists from Industry 4.0 technologies in this.

The paper also develops the scientific provisions of the concept of the formation of a socially oriented society through clarification of the cause-and-effect links of security of the biosocial essence of a person. The known cause-and-effect links were supplemented by education (training of lawyers-criminologists), and the importance of this factor for increasing the results in the sphere of security of the biosocial essence of a person within the formation of a socially oriented society was proved.

This allowed proposing a new – educational – approach to ensuring the security of the biosocial essence of a person. The comparative analysis of the existing and new offered approaches is performed in Table 5.

Table 5. Comparative analysis of the existing and new offered approaches to security of the biosocial essence of a person

The criterion of the comparison of approaches	Existing regulatory approach		New proposed – educational - approach
	Provision of the approach	Reflection of the provisions of the approach in literature	
The model of teaching lawyers-criminologists that is used within the approach	The model that is oriented toward the accelerated training of the maximum possible number of lawyers-criminologists (improvement of the quantitative characteristics of education)	(<u>Ryan, 2021</u> ; <u>Shalini, 2021</u> ; <u>Younes and Alsharqawi, 2021</u>)	The model that is oriented toward the maximum development of professional competencies of lawyers-criminologists (increase in the quality of education)
Source of the security of the biosocial essence of a person in the approach	Norming: tightening of the norms of detection of crimes against the security of the biosocial essence of a person	(<u>Albert et al., 2021</u> ; <u>Albina et al., 2022</u>)	Quality management through HRM of lawyers-criminologists: increase in the human potential of lawyers-criminologists in the sphere of detection of crimes against the security of the biosocial essence of a person
Method of ensuring the quality of the approach	Quantitative increase in the number of solved crimes against the security of the biosocial essence of a person	(<u>Sanclemente, 2022</u> ; <u>Shaw, 2021</u>)	Increase in the quality of services of the security of the biosocial essence of a person: more targeted influence on violators and the preventive effect
The contribution of the approach to the formation of a socially oriented society	Only ensuring the security of the biosocial essence of a person	(<u>Cousins, 2021</u> ; <u>Song and Tong, 2022</u>)	Also (additionally) the development and unlocking of human potential of lawyers-criminologists

Source: Author.

Unlike the regulatory approach, which is described in the works (Ryan, 2021; Shalini, 2021; Younes and Alsharqawi, 2021), the model of education of lawyers-criminologists within the educational approach is to focus not on accelerated training of the maximum possible number of lawyers-criminologists (improvement of the quantitative characteristics of education) but on the maximum development of professional competencies of lawyers-criminologists: raising the quality of education.

Unlike (Albert et al., 2021; Albina et al., 2022), the source of the security of the biosocial essence of a person in the new model is not toughening the norms of detection of crimes against the security of the biosocial

essence of a person (norming) but the management of quality through HRM of lawyers-criminologists: improvement of the human potential of lawyers-criminologists in the sphere of detection of crimes against the security of the biosocial essence of a person. Unlike (Sanclemente, 2022; Shaw, 2021), a method of ensuring the quality of the educational approach is not the quantitative increase in the number of solved crimes against the security of the biosocial essence of a person but an increase in the quality of services of security of the biosocial essence of a person: more targeted influence on violators and the preventive effect.

Unlike (Cousins, 2021; Song and Tong, 2022), the contribution of the educational approach to the

formation of a socially oriented society consists not only in the support for the security of the biosocial essence of a person but also in (additionally) the development and unlocking of human potential of lawyers-criminologists.

6. CONCLUSION

Thus, as a result of the research, the proposed hypothesis H_1 was proved; it was substantiated that the education of lawyers-criminologists plays an important role in the support for the security of the biosocial essence of a person. The results of modelling of the econometric dependence of the safety index on the human development index based on the international experience in 2022 showed that the quality of services for support of security of the biosocial essence of a person is by 63.06% explained by the quality of the educational training of lawyers-criminologists, including the training of digital personnel among them. Hypothesis H_2 was also proven; it was substantiated that the engineering support with the help of Industry 4.0 technologies positively and seriously influences the quality of education of lawyers-criminologists, determining the human development index by 44.08%, the level of training of digital personnel by 71.98%, and the level of employee training by 67.08%. Thus, there is a necessity for very active use of Industry 4.0 technologies to raise the quality of training of lawyers-criminologists.

Based on this, a new – educational – approach to the security of the biosocial essence of a person was offered. The specific features of the author's approach include, first, improvement of the quality of education of lawyers-criminologists; second, management of the quality of services of the security of the biosocial essence of a person through HRM of lawyers-criminologists; third, development and unlocking of human potential of lawyers-criminologists. The advantage of the educational approach is a more targeted influence on violators and the preventive effect of security of the biosocial essence of a person.

The key conclusion as a result of the performed research is that Industry 4.0 technologies are required in the modern model of improvement of the quality of training lawyers-criminologists to ensure the security of the biosocial essence of a person within the creation of a socially oriented society. The fundamental value of this conclusion is that it disclosed a previously unknown organisational (quality educational training of lawyers-criminologists) and technological (engineering support of Industry 4.0 technologies to raise the quality in education) condition for ensuring the security of the biosocial essence of a person within the creation of a socially oriented society.

Insufficient engineering support of Industry 4.0 technologies does not allow to fully develop the potential for improvement of the quality of education of

lawyers-criminologists. Fuller engineering support of Industry 4.0 technologies, which is ensured in the author's approach, will allow realising the existing potential. However, this requires not just a simple adaptation of Industry 4.0 technologies to the specifics of the educational process but the development of the highly-effective use of these technologies to raise the quality of higher education services.

Thus, the paper provided a new view of the engineering of Industry 4.0 technologies in higher education – from the position of quality (on the example of training of lawyers-criminologists). This new view demonstrated a systemic connection between quality, technological innovations, effectiveness, and sustainability of higher education. The theoretical significance of the paper consists in the improvement of the understanding of the causal relationships between the formation of a quality model of education of lawyers-criminologists to ensure the security of the biosocial essence of a person within the formation of a socially oriented society.

The practical significance of the paper consists in the fact that the proposed new – educational – approach to security of the biosocial essence of a person allows raising the quality of the model of education of lawyers-criminologists and improving the quality of the services to ensure the security of the biosocial essence of a person, thus stimulating the accelerated formation of a socially oriented society.

The social significance of the paper consists in the author's approach allowing lawyers-criminologists to receive more opportunities for the development and unlocking of human potential. The new approach will contribute to the formation of a socially oriented society, in which the interests of consumers and subjects of provision (lawyers-criminologists) of services of security of the biosocial essence of a person will be improved.

As for limitations of the performed research, it should be noted that during its preparation and the formulation of conclusions, the focus was made on the quality of educational attainment of lawyers-criminologists. Therefore, the results of this paper are focused on ensuring the security of the biosocial essence of a person within the creation of a socially oriented society through law-enforcement activity. It should be noted that citizens can independently ensure the security of their biosocial essence through caution and vigilance. Consideration of the support for the security of the biosocial essence of a person within the creation of a socially oriented society only from outside, when the subjects of this process are lawyers-criminologists, is a limitation of this paper. The results obtained allow assuming that the quality of educational attainment of citizens, and in particular, an increase in their legal literacy, may also be important for ensuring the security of the biosocial essence of a person within the creation

of a socially oriented society – but this remained outside of the scope of this research. Future scientific studies should perform more comprehensive and complex

research on the influence of the quality of education on ensuring the security of the biosocial essence of a person within the creation of a socially oriented society.

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Appendix

Country	Safety Index	Human development index	Digital/Technological skills	Employee training	Robots in Education and R&D	E-Participation	Use of big data and analytics
Argentina	35.9	0.842	57	62	36	27	41
Australia	55.2	0.951	39	44	24	9	30
Austria	73.2	0.916	40	3	10	6	44
Belgium	53.3	0.937	36	22	18	55	31
Brazil	33.2	0.754	60	45	16	18	60
Bulgaria	61.6	0.795	26	59	48	22	54
Canada	56.4	0.936	14	10	8	16	4
Chile	43.5	0.855	31	56	44	27	45
China	71.2	0.768	12	11	1	9	5
Colombia	41.3	0.752	53	41	48	26	36
Croatia	76	0.858	32	49	37	22	51
Czech Republic	74.2	0.889	23	31	15	49	33
Denmark	73.7	0.948	5	1	25	9	6
Estonia	75.9	0.89	44	8	48	1	22
Finland	73.2	0.94	3	9	22	14	15
France	45.6	0.903	28	17	5	18	43
Germany	63	0.942	52	4	2	44	52
Greece	52	0.887	47	54	38	39	62
Hungary	66.1	0.846	54	52	28	54	57
Iceland	75.7	0.959	1	35	53	40	17
India	55.4	0.633	17	27	23	27	13
Indonesia	53.9	0.705	41	18	42	44	26
Ireland	54.1	0.945	34	15	30	27	18
Israel	67.8	0.919	19	36	38	50	8
Italy	53.8	0.895	49	48	11	34	47
Japan	77.8	0.925	62	30	4	4	63
Latvia	61.5	0.863	27	23	47	58	24
Lithuania	67.4	0.875	2	21	46	48	21
Malaysia	45.6	0.803	37	40	26	27	29
Mexico	46.1	0.758	48	43	12	34	56
Netherlands	72.4	0.941	6	5	21	9	16
New Zealand	55.4	0.937	51	42	44	4	39
Norway	66.5	0.961	8	12	31	18	7
Peru	32.8	0.762	59	53	41	43	53
Philippines	57.6	0.699	42	38	51	44	38
Poland	67.9	0.876	61	60	14	9	50
Portugal	68.5	0.866	20	61	34	34	61
Qatar	85.8	0.855	11	19	51	55	3
Romania	67.5	0.821	22	47	35	38	37
Russia	60.7	0.829	49	42	7	26	31
Saudi Arabia	75.4	0.875	7	14	53	50	23
Singapore	72.8	0.939	9	24	29	6	11
Slovakia	69.5	0.848	35	46	32	52	42
Slovenia	76.8	0.918	25	26	33	27	35
South Africa	24.6	0.713	56	55	40	44	27
South Korea	73.9	0.925	46	34	7	1	34
Spain	65	0.905	30	50	9	33	55
Sweden	51.2	0.947	4	7	20	34	14
Switzerland	77.9	0.962	18	2	13	18	25
Thailand	61.1	0.8	45	20	17	40	28
Turkey	60.1	0.838	50	63	27	22	40
United Arab Emirates	85.1	0.911	16	26	43	16	20
United Kingdom	53.4	0.929	24	37	6	6	19
United States	51.6	0.921	10	33	3	1	1
Venezuela	16.8	0.691	63	58	53	61	58

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