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IMPROVEMENT OF PRODUCT QUALITY IN THE AI ECONOMY: HUMAN KNOWLEDGE VS. DIGITAL TECHNOLOGIES

Abstract: *This paper is a comparative study of the advantages of the influence of implementing digital tools and the quality of human knowledge on the improvement of product quality. We substantiate the role of the human factor in the formation of competitive knowledge that is necessary for implementing ambitious goals of companies in the achievement of competitive advantages in the sphere of continuous improvement of product quality. We also prove the necessity for supporting the level of human knowledge competitiveness, which will facilitate the increase in product quality and social justice (employment level).*

To reach the goals of this research, we use the index method, comparative analysis and cause-effect relationships method.

The novel aspect of this paper is connected with the determination of the specifics and advantages of using the quality of human knowledge and digital technologies for achieving the goals of the growth of product quality, which allows forming the current directions for the creation of efficient solutions for further industrial growth.

Keywords: *Digital technologies, Human knowledge, Artificial intelligence, Improvement of product quality, Industrial robots, Digitalisation, Employment.*

1. Introduction

Product quality allows companies to conquer national and international markets. New requirements for quality become more universal, which ensures opportunities for integration in the world markets for companies that have the ability and potential to repurpose their production to new demands. High durability and strength of materials and the innovative characteristics of production allow reaching the advantages of products in the sphere of quality. These parameters that are implemented through the expanded use of the function of quality (de Sales, et al., 2021, Arsovski 2023) ensure market competitiveness in the international commodity markets. They also influence price characteristics, receipt of effect in the form of value added that affects profit and new opportunities for investing. Improvement of quality in the modern globalised world is possible under the conditions of the focus on new digital technologies, which ensure additional parameters of quality. An important place among such technologies belongs to artificial intelligence, which is implemented with the help of industrial robots that ensure the achievement of high quality in the sphere of

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complex and hazardous processes, as well as monotonous operations. The means of artificial intelligence are also used as software solutions, built into modern innovative products.

High-tech societies have a high level of digital technologies and a high level of human resources readiness to use them. This ensures an effective and adequate reaction to substantial changes in technological processes. That is, AI economies are usually supported by highly organised personnel. In countries in which labour resources have a sufficiently high level of knowledge but no skills for quick adaptation to technological changes, there are no significant results in the context of constant growth of product quality, which affects products' competitiveness. Such an assumption requires further substantiation, which is attempted in this paper.

The goal of this research is to determine the advantages of achievement of product quality under the conditions of economies that are oriented toward AI and digital technologies, compared to the conditions of economies that have a high level of human knowledge and human resources. The tasks of this research are as follows: 1) assessing the countries' rating by the indicator of regulatory requirements to product quality and identifying the level of implementation AI in production (World robots distribution and Use of big data and analytics); determining leading countries in the sphere of industrial production; 2) description of the world rating of countries that demonstrate a high level of knowledge of human resources, determining the level of requirements to product quality in these countries, identifying leading countries in the context of industrial production; 3) discovering the advantages of the focus on AI and human knowledge for the improvement of product quality.

2. Materials and method

In this research, we use theoretical and empirical materials on the use of AI economy means and the influence of its technologies on product quality: (de Sales et al., 2021), (Chen et al., 2022), (Woźniak et al., 2021), (Ertürk et al., 2021), (Lee et al., 2018), (Martincevic, 2021), (JinKyo et al., 2019), (Vijaranakorn and Shannon, 2017), (Brall and Schmid, 2022), (Fulton et al., 2021), (Bordot, 2022), (Rainatto et al., 2021) and (Cords and Prettner, 2022). Given the necessity to assess the advantages of using AI tools compared to human knowledge for ensuring the improvement of product quality, we studied the provisions of the above works and performed analytical research in this direction.

In this paper, the index method is used for determining the ranks of countries in the sphere of regulation of product quality and the level of implementation of AI (in the context of main digital technologies), the level of knowledge of human resources and the level of industrial development. Comparative analysis allows determining the change in the considered indicators at the level of studied countries and identifying the advantages of managing the digital economy tools for product quality improvement. The cause-effect relationships method allowed substantiating the role of the implementation of AI in the resolution of the problem of product quality improvement and proving the advantages of AI compared to the conditions of the focus on human knowledge during the provision of product quality improvement in various sectors.

3. Results

Let us consider the dependence of product quality improvement on the implementation of the means of AI, namely the use of big data and analytics and world robots distribution. The industrial production index was determined based on the industry value added index.

Table 1 contains the rating data on the level of regulation of product quality and industrial production.

Table 1. Rating of countries by the indicator of product quality regulation and industrial production over 2019-2022.

Country	Value, Rank				Change, Rank			Industrial production index, Rank
	2019	2020	2021	2022	2019-2020	2020-2021	2021-2022	
Hong Kong	1	1	2	7	0	1	5	70
Singapore	2	2	1	1	0	-1	0	37
New Zealand	3	4	3	2	1	-1	-1	56
Netherlands	4	3	5	8	-1	2	3	23
Australia	5	5	4	5	0	-1	1	13
Canada	6	14	10	12	8	-4	2	10
Switzerland	7	8	12	12	1	4	0	20
Finland	8	7	6	3	-1	-1	-3	49
Norway	9	10	7	9	1	-3	2	34
Sweden	10	6	8	10	-4	2	2	29
Germany	11	12	9	13	1	-3	4	4
United Kingdom	12	9	13	15	-3	4	2	7
Luxembourg	13	11	11	4	-2	0	-7	100
Estonia	14	17	15	14	3	-2	-1	103
USA	15	16	20	21	1	4	1	2
Denmark	16	13	16	6	-3	3	-10	43
Japan	20	22	21	19	2	-1	-2	3
Republic of Korea	29	30	29	32	1	-1	3	6
United Arab Emirates	32	34	36	30	2	2	-6	25
Portugal	35	35	37	38	0	2	1	55
Turkey	67	74	72	74	7	-2	2	18
China	81	82	91	77	1	9	-14	1

Source: compiled by the authors based on WIPO (2022), Indexmundi (2022).

Based on the analysis of the results obtained (Table 1), we may note that the most industrialised countries of the world (in the context of the industrial production rating) have high (1-20) and medium indicators (21-40) by product quality regulation. These countries include Australia, Canada, Germany, the UK, the USA, Japan, the Republic of Korea and Switzerland. As for China, which is ranked 1st by industrial procution, we can note the positive tendencies in the improvement of product quality regulation. According to Chen et al. (2022), such a positive change in the sphere of the growth of requirements to regulation was due to the Chinese government's starting to implement more progressive and transparent methodological approaches to compliance with standards and norms, which meant the improvement of the government organisational mechanism in this sphere.

Turkey was ranked 18th in the sphere of industrial production. The country is in the constant process of transformation by the indicator of product quality regulation. We selected Turkey for the analysis because in certain sectors this country reached significant results in the sphere of the growth of product quality.

Over 2018-2020, the following directions were implemented: development and mass production of 3D models for surgical

modelling of precision surgeries, which are performed by medical establishments in case of various fractures (Ertürk et al., 2021). Manufacture of such products allows raising the quality of medical operations, and they are in high demand in international markets. Implementation of this production allowed raising product quality in the sector of surgical products in Turkey. According to Woźniak et al. (2021), the assessment of the quality of 3D models of products requires close attention. To obtain competitive advantages in this sphere, there is a need for a certain organisational and technical mechanism. Such a mechanism has been formed and is constantly improved under the conditions of manufacture of the above 3D products. We should also mention the achievements in implementing effective mechanisms of evaluation of product quality in the sphere of the aviation industry in Turkey.

Table 2 presents the rating of the selected countries by the level of indicators of AI in the sphere of product quality improvement.

Table 2. The rating of countries by the indicators of implementation of AI in the sphere of product quality improvement.

Country	World robots distribution, Rank				Use of big data and analytics, Rank				Level of industrial development
	2019	2020	2021	2022	2019	2020	2021	2022	
Hong Kong	36	37	38	37	19	21	12	12	Medium-high
Singapore	15	15	14	14	15	10	14	11	Medium
New Zealand	42	41	41	41	21	48	33	39	Medium-high
Netherlands	18	21	20	20	10	20	17	16	Medium
Australia	29	29	30	30	28	29	35	30	High
Canada	14	13	13	13	13	4	8	4	High
Switzerland	27	26	25	24	29	25	23	25	High
Finland	33	33	34	33	24	15	16	15	Medium
Norway	41	42	42	40	15	6	9	7	Medium
Sweden	17	18	21	21	7	7	10	14	Medium
Germany	5	5	5	5	46	46	53	52	High
United Kingdom	12	14	15	15	25	23	18	19	High
Luxembourg	no data	58	no data	no data	32	38	21	46	Low
Estonia	49	47	47	46	43	37	34	22	Low
USA	4	4	4	4	6	9	5	1	High
Denmark	30	30	29	29	17	12	13	6	Medium
Japan	2	2	2	2	63	63	63	63	High
Republic of Korea	3	3	3	3	40	15	26	34	High
United Arab Emirates	53	53	53	51	1	2	3	20	Medium
Portugal	31	31	32	31	45	55	58	61	Medium-high
Türkiye	20	20	19	18	58	42	54	40	High
China	1	1	1	1	12	8	11	5	High

Source: compiled by the authors based on IMD (2022).

The above industrialised countries (Table 2) could **b**e divided into categories:

- High level of implementation of both types of digital tools of AI, namely World robots distribution and Use of big data and analytics. These countries include Canada, the USA and China;
- Medium and high level of implementation of one or both digital tools: Australia, Germany, Japan, the UK, the Republic of

Korea, Turkey, Türkiye and Switzerland.

Thus, we can see a connection between the implementation of digital tools of AI and an increase in product quality. Industrialised countries with a medium-high level of regulation of product quality demonstrate high and/or medium levels of the use of the digital tools of AI. Their focus on the improvement of product quality through the selected form of digitalisation is connected with the potential and strategies of industrial companies in market development. Certain countries were able to implement the use of two given digital tools of AI at a high level (Canada, USA and China). These countries are undisputed leaders given their financial capabilities and a high level of practical implementation of R&D achievements in the sphere of digitalisation at the level of certain export sectors.

Let us elaborate on the connection between human knowledge and the indicator of product quality improvement, which is realised through the elements of regulation of standards and level of industrial production. For this, we assess the rating of countries by the level of human knowledge (elements: education and tertiary education) (Table 3).

Table 3. Ranking of countries by the level of human knowledge and industrial production.

Country	Education, Rank				Tertiary education, Rank				Level of industrial development, Rank
	2019	2020	2021	2022	2019	2020	2021	2022	
Norway	3	5	3	3	50	42	42	47	34
Sweden	6	6	4	4	28	28	25	28	29
Belgium	5	2	2	5	44	49	52	46	32
Iceland	9	11	7	6	68	63	58	52	118
Denmark	2	3	5	8	29	26	30	30	43
Finland	4	8	9	9	10	14	12	15	49
New Zealand	15	14	11	11	12	11	17	9	56
Cyprus	12	13	14	12	42	20	34	20	128
Republic of Korea	21	28	22	13	16	16	13	18	6
Hong Kong	48	48	37	15	15	9	11	12	70
Belarus	20	16	16	16	9	10	7	8	76
Netherlands	23	19	20	17	59	37	39	35	23
Germany	33	38	27	22	5	6	5	7	4
Canada	51	40	33	23	32	31	35	14	10
Switzerland	30	31	24	27	17	18	25	19	20
Australia	19	29	29	36	13	5	6	3	13
Austria	22	18	19	20	3	4	4	4	30
Greece	16	42	13	38	8	3	1	6	65
United Kingdom	34	35	28	40	11	15	18	11	7
Singapore	57	51	54	43	1	1	2	2	37
USA	45	45	41	44	53	45	45	48	2
United Arab Emirates	17	17	61	57	6	2	3	1	25
Russian Federation	35	46	40	58	14	17	14	16	8
Türkiye	73	70	60	66	43	91	24	56	18
Malaysia	70	68	77	74	18	8	15	13	27
Qatar	105	106	94	76	19	46	37	10	41
Peru	86	86	85	80	21	13	8	5	50

Source: compiled by the authors based on WIPO (2022), Indexmundi (2022).

As is seen from Table 3, among industrialised countries that have high indicators of human knowledge (Education and Tertiary education), we can distinguish only the Republic of Korea. The country is ranked 6th by industrial development and is very export-oriented due to the constant provision of monitoring and improvement of quality. A high level of industrial development, supported by high-tech products, is connected with the level of human knowledge.

The competitive personnel in the Republic of Korea have their priorities in decision-making on the loyalty to the companies in which they work. Such parameter as life-long learning and advanced training paid for by employers is the advantage that ensures a positive effect on the support for companies and the manifestation of initiative and creativity in the work of skilled personnel. It also leads to the reduction of personnel turnover in high-tech companies that implement measures for constant improvement of product quality to raise consumer advantages and added value (Lee et al., 2018). Unlike the USA, the management's attitude in South Korean companies does not influence the personnel's dedication to working. In this case, the priority is only personal interest, which is connected with the increase in market competitiveness.

The competitiveness of human resources brings unquestionable benefits for the achievement of high consumer quality of products under the conditions of Industry 4.0, in which the most important aspect is the demand for unique features that can meet new requirements (Martincevic, 2021). Competitive personnel can facilitate the achievement of corporate goals in the management of high-tech technologies and/or equipment, which is ensured by their abilities for quick adaptation to new work conditions and redistribution of work burden, ability to use knowledge and skills when making independent decisions that often influence product quality. It should be also noted that it is easier for competitive personnel to accept the company's strategy with a focus on the improvement of product quality and the indicators of product safety. This is primarily due to material and career motivation. Accordingly, the following result is achieved: all participants of the process, who are interested parties, aim at the growth of product quality. Continuous improvement of product quality is not the priority of all industrialised countries. As an example, part of the production of BMW (Germany) is located in underdeveloped countries of Asia and South Africa, which do not have a high level of competitiveness of human resources. Workers in these regions can perform mostly simple tasks, without a focus on unique creative efforts (JinKyo et al., 2019). Though not all world manufacturers strive toward placing their production in countries with the unskilled workforce, this is due to the fact that companies take into account the possibility of mass defects, losses and a decrease in competitiveness. An example of this is the activity of LG (Republic of Korea), which, for the purpose of the quality of laptops, ordered the production of components from Taiwan, which has skilled workforce. The modern focus of consumers on high-tech products is currently shifting to such parameter as perceived quality, which is largely determined by the country in which components are produced and assembly is performed (Vijaranakorn and Shannon, 2017). If this is a country with a cheap workforce, the quality is perceived negatively, and vice versa. The parameter of workforce cost in high-tech production is identical to the parameter of human resources' readiness for future technological transformations. As a result, the quality of the workforce in the modern world, in the sphere of production depends on the development of technologies, including digital, and the ability to quickly master them.

Let us dwell on the ranks of the selected countries by the indicator of product quality regulation.

Table 4. Rating of countries by the indicator of product quality regulation, industrial production, for 2019-2022.

Country	Value, Rank				Change			Evaluation of the level of industrial development
	2019	2020	2021	2022	2019-2020	2020-2021	2021-2022	
Norway	9	10	7	9	1	-3	2	medium
Sweden	10	6	8	10	-4	2	2	medium
Belgium	24	25	22	20	1	-3	-2	medium
Iceland	19	19	19	17	0	0	-2	low
Denmark	16	13	16	6	-3	3	-10	medium
Finland	8	7	6	3	-1	-1	-3	medium
New Zealand	3	4	3	2	1	-1	-1	medium-high
Cyprus	31	32	32	33	1	0	1	low
Republic of Korea	29	30	29	32	1	-1	3	high
Hong Kong	1	1	2	7	0	1	5	medium-high
Belarus	113	111	104	107	-2	-7	3	medium-high
Netherlands	4	3	5	8	-1	2	3	medium
Germany	11	12	9	13	1	-3	4	high
Canada	6	14	10	12	8	-4	2	high
Switzerland	7	8	12	12	1	4	0	high
Australia	5	5	4	5	0	-1	1	high
Austria	18	18	17	18	0	-1	1	medium
Greece	58	57	47	44	-1	-10	-3	medium-high
United Kingdom	12	9	13	15	-3	4	2	high
Singapore	2	2	1	1	0	-1	0	medium
USA	15	16	20	21	1	4	1	high
United Arab Emirates	32	34	36	30	2	2	-6	medium
Russian Federation	103	105	100	98	2	-5	-2	high
Turkey	67	74	72	74	7	-2	2	high
Malaysia	40	40	41	40	0	1	-1	medium
Qatar	51	46	40	37	-5	-4	-3	medium
Peru	52	45	45	45	-7	0	0	medium

Source: compiled by the authors based on WIPO (2022), Indexmundi (2022).

Analysing the data from Table 4, we should note that the Republic of Korea, which is characterised by a high level of industrial development and human knowledge, was not able to reach an increase in the level of product quality regulation. However, this level can be considered acceptable for a high-tech country. Production companies in the Republic of Korea reach success in the increase in quality with a medium level of education, but with such indicator as high adaptability of human resources to the change of technologies3 (indicator that characterises the competitiveness of personnel).

Other considered countries that have a high level of formation of one of the two indicators of human knowledge (Tertiary education and Education) focused on the production potential of national companies

in the mastering of digital tools of AI, to achieve the goal of the increase in product quality. These counties include the following:

- Germany, which is ranked 5th in the world by industrial robots (Table 2) and demonstrates a high quality of Tertiary education, including in the sphere of technological specialties. Accordingly, the use of industrial robots in the manufacture of high-tech products, which ensures their quality at all stages, was combined with a high quality of the work of personnel, which had a high level of knowledge and skills in the control of robotised processes. According to (Brall and Schmid, 2022), during the implementation of the first industrial robots in mass production in 1990-2000 in Germany, there was a larger wage inequality, since the number of personnel who were able to quickly learn the management of the processes and to work under new conditions of automatization was not sufficient. The work of such personnel was evaluated higher compared to personnel with similar education and similar or larger work experience but were not able to work under the new conditions and demonstrated low productivity. Over 2010-2017, the system of higher education in Germany, including personnel for high-tech production, focused more on the training of future specialists (Brall and Schmid, 2022). Human resources had to have high adaptability to the implementation of new digital technologies, which required quick mastering and application. The wide use of industrial robots is a factor of modern German product quality, which is famous around the world. In the German industrial sector, the most robotised sectors as of now are as follows: electronic industry (including the production of semiconductors, which are of high quality and in demand in the world market); electrotechnical industry; metallurgy; car industry; food industry; production of surgical and diagnostics equipment and technologies. Compared to other countries in Europe, Germany is the leader in the number of industrial robots: as of the end of 2021, around 230,000 robots were used in all sectors of industry. To compare, this indicator in Italy was 78,000, in France – 45,000, in Spain – 38,000 and in the UK – 23,000 (Gtai.de, 2022). Germany holds a key position in Europe by the density of robots in the sphere of processing sectors. As of year-end 2020, it reached the level of 371 robots per 10,000 personnel. In Sweden, this indicator was 289 robots per 10,000 personnel, in Denmark – 246 robots per 10,000 personnel, in Italy – 224 robots per 10,000 personnel, in Belgium and Luxembourg – 221 robots per 10,000 personnel and the Netherlands – 209 robots per 10,000 personnel (Gtai.de, 2022);
- Canada, which was ranked 4th by the implementation of the Use of big data and analytics in 2020, 13th – by robotisation in industry, and 10th – by the quality of Tertiary education. Sectors that use two tools of AI to raise product quality in Canada include the light industry (e.g., Groupe Dynamite (Insolvencies.deloitte.ca, 2022)); pharmaceutical industry (Abbott Laboratories Limited, AA Pharma Inc., Accord Healthcare Inc., Abbvie Corporation, Actelion Pharmaceuticals Canada Inc., ACIC Pharmaceuticals, Advanz Pharma, Acerus Pharmaceuticals Corporation, Alk Abello Inc., Alethia Biotherapeutics, Allergan Inc. etc. (Pharmapproach, 2020)); petrochemical industry (a large oil refining complex Sarnia-Lambton, which is a cluster for a range of multinational companies); woodworking industry (Tolko Industries Ltd, Resolute Forest Products, West Fraser Timber Co Ltd, Canfor, etc.); food industry (large innovative companies that produce plant-based food and agro-industrial companies). The use of big data and analytics in the above sectors of Canada is often realised with the help of sectoral applications, developed by national IT companies in view of local specifics and the possibility for adaptation to other conditions of the sector's formation (Fulton et al., 2021). Such applications in agro-industrial

production systematise data on the requirements of temperature and norms of care, with sensors for identification and treatment of factual data. Similar apps are used in other sectors as well. Similarly to Germany, Canada has a high level of Tertiary education of personnel with high adaptability to technological change. The personnel are responsible for the achievement of high product quality of innovative companies;

- Switzerland, which demonstrated high achievements in the sphere of Tertiary education and medium values in the implementation of the digital tools of AI. The country has a medium level of digitalisation, which facilitated the growth of GDP due to selling high-tech products. This was largely supported by the government's introducing requirements for product quality, including standards used in the EU and separate requirements for products of domestic use (Legacy.export.gov, 2022). Similarly to Germany, industrial growth and the creation of requirements to quality are connected with innovations in the sphere of digital technologies in Switzerland. Reforms and further growth of the Swiss watchmaking industry in the last five years were achieved also due to the use of precision robots. An example of this is delta robot EXPT, presented by Festo and used in watchmaking (Festo, 2022);
- Australia and the UK, which have high and medium indicators of product quality regulation and a high level of Tertiary education. The UK uses industrial robots primarily in the processing industry (Industrytoday, 2022). The mass transition to robotisation was predetermined by the fact that there was a significant lack of skilled technical personnel able to quickly master new equipment and technologies in recent years. The UK processing industry felt the lack of trained personnel required for production at the set level of quality in 2020, during the global COVID-19 pandemic. This was due to the employees' health problems (including COVID-19 lethal cases) and restricted movement. The need to retain the production rate led to the necessity for the mass transition to the use of industrial robots (Industrytoday, 2022). The focus on robotisation in the sectors of the UK processing industry after the pandemic caused such a problem as personnel cuts. It is possible to state that the implementation of industrial robots became a factor in the diversification of the structure of employment in the UK industry (Bordot, 2022). Australia has certain problems with the implementation of industrial robots, which are similar to the ones the UK faced. In the USA and Australia, the wide industrial use of robots led to the loss of highly qualified personnel, while Germany and Austria, on the contrary, are peculiar for firing unskilled personnel (Cords and Prettner, 2022). The reason is that Australia and the USA were oriented toward the purchase of robots that were able to replace work areas during idle periods when there was no possibility to use human personnel. Given the cost and effectiveness of the transition to robotisation in Australia, the return to the use of the human workforce does not take place. Germany and Austria were focused on the social component, so robotisation initially took place in sectors and production areas where leads qualified personnel were used. According to Cords and Prettner (2022), robotisation and an increase in unemployment led to the quick diversification of the structure of higher education in the direction of personnel's reorientation toward adjacent specialties.

4. Discussion

Study of the effectiveness of the orientation toward the use of human knowledge and the digital tools of AI to ensure the increase in product quality demonstrated their equal importance. Without human knowledge in the high-tech sphere, the production process cannot be continuously supported in the case of failures and emergencies. There is a need for performing measures on optimisation,

changes in the settings of robots (reprogramming, services) and changes in the apps that are based on the use of big data and analytics. Given the scale of productions and their influence on the functioning of certain critical infrastructures of society's activities, the scale and consequences of failures in the works of industrial robots depend on the level of companies' personnel adaptability.

In most countries, the entrepreneurial sector is focused primarily on saving or increasing its capital, so the interests of human resources in the sphere of provision of decent work and wages are not the main priority of the business environment. Therefore, the industry's focus on growth and capitalisation is a precondition for human resources' focusing on their competitiveness. Highly competitive personnel are needed by companies that are aimed at the provision of a constant increase in product quality. That is why students and employees who desire to be competitive must ensure the growth of their knowledge and skills, for their quick use under the conditions of digitalisation.

AI is a precondition for the growth of product quality, allowing certain companies to reach the transnational scale of activity. The use of the digital technologies of AI allows countries to become world leaders in the sphere of the digital economy. Implementation of AI for the purpose of product quality improvement implies the use of active initiative from all interested parties: companies that produce modern technologies and equipment, the industrial sector, and labour resources of industrial companies that strive toward constant professional growth.

Consideration of the social component, which is connected with the large-scale transition to the use of the digital technologies of AI, is important for countries and the entrepreneurial sector if the latter is aimed at support for the country's sustainable development.

5. Conclusion

The study of the focus on the two directions of product quality improvement (quality of human knowledge and implementation of AI) did not allow determining which of them is of the higher priority. This conclusion comes from the consequences that appear in the case of the industrial sectors' choosing only one of the two directions. Each of the analysed directions should be developed for the comprehensive development of the economy and transformation of the educational system. High adaptability of human resources is the decisive factor of formation of each direction of the formation of conditions for product quality improvement. Human resources should become a power that will accept the individualised role as a participant in the sphere of industrial products' quality improvement.

We elaborated on the specific features in the sphere of product quality standards regulation at the level of countries. We showed that the leading countries in industrial development demonstrate substantial results in this direction and optimisation on certain high-tech sectors. The countries' focus on product quality improvement stimulates further growth of consumer preferences, which, in their turn, are a precondition for the increase in the level of implementation of AI and the growth of human knowledge quality.

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