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«Admitted to the defense»

Head of the Department

_____ Yuriy Petrushenko
(signature) (full name)

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QUALIFICATION PAPER

It is submitted for the Master's degree

Specialty 292 "International Economic Relations"
on the topic "THE IMPACT OF THE EDUCATION SYSTEM ON THE
COUNTRY'S INTERNATIONAL COMPETITIVENESS AND INNOVATION
POTENTIAL"

Student group МБ.М-21аН
(group's code)

_____ (signature)

Anna Diana Sliusarenko
(full name)

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Master's level degree qualification paper contains the results of own research. The use of the ideas, results and texts of other authors has a link to the corresponding source

_____ (signature)

Anna Diana Sliusarenko
(full name)

Research advisor PhD in Economics, Associate Professor, Senior lecturer
(position, scientific degree, full name)

_____ (signature)

Viktoriiia Shcherbachenko

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ABSTRACT

of Master's level degree qualification paper on the theme

«THE IMPACT OF THE EDUCATION SYSTEM ON THE COUNTRY'S
INTERNATIONAL COMPETITIVENESS AND INNOVATION POTENTIAL»

student Sliusarenko Anna Diana Dmitrievna

The main content of the master's level degree qualification paper is set out on 74 pages, including a list of used sources of 55 titles, which is placed on 7 pages. The work contains 2 tables, 7 figures, which are placed on 11 pages.

The study aims to comprehensively analyse the impact of the education system on the country's international competitiveness and innovation potential. It seeks to reveal the key aspects of the interaction between educational processes and the economic and innovation spheres to develop constructive recommendations for improving this interaction. To achieve this goal and objectives there were used following scientific methods of research: the analysis of statistical data from official sources such as the World Bank Group, OECD database, and Statista statistical data service. Theoretical and practical developments of domestic and foreign researchers were also processed and analyzed. The synthesis method was used to develop practical solutions based on data collection and analysis.

The information base of the work is publications in professional periodicals, materials of scientific all-Ukrainian and international conferences; statistics and surveys, including the World Bank Group, OECD database, Statista and World Economic Forum.

The main scientific results of the work are as follows:

- 1) A country's competitiveness has a significant impact on the standard of living of its citizens. Education systems around the world vary greatly, presenting a diverse landscape with innovations, challenges, and opportunities for improvement.

2) During the COVID-19 pandemic, China, South Korea, Finland, and Estonia effectively implemented distance learning. Success in distance learning is often attributed to a well-developed technological infrastructure, widespread internet access, and sufficient budgetary resources. However, it is important to note that distance learning can contribute to growing inequality between students who have access to necessary technology and suitable study environments and those who do not.

3) The quality of education is influenced by a range of factors, including geography, economics, social dynamics, culture, history, religion, politics, language, and technology. In Ukraine, educational quality is determined by factors such as mastery of key competencies, overall pupil development, learning interest, high entrance exam results, stakeholder cooperation, safe environments, teacher qualifications, academic honesty, and sanitary conditions.

4) The government's actions during the pandemic have been criticized for instances of negligence and untimely decision-making, which have had repercussions on the effectiveness of the educational process in Ukraine.

5) Since February 24, 2022, Russia's full-scale invasion has severely damaged Ukraine's educational system. This includes physical destruction of infrastructure and loss of life, as well as moral consequences such as the departure of families, brain drain, constant instability, stress, and psychological pressure on the population.

6) Recommendations aim to ensure the physical and mental safety of students and teachers, reduce workload, implement new projects, change service delivery, and foster collaboration with business representatives and educational figures. Additionally, the introduction of mentoring at universities is suggested as a valuable initiative.

The obtained results are of scientific and practical interest. The study's theoretical positions, proposals, recommendations, and conclusions can shape new public policy courses in education and business. Initiatives for cooperation between

universities and businesses can be introduced, and grant programs for businesses and scientists can be promoted. The study's findings can also shape the scientific environment and be applied during students' studies and in schools, as well as in the pedagogical activities of educators.

The results of the approbation of the main provisions of the master's level degree qualification paper were considered at:

1) Viktoriia Shcherbachenko, Anna Diana Sliusarenko, Artem Artyukhov. Recommendations on compulsory online learning for educational institutions during wartime on the basis of the best international practices. Philosophy, economics and law review. Volume 3, no. 2, 2023. DOI 10.31733/2786-491X-2023-2-123-137 (Index Copernicus).

2) Shcherbachenko V., Sliusarenko A. D. Prospects and challenges of online education development in Ukraine. Socio-economic relations in the digital society. 2023. V. 2, № 48. P. 84–92. URL: <https://doi.org/10.55643/ser.2.48.2023.496> (date of access: 05.12.2023).

The research was carried out with funds from the budget of the Ministry of Education and Science of Ukraine, provided for the research topic "Modeling educational transformations in wartime to preserve the intellectual capital and innovative potential of Ukraine" (№ 0123U100114); «Cognitive model of innovations' commercialization in the conditions of Industry 4.0: intellectual capital protection, marketing and communications» (№ 0122U000780).

KEYWORDS: EDUCATION SYSTEM, INNOVATION, COMPETITIVENESS, SOCIO-ECONOMIC DEVELOPMENT, DISTANCE LEARNING, COVID-19, WAR.

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MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

SUMY STATE UNIVERSITY

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TASKS FOR MASTER'S LEVEL DEGREE QUALIFICATION PAPER

(specialty 292 “ International Economic Relations “)

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Sliusarenko Anna Diana Dmitrievna
(student's full name)

1. The theme of the paper is “The impact of the education system on the country's international competitiveness and innovation potential”
approved by the order of the university from « 29 » November 2023 №1371-VI.
2. The term of completed paper submission by the student is « 18 » December 2023.
3. The purpose of the qualification paper is to comprehensively analyse the impact of the education system on the country's international competitiveness and innovation potential.
4. The object of the research is the education system of the country.
5. The subject of research is the impact of the education system on the international competitiveness and innovation potential of the country.
6. The qualification paper is carried out on materials of publications in professional periodicals, scientific all-Ukrainian and international conferences, as well as statistics and surveys from sources such as the World Bank Group, OECD datab Statista, and World Economic Forum.
7. Approximate master's level degree qualification paper plan, terms for submitting chapters to the research advisor and the content of tasks for the accomplished purpose is as follows:

Chapter 1 “Theoretical overview of educational systems across countries”, until 19 November. Chapter 1 deals with the advantages and disadvantages of modern educational systems, identifies factors that impact the quality of education, and highlights the current global challenges faced by education systems.

Chapter 2 “Methodology for examining the international competitiveness and innovation potential of a country”, until 7 December. Chapter 2 deals with the factors that determine a country's international competitiveness and innovation potential. It evaluates the influence of the educational system on economic growth and examines methods for measuring a country's innovation potential.

Chapter 3 ”Development of effective state policy in the field of education to strengthen the country's position in the international environment”, until 12 December. Chapter 3 deals with an overview and assessment of the indicators of education and economic development in Ukraine. It also offers practical recommendations that can be implemented at the state level during educational activities.

8. Supervision on work:

Chapter	Full name and position of the advisor	Date	
		task issued by	task accepted by
1	Viktoriiia Shcherbachenko, PhD in Economics, Associate Professor, Senior lecturer	05 November 2023	19 November 2023
2	Viktoriiia Shcherbachenko, PhD in Economics, Associate Professor, Senior lecturer	20 December 2023	07 December 2023
3	Viktoriiia Shcherbachenko, PhD in Economics, Associate Professor, Senior lecturer	08 December 2023	12 December 2023

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INTRODUCTION

Justification for the choice of the topic and its relevance. To enhance competitiveness, countries should transition from relying on low-skilled labour to actively engaging highly skilled professionals. This shift enables countries to compete more effectively in the global market. Nowadays, education is more accessible than ever before, and its accessibility is determined by the demand for skilled workers. In a rapidly changing world, lifelong learning has become the norm.

Engaging highly skilled professionals can position countries to compete more effectively in the global market. Skilled workers can provide a country with a competitive advantage in various industries and sectors through their expertise and innovative ideas.

The development of new products and technologies generates revenue that a country can invest in education, contributing to the development of a more talented human capital. This, in turn, fosters innovation and enhances the country's competitiveness. Discussing the factors that influence the formation of a quality education system, mechanisms for measuring the current level of education in a country, and providing examples of leading education systems and economies. A deeper understanding of the strengths and weaknesses of the chosen education system can aid in the development of effective recommendations. And this statement implies that the given action will have a positive impact on someone's life.

The degree of the problem studied. Foreign and domestic researchers take an interest in this topic because it is relevant. Economies compete with each other, and manufacturers are captivating the world with goods. Therefore, governments are making efforts to develop the creative and innovative potential of children who are going to create history in the future. Chentukov Y. investigated the influence of the education system on the innovation potential of the country. Assessing the impact of the competitiveness of higher education on the level of socio-economic

development of the country, Saukh P., Antonova O., Bereziuk O., Vitvitska S., Vlasenko O. M., Vozniuk O. V. devoted themselves to the problems and prospects of innovation in higher education. Yang, Y conducted research on the South Korean education system. Khan M., Sarwar K., and Niazi G. R. investigated the impact of the education system on economic growth in developing countries. Lopez-Leyva S. and Rhoades G. examined the relationship between country competitiveness and higher education indicators.

The object of the study is the education system of the country.

The subject of the study is the impact of the education system on the international competitiveness and innovation potential of the country.

The study aims to comprehensively analyse the impact of the education system on the country's international competitiveness and innovation potential. It seeks to reveal the key aspects of the interaction between educational processes and the economic and innovation spheres to develop constructive recommendations for improving this interaction.

Objectives of the study:

- to explore current state of education systems in different countries;
- to analyse features and trends in the development of educational systems;
- to identify factors that affect competitiveness and innovative development;
- to identify factors affecting the quality of the education system;
- to study key mechanisms for measuring the quality of education, international competitiveness and innovation potential of the country;
- to analyse challenges associated with modern technologies and distance learning;
- to determine methods for assessing the impact of the education system on international competitiveness;

- to identify the mechanisms through which the educational system promotes or hinders the international competitiveness of the country;
- to explore indicators of education and economic development of Ukraine;
- to develop recommendations aimed at increasing the level of competitiveness of Ukraine as an international player.

The study employed research methods, including the analysis of statistical data from official sources such as the World Bank Group, OECD database, and Statista statistical data service. Theoretical and practical developments of domestic and foreign researchers were also processed and analyzed. The synthesis method was used to develop practical solutions based on data collection and analysis.

Testing of the work materials and their publication in scientific journals. The research was carried out with funds from the budget of the Ministry of Education and Science of Ukraine, provided for the research topic "Modeling educational transformations in wartime to preserve the intellectual capital and innovative potential of Ukraine" (№ 0123U100114); «Cognitive model of innovations' commercialization in the conditions of Industry 4.0: intellectual capital protection, marketing and communications» (№ 0122U000780).

The main content of the paper is set out on 74 pages, including a list of used sources of 55 titles, which is placed on 7 pages. The work contains 2 tables and 7 figures.

1 THEORETICAL OVERVIEW OF EDUCATIONAL SYSTEMS ACROSS COUNTRIES

1.1 Contemporary education systems across countries: advantages and disadvantages

A review of modern education systems in different countries reveals a multiplicity of approaches, methods and defined objectives for educational programmes. According to the latest data from the PISA 2022 International Study, which covered 81 countries and measured the quality of education, Singapore excels in three key competencies: reading, mathematics and science. These strong performance levels are indicative of the exceptional standard of education in the country. Among the leading countries that traditionally score highly in PISA are Asian nations such as China, Korea, Japan and Hong Kong. These countries have demonstrated high standards of learning, indicating their education systems are robust.

On the other end of the spectrum, the survey results distinguish Cambodia, ranking at the bottom of the list. This is evidence of the constraints encountered by the education system in Cambodia and provides opportunities for decision-making designed to enhance the quality of education in the country [1].

In the modern world, education is defined not only by the accumulation of knowledge, but also by flexibility, innovation and the ability to adapt to changes in the global socio-cultural and economic environment. The diversity of education systems in different countries is becoming an essential field of study to enable understanding and adjustment to current and future concerns. The experience of implementing the best educational practices is being studied by countries less developed in terms of their own education practices in order to transfer and incorporate similar expertise adjusted to the own contexts.

Historical development of education systems is based on various factors of influence. For instance, the Chinese education system, the way it is currently recognised, commenced its formation in December 1949 as a direct aftereffect of the first National Education Work Conference conducted by the newly formed People's Republic of China [2].

In terms of its historical origins, education in China dates back to the Shang Dynasty (around 1800-1050 BC), the first recorded mention of the term “school” within the framework of Chinese history [3].

In a book dedicated to an extensive survey of the core aspects of traditional Chinese education, Thomas H.C. Lee highlights the idea that confluence of a plethora of intellectual influences has profoundly shaped China's educational history. This complicated mosaic incorporates beyond the effect of prevailing religious traditions, but also recognizes education's inherent significance as a source of intrinsic worth and happiness [3, p. 10].

Meanwhile, China's education system was designed to be accessible only to the wealthy, as the difficulty of mastering traditional Chinese, a language consisting of a combination of multiple written and spoken forms with no alphabet, required an investment of money and time beyond the means of most Chinese people [4].

However, with 80 % of the population being illiterate, a properly targeted policy towards the development of the Chinese education system resulted in a new level being achieved, witnessed by the world today.

Chinese society has embraced many foreign education systems as a result of various historical events: the Western model after being defeated in the Opium War (1840-1842), the Japanese model after the loss in the First Sino-Japanese War (1894-1895), the American model (1920s), the Soviet model after the liberation of the country (1949). Eventually, after the Cultural Revolution (1966-1976), which resulted in unprecedented destructive consequences for China's education system, the situation in the country began to improve after 1976, following changes to the regime, and a new Chinese education system began to emerge [5].

Led by the Ministry of Education, China's Project 101 underscores a deliberate focus on elevating teaching quality and fostering collaboration among universities. The initiative includes a mechanism for class evaluations, where educators from one institution assess practices at another, promoting cross-institutional learning and enhancement. Participating universities join forces in consortia, collaborating to enhance teaching standards through activities such as classroom observations, resource sharing, course system development, and the creation or improvement of textbooks. Notably, it aims to address concerns related to funding disparities and unethical practices often associated with research-centric initiatives. This effort is in harmony with the broader objective of shaping a higher education system with unique Chinese characteristics.

In the project's initial trial phase, 33 institutions, which notably included Peking, Tsinghua, and Beihang universities, collaborated in alliances aimed at enhancing the quality of computer science education. Over the course of the first year, the initiative saw the completion of more than 400 class assessments, frequently involving educators from one institution evaluating teaching methods at a competing academic entity. While the initiative represents a departure from traditional research-focused excellence initiatives, it is seen as a positive step toward fostering a more inclusive, effective, and culturally relevant higher education system in China [6].

In China, a notable example of a successful technological startup is Squirrel AI, which leverages artificial intelligence (AI) for education. The company provides learning support for students ranging from Kindergarten to 12th grade, primarily emphasizing STEM subjects while also offering language classes. Squirrel AI has implemented a unique and innovative approach to education. The educational process entails students utilizing laptops, accompanied by the presence of a teacher in each class. The teacher discreetly observes the students' laptop-based progress and steps in when identifying issues beyond the resolution capacity of the artificial intelligence (AI) system. Squirrel AI's ingenuity, inspired by the adaptive learning

platform ALEKS, is evident in its strategy of deconstructing subjects into numerous intermediary steps. The collaborative team, consisting of both engineers and educators, classifies these steps as “knowledge atoms” or “pods”. To illustrate, the mathematics curriculum is fragmented into more than 10,000 such pods, encompassing themes such as rational numbers, properties of triangles. This stands in sharp contrast to conventional textbooks, where the equivalent subject might typically be compartmentalized into around 3,000 sections on average. Squirrel AI's success highlights the transformative potential of integrating AI into education, providing students with a personalized and adaptive learning experience [7].

Conversely, the system has significant drawbacks, provoking resentment among citizens and debate in the international community. Occasionally, well-intentioned initiatives turn into unexpected negative side effects, as exemplified by the Double First Class excellence initiative in China, designed to elevate universities globally. It is facing criticism as researchers warn of “negative effects” that may diverge from its original policy goals. According to an analysis published in the journal *Higher Education*, the initiative has led to uneven funding, widening the gap between affluent eastern universities and less privileged middle and western institutions. The study reveals that elite universities with larger budgets are poaching talented academics from less-resourced counterparts, causing a geographical brain drain. The initiative has resulted in substantial funding disparities between elite eastern universities and those in the middle and west. This has deepened the gap and created challenges for less-privileged institutions. As an illustration, despite the fact that both institutions fall under the classification of “world class”, Tsinghua University in Beijing exhibits by a factor of six a budgetary allocation surpassing that of Lanzhou University in Gansu province [8].

Another shadowy side of Chinese education is the ambiguous impact of the Gaokao entrance exam. There is a great deal of pressure exerted by parents towards their children, implanting in their minds the simple truth: “If you do well in the Gaokao, you will be able to enter a prestigious university, and if you enter a

prestigious university, you will be able to get a good, well-paid job.” The downside of this incentive is the belief that if a student fails the Gaokao, life is over and misery is inevitable.

The nine-hour Gaokao test administered over a three-day period, extremely complex with an estimated 40 % rate of success at the first attempt, is the only factor that determines whether a student is admitted to a university. Applicants are only considered for academic knowledge in Chinese, mathematics, a foreign language of their preference, and either liberal arts subjects such as history and geography or STEM subjects including physics and chemistry.

Owing to the overwhelming cultic prominence of Gaokao, pupils are expected to study rigorously over the course of their school days. Primary school kids in China dedicate around seven hours every day to their academic endeavors. Middle school pupils, on the other hand, often have a longer academic day that lasts roughly nine hours. High school students in China have a more thorough schedule, with the school day beginning at 7:00 a.m. and potentially extending until 9:00 p.m. or later, depending on the school and the specific student's schedule. It is necessary to recognize that these figures represent average school hours, and that differences may occur between schools and areas throughout China [9].

Nevertheless, students lose sight of their genuine interests in extracurricular activities, such as sports and art. Consequently, the results of a study of Chinese educational ecology through the prism of self-determination theory (SDT) showed that about 70 % of pupils surveyed could not answer the question of what field they would like to work in in the future, or even what interests they have aside from studying. Nor does it contribute to the formation of teamwork skills and the acquisition of soft skills. Academic knowledge alone may not be enough foundation for a mature life [10], [11].

The gaokao system faces controversy due to significant regional variations in admission quotas. Students residing in urban centers like Beijing and Shanghai typically enjoy more generous admission quotas compared to their counterparts in

rural areas. The gaokao system is now seen as progressively inequitable, triggering discussions on the credibility of the quota system and urging calls for essential reforms. These appeals emphasize the need to establish a more fair and inclusive higher education entrance process in China [12].

A recognised advantage of the Chinese education system is the respect for teachers. Meanwhile, scholars have observed a widespread concern among students, pointing out that educators frequently overlook the development of independent thinking. Instead, they tend to adopt a more surface-level approach to teaching, neglecting the promotion of a deep understanding of the subject matter. This may be explained through the Confucian concept, according to which teachers are perceived to possess the capacity to guide individuals toward knowledge and a more meaningful life. This enduring notion continues to shape the perspectives of many Chinese educators. As a result, a significant number of teachers and professors in China adhere to a lecture-style teaching approach, providing limited opportunities for student questions or discussions. The traditional expectation prevails, underscoring the importance of students showing deference to their instructors through attentive listening [13].

Moving to the next leader in education, South Korea's success in transitioning to online education during the pandemic is attributed to its exceptional information technology (IT) infrastructure. This includes widespread access to advanced 4G, which has 99 % coverage and 5G networks, high penetration of internet connectivity, and computer resources in a significant percentage of households. The administration of President Moon Jae-in demonstrated a strong commitment to sustaining educational activities by improving public IT infrastructure. Efforts have been made to increase the scalability of e-learning platforms beyond their previous operational capacity.

The establishment of a “Community of 10,000 Representative Teachers” indicates a conscious effort to create a large network of educators who can serve as leaders and role models. This community includes experienced and effective

teachers who can share their expertise with others, the Ministry of Education, provincial education offices and related organisations on a common platform, underlines a collective and coordinated effort to improve distance education and fostering a culture of continuous improvement [14].

On the other hand, there is recognition of potential hazards associated with the indiscriminate adoption of a universal tertiary education strategy. Korean parents express dissatisfaction with the public education system, leading to increased costs for private education. The perceived inability of the education system to nurture creative genius is a notable concern. Teachers highlight significant challenges, including an enormous administrative burden and perceived government interference. Students face challenges such as exam stress and concerns about youth unemployment. In response, education reforms in South Korea include a shift from a knowledge-centred pedagogical approach to one that focuses on students' competencies. This means moving towards an education system that prioritises the development of practical skills and abilities that can be applied in real-world scenarios [15].

Two other examples of excellent education initiatives are the implementation of tutor-teacher positions in Finland and the introduction of educational technologist roles in Estonia which demonstrate innovative approaches to improving education through mentorship and the effective integration of technology. Both initiatives emphasise the importance of mentoring and support for educators, whether through tutor teachers in Finland or educational technologists in Estonia.

The tutor-teacher initiative aimed to create a cohesive network of mentor teachers who were given the role of guiding and supporting their colleagues. Key objectives included the promotion of pedagogical innovation and the integration of technology into teaching methods, with a focus on modernising teaching approaches and using technology to improve learning outcomes. Other objectives included fostering expertise, promoting collaborative teaching strategies, revitalising educational cultures and implementing the curriculum in a competent manner [16].

Educational technologists provide an array of services that combines current educational insights with digital technological expertise. Their role revolves around bridging the gap between conventional educational practices and the dynamic digital era. As facilitators of digital learning, educational technologists act as catalysts for change, guiding educational institutions toward effective integration of technology in pedagogical strategies.

Educational technologists in Estonia bring together educational insights and digital technological expertise, playing a crucial role in bridging the gap between traditional educational practices and the dynamic digital era. Educational technologists take the lead in initiating and overseeing digital learning and ICT projects, showcasing their proactive role in driving technological innovation in education [17], [18].

1.2 Factors affecting the quality of the education system

Education systems in different countries have been shaped by cultural, economic, and social influences. Each country aims to create an effective education system that equips students with the knowledge and skills needed to meet the challenges of today's environment. However, progress can have both positive and negative effects on the strengths and weaknesses of education systems. To establish a quality education system, it is necessary to understand the factors that contribute to its successful functioning.

Determinants of educational quality may be general and comprehensive or identified in the course of a specific research study and relate to a particular national educational system.

The national character of education is influenced by various factors, including geography, economics, social dynamics, culture, history, religion, politics, language, and technology.

Geographical characteristics, in particular, have a significant impact on the educational process through three main factors: climatic conditions, population distribution, and land configuration. Climatic conditions can affect the content of education and the timing of schooling. For instance, regions with continental climates may prioritise education on diseases prevalent in those areas, such as tropical diseases in tropical climates. In areas with low temperatures, like Norway, schools may commence later in the day due to darkness and extreme cold, which can affect accessibility for young children.

Geographical factors often result in different education systems in urban and rural areas. In Australia, for example, urban areas have well-equipped schools with qualified staff, while rural areas face challenges such as small schools, limited teachers, and reliance on government support for administration and funding. In sparsely populated rural areas where daily attendance is difficult, the government may use distance learning. This can be achieved by employing itinerant teachers and occasional visits by education inspectors. The configuration of the land influences the architectural structure of buildings, including farmhouses and school buildings. It also impacts the location of villages and schools, as well as determining settlement patterns and school locations. Boarding schools may be less common due to the proximity of family ties, especially for students who live close to their families. However, for students who come from far and inaccessible places, boarding schools may still be a viable option.

A country's economic strength influences its education system in various ways, from the availability of resources to the structure and objectives of the curriculum. For instance, economic conditions directly affect the viability and development of formal education systems. Formal education tends to thrive in countries where production exceeds consumption. In economically strong countries

like the US and Japan, the education system is designed to equip individuals with skills for achieving economic independence. The curriculum is tailored to help graduates become self-sufficient. In contrast, developing countries may face challenges such as unemployment among the educated, where graduates struggle to find suitable employment. Economic status often determines the duration of an individual's education. Educational inequalities arise from the fact that wealthier families can afford to keep their children in school for longer periods. In subsistence economies, where meeting basic needs is a challenge, education tends to be more informal and job-oriented. Countries with strong economies, such as the UK, France, Japan, and the US, provide sufficient funding to support quality education. This includes funding for teachers' salaries, teaching materials, and educational programmes. Developing countries with limited resources may face challenges in providing adequate support for educational programmes due to factors such as low teacher salaries and insufficient teaching materials.

Social and cultural factors have a significant impact on the values, traditions, and overall character of a community. Education can act as a stabilising force, perpetuating and protecting the traditions and aspirations of a society. Culture often changes at a slow pace, and certain values remain constant, such as faith in God, love for truth, non-violence, universal motherhood, and justice. The implementation of significant societal reforms may encounter hindrances due to cultural lag, which refers to the time it takes for cultural values to align with social changes. Fostering a love for one's culture through the education system can strengthen nationalism, thereby contributing to the strength and prosperity of the country. In diverse societies with multiple communities, classes, castes, and interests, the absence of national sentiments can result in a disregard for national interests. Education can play a crucial role in overcoming suspicion between minority and majority groups, fostering a sense of unity and a shared national identity. Educational reforms can lead to cultural shifts that change the relationships between various units of society,

such as parents and children, and teachers and students. These changes can then reflect broader cultural shifts.

The historical factor is a crucial determinant in understanding the similarities and differences observed in education systems around the world. The diversity of educational landscapes is influenced by colonial legacies, missionary influences, attempts to form geographical groupings, and struggles for national identity. For instance, the education systems of many African countries and other parts of the world have been shaped by colonial influence. Often, the structures and characteristics of education in former colonies mirror those of their colonial masters. Christian missionaries have had a significant impact on the education systems of Africa, Asia, North and South America.

Geographical groupings within close boundaries, such as East Africa, South Africa, West Africa and North Africa, have resulted in education systems with common features. Shared historical experiences tend to result in similarities in education systems, while struggles for national identity and statehood lead to differences in national factors that are reflected in education.

The political philosophy that governs a country has a significant impact on the administration, characteristics, and functioning of its education systems. Education systems are shaped to reflect the values, goals, and ideologies of the ruling authorities, whether they are socialist, democratic, or nationalist. In the case of socialist political philosophy, it addresses issues of labor exploitation and class mass. It recognises property as the basis of the economic structure of the state, leading to the concentration of power in the property-owning class. It advocates state control and nationalisation of the means of production. This requires reform of education, with the state taking full control of the curriculum and educating citizens for the benefit of the state. Mexico, Bulgaria, and Cuba are among the countries that have adopted socialist systems. These systems feature state monopolies on education, secularism, physical and military training, political indoctrination, and an emphasis on scientific subjects.

Another example of political influence is the centralized or decentralized education system. For instance, France has a centralized education system aligned with the central government controlling all aspects of education. In contrast, the education systems of the USA and Japan are highly decentralized, reflecting democratic and capitalistic political philosophies.

The language factor is crucial in promoting communication, identity, and cultural development within a nation. The choice of language as a medium of instruction has a significant impact on curriculum design, national character, and the overall effectiveness of the education system. The national language holds a special place in every country and is considered a symbol of its people. Proficiency in the national language is crucial for fostering a sense of national identity and is therefore emphasised in national education systems. Following British colonization, English was established as the medium of instruction, but a bilingual system emerged with the recognition of Afrikaans in 1914. Cameroon is a bilingual country with both Anglophone and Francophone regions, each with its own official language and education system. The choice of language as a medium of instruction reflects cultural identity and historical influences.

The influence of religion on education is evident in the initiatives taken by religious organizations, the development of educational institutions, and the integration of religious subjects in curricula. European Christian missionaries have had a significant impact on education systems in Africa, leaving behind common elements that reflect their initiatives. The current education systems in Africa often include the teaching of religious subjects in primary and secondary curricula, which is a direct result of the influence of European Christian missionaries. The organization of school days reflects religious considerations, with rest days typically falling on Saturday and Sunday. This accommodates worship days for people who observe Saturday or Sunday as their holy day. The ongoing influence of religious organizations in education is demonstrated by Catholic institutions such as the

Catholic University in Kenya and numerous Catholic-sponsored primary and secondary schools.

Technological advancements have transformed the way education is delivered and accessed through the use of computer technology, the internet, and information communication technology. Technology is applied in various ways, including e-learning, online resources, interactive tools, and virtual classrooms. The emphasis on industrial and technical education can be traced back to historical developments, particularly the industrial revolution. Recently, the global education sector has undergone a revolution due to the emergence of computer technology and the internet. The use of technology has modernised educational practices, adapting them to the contemporary digital age. Information Communication Technology (ICT) has made home learning opportunities possible. Universities are adopting projects such as Autonomous Underwater Vehicles (AUVs) and e-learning to harness technology for educational advancement. Educational administrators and policymakers encounter challenges in ensuring that the appropriate infrastructure is in place to fully utilise information and communication technology [19].

Resulting from the technological advancement the survey “Opinions of Teachers, School Heads, Educational Experts, Pupils and Their Parents on the Quality of Education” on behalf of the State Education Quality Service of Ukraine was conducted in October-November 2020. The survey was carried out by Vox Populi Agency as part of the Education Quality Assurance System initiative. Figure 1.1 below displays the survey results.

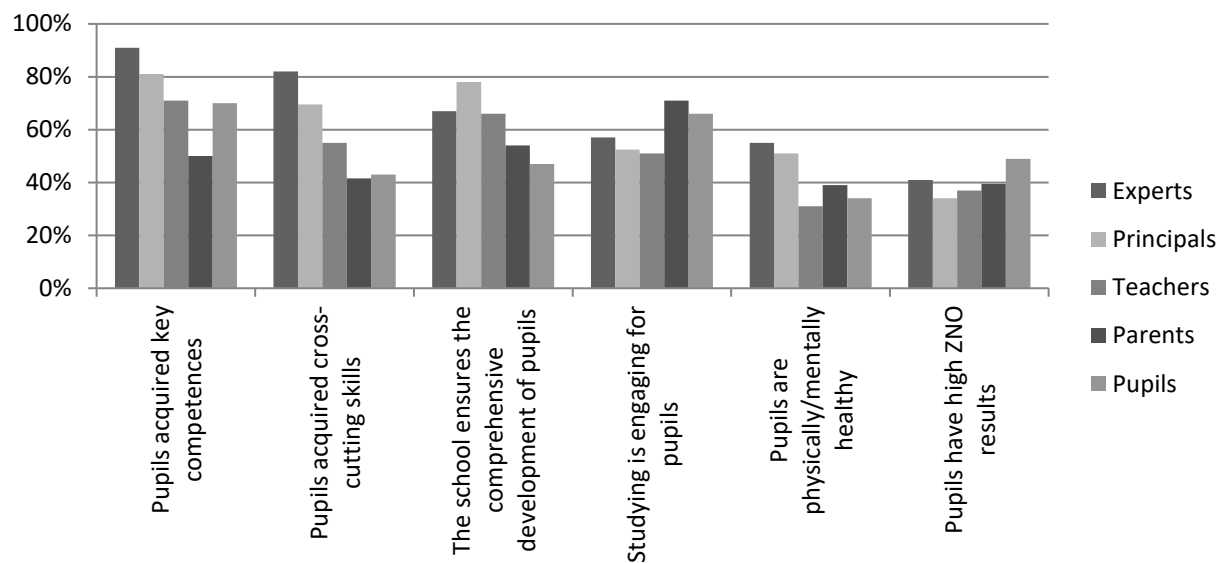


Figure 1.1 – The TOP most important characteristics of quality education in schools [20]

The results of this part of the survey are presented in Figure 1. The survey included interviews with 59 principals, 1560 teachers, 1631 parents, 899 pupils, and 752 experts. The quality of education in schools is determined by several criteria. These include the mastery of key competencies, which refers to the ability to apply knowledge to real-life situations. This criterion was identified as important by 91 % of experts, 81 % of school principals, and 70 % of pupils. Another important criterion is the mastery of cross-cutting skills, which includes the ability to cooperate, think critically, and manage emotions. This criterion was identified as important by 82 % of experts and 69.5 % of principals. Finally, the overall development of pupils was identified as an important criterion by 67 % of experts and 78 % of school principals. According to the survey, parents prioritise learning interest (71 %), general development (54 %), and competences (50 %). Meanwhile, pupils place the highest importance on competences (70 %), interest in learning (66 %), high entrance exam results (49 %), and general development (47 %).

The second part of the survey aimed to identify the factors that have the greatest impact on the quality of education. The results are presented in Figure 1.2.

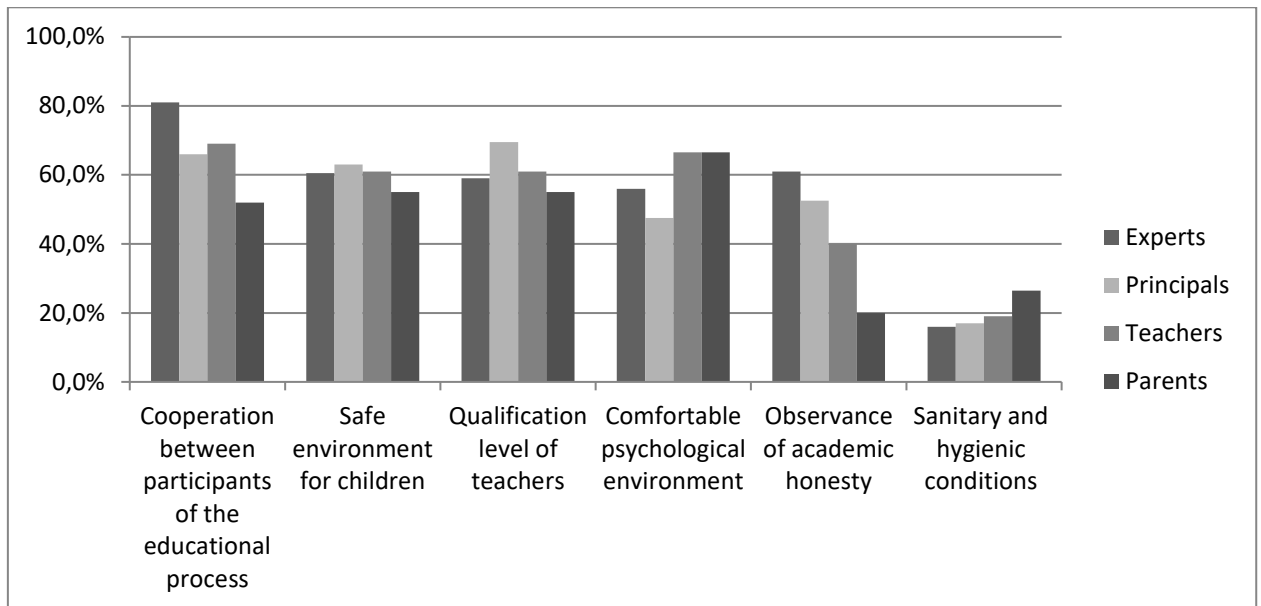


Figure 1.2 – The TOP factors most influencing the quality of education at school [20]

Figure 1.2 illustrates that, according to experts, principals, teachers, and parents, the most crucial factor determining the impact on the quality of education is the cooperation between stakeholders in the educational process. Additionally, a safe environment for children, free from bullying, harassment, or discrimination on various grounds, and the qualifications of teachers, as well as a comfortable psychological environment, are also essential. Experts and principals consider academic honesty to be important. However, this aspect is less emphasised by teachers and even less by parents. Approximately a quarter of parents included sanitary and hygienic conditions, such as the comfort of toilets, cleanliness of classrooms, and temperature, in their top 5 factors.

School principals and teachers recognised cooperation between participants in the educational process and a comfortable psychological environment as their top priority. Parents, however, prioritised a comfortable psychological environment and the qualifications of teachers. [20].

1.3 Modern challenges in education and distance learning

The outbreak of COVID-19 coronavirus was first reported on 31 December 2019 in Wuhan, China. Since then, it has become a global epidemic, resulting in nearly 7 million deaths due to infection [21].

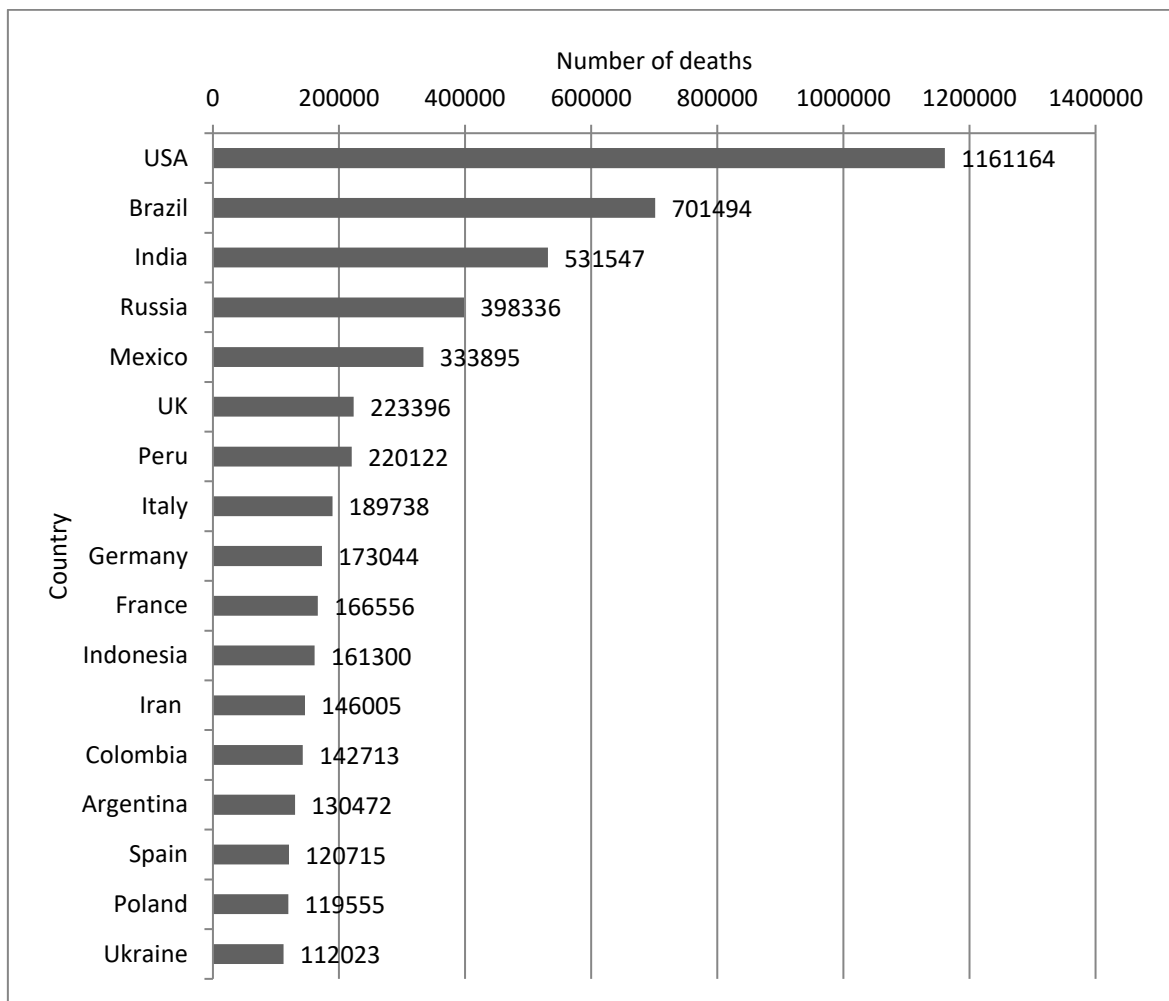


Figure 1.3 – Number of novel coronavirus (COVID-19) deaths worldwide as of May 2, 2023, by country and territory [22]

Figure 1.3 displays the COVID-19 death toll as of 2 May 2023 in the 17 most affected countries. The statistics reveal that the United States has suffered over a million deaths, Brazil over 700,000, and India over half a million.

UNESCO data indicates that the pandemic has affected 1.5 billion pupils and students worldwide, with young people being the most vulnerable to the damage [23]. Due to the rapid expansion and high mortality rate caused by the disease, educational institutions worldwide implemented an emergency mode of distance education at an early stage. At the height of the epidemic, 45 European and Central Asian nations closed their schools, affecting 185 million pupils.

In the discussion on the aftereffects of school closure, Professors of Epidemiology Peter Collignon and Marylouise McLaws expressed concerns about the potential detrimental effects of closing schools. They noted that children would likely miss out on over six months of teaching, and that while online learning might be available, it is unlikely to be as effective as face-to-face teaching. They also pointed out that those with fewer resources would be disproportionately disadvantaged. Minimal or no interaction with friends and other children for over six months can also have negative effects [24].

The study conducted by Joana Maldonado and Kristof De Witte in Flemish schools in Belgium examines the impact of school closures on standardised test scores.

The study covers six years, from 2015 to 2020, and analyses a large sample of Flemish schools. One of the key findings is that students in the 2020 cohort experienced significant learning losses compared to the previous cohort. The average school scores for maths and Dutch decreased by 0.19 and 0.29 standard deviations, respectively.

Additionally, there was an increase in educational inequality, with a 17 % increase in maths and a 20 % increase in Dutch within schools. Furthermore, inequality between schools increased by 7 % in maths and 18 % in Dutch. These findings suggest that the impact of school closures is not evenly distributed among different schools and student groups. Another aspect of the study is the correlation between learning losses and school characteristics. Schools with more vulnerable student populations experience greater learning losses [25].

Research conducted by Dutch scientists analysed the impact of school closures on the country's education system. The study found that even with high-speed internet and a relatively short closure period of 8 weeks, the quality of education in the Netherlands decreased by approximately 0.08 standard deviation. This equates to a fifth of the school year lost. The research suggests that learners from lower-educated backgrounds experience up to 60 % greater learning loss, highlighting concerns about the unequal impact of the pandemic on students [26]. Available data on the impact of school closures on education are presented in Table 1 below.

Table 1 – The effect of school closure on learning outcomes [27]

Country	Length of closure	Subject	Level	Learning Loss
Belgium	3 months	Math Dutch	Primary	0.19 SD 0.29 SD
Netherlands	8 weeks	Math, spelling, reading	Primary	0.08 SD
Switzerland	8 weeks	Math, German	Primary Secondary	2X 0
UK	2 months	Writing	Secondary	22 months behind
Kazakhstan	3 months	Overall	-	11 %

Table 1 presents data on real learning losses in Belgium, the Netherlands, Switzerland, the United Kingdom, and Kazakhstan. Longer school closures lead to greater losses in educational outcomes, as students miss out on essential classroom instruction and experience disruptions in their academic routines and engagement. Extended absence from structured learning environments can lead to gaps in knowledge acquisition, hinder skill development, and impede educational continuity. Furthermore, prolonged school closures have effects beyond academic realms. Social and emotional aspects of learning, such as peer interactions, collaborative activities, and extracurricular engagement, are compromised during extended closures.

The closure of schools due to the COVID-19 pandemic has resulted in children and adolescents with mental health problems losing access to important resources that are typically provided through educational institutions. This includes not only education but also mental health support. The findings of a survey conducted by YoungMinds, a mental health charity, highlight the concerning nature of this situation. A survey of 2,111 respondents under the age of 25 with a history of mental illness in the UK found that 83 % reported a negative impact on their condition due to the pandemic. School closures were identified as an additional factor that worsened their mental health and overall well-being. Furthermore, 26 % of respondents reported being unable to access necessary mental health support. The closure of self-help groups and cancellation of face-to-face counselling have hindered access to support. Additionally, psychological support via phone or online communication can be challenging for some young people, particularly due to their specific needs and comfort levels with these formats.

College and university students faced numerous challenges during the pandemic. These included concerns about dormitory evacuation, the cancellation of significant events such as exchange studies and graduation ceremonies, and the unexpected loss of part-time jobs due to local business closures. Final-year students faced additional concerns, as the uncertainty of the job market loomed over their impending graduation. The job market has undergone significant changes, leading to increased anxiety about the availability of opportunities and the competitiveness of the job market that graduates are about to enter [28].

In response to the global imperative to minimise disruptions in learning caused by the COVID-19 pandemic, countries worldwide prioritised the adoption and expansion of distance education modalities. Countries such as Argentina, Croatia, China, Cyprus, Egypt, France, Greece, Italy, Japan, Mexico, Portugal, the Republic of Korea, Saudi Arabia, the United Arab Emirates, and the United States leveraged internet-based platforms to facilitate ongoing learning.

The internet is predominantly used to provide continuous learning opportunities through online platforms. Teachers and school administrators are encouraged to use applications for effective communication with learners and parents. Additionally, live and recorded lessons, including Massive Open Online Course (MOOC)-styled lessons, are used to enhance the accessibility of educational content.

To cater to the diverse needs of their populations, many countries used alternative channels to disseminate learning content. Television and other media outlets were utilized for this purpose in countries such as Argentina, Croatia, China, Costa Rica, France, the Islamic Republic of Iran, the Republic of Korea, Mexico, Rwanda, Saudi Arabia, Senegal, Spain, Peru, Thailand, and Vietnam.

To ensure a cohesive implementation of distance learning programs and engage all relevant stakeholders, government agencies launched awareness campaigns or communication strategies.

Equitable access to ICT-based learning was a major concern, especially for students from underprivileged backgrounds with limited access to devices and the internet outside of school. Various countries addressed this challenge differently.

In an effort to support students from low-income families, China provided computers, mobile data packages, and telecommunication subsidies. Similarly, France distributed devices and printed assignments to the 5 % of learners who lacked internet or computer access. The United Arab Emirates established a hotline to provide technical support during online learning. In Washington State, U.S., schools refrained from offering online learning services until equal access was ensured. Portugal considered collaborating with postal services to distribute worksheets to students who lack internet access.

Countries with extended closures prioritised adjusting their school and exam schedules. Chile, China, France, Japan, Spain, and Vietnam rescheduled exams, with China introducing online exams. Japan and Thailand implemented safety measures for in-person exams. Spain, the Republic of Korea, and Vietnam modified their

school calendars to make up for lost learning days. State testing for the 2019-2020 school year was cancelled in some US states, including Florida and Washington.

School closures disrupted teacher training and licensing schedules. China moved some teacher training courses online, Japan issued temporary licenses, and the United Arab Emirates provided remote specialized training. Chile organized webinars on online teaching and administration to enhance teachers' digital skills. To overcome pandemic challenges and ensure educational continuity, various countries implemented adaptations. These efforts demonstrate a global commitment to maintaining education during the pandemic.

Countries implemented measures to support parents and caregivers during this period. For instance, in China, parents and caregivers were provided with online pedagogical support to facilitate remote learning. Similarly, in Italy, online courses were introduced to guide parents on managing their relationship with learners during periods of confinement. Spain used various communication platforms and apps, such as Edugestio, to foster collaboration between teachers and parents/carers in co-designing the learning process. Guatemala provided teaching guidelines and learning materials directly to parents and caregivers to ensure the continuity of learning in an offline context.

To place children who couldn't be cared for at home, a few countries, including France, Japan and the Republic of Korea, kept a limited number of schools open. In situations where citizens were not confined to their homes, countries like Japan and Thailand arranged for regular visits by teachers to families. These visits served the dual purpose of monitoring the progress and well-being of students and providing advice and support to parents and caregivers [29].

Unlike developed countries, where the situation was not critical before the pandemic and the education system had sufficient resources to strengthen its capacity, some cases reveal the impossibility of the necessary emergency response.

Lebanon faced unprecedented challenges due to the convergence of multiple crises, as highlighted in a report by the World Bank. In 2021, Lebanon's education

sector faced five significant challenges: the Syrian refugee crisis, economic collapse, political instability, the COVID-19 pandemic, and the devastating explosion at the port of Beirut. These crises have worsened the vulnerabilities of the education system, creating a critical situation for both institutions and students.

In 2021, schooling was interrupted for approximately 15 % of Lebanese families, with one in ten children having to forego education and enter the workforce to contribute to their families' income.

The closure of 50 public schools and around 30 private schools since the start of the 2021 school year has been attributed by the Ministry of Education to a lack of adequate budgetary allocations. The devaluation of the Lebanese pound has compounded the issue of insufficient funds, impacting not only the sustainability of schools but also the livelihoods of educators. It is important to address this issue to maintain the quality of education in Lebanon. To ensure decent salaries for teachers, many have been forced to seek employment opportunities abroad as the fees collected from students are no longer sufficient [30].

This chapter presents an overview of current education systems in various countries, highlighting their strengths and weaknesses. It considers the key factors that influence the formation of successful educational strategies and highlights important historical trends that determine the development of education in the modern world. This text identifies educational approaches and innovations and highlights potential areas for further research to improve educational practices in various contexts.

It also acknowledges that the factors affecting the quality of the education system can be either general or individual, depending on the level of analysis.

The COVID-19 pandemic has had a significant impact on the education systems of countries, resulting in learning losses, increased educational inequalities, and challenges in implementing effective distance education. There are also concerns about the impact on students' mental health. Various strategies have been adopted by countries to mitigate these challenges. However, the pandemic has

exposed and exacerbated pre-existing vulnerabilities in education systems, particularly in regions facing multiple crises, such as Lebanon.

2 METHODOLOGY FOR EXAMINING THE INTERNATIONAL COMPETITIVENESS AND INNOVATION POTENTIAL OF A COUNTRY

2.1 Determinants of the country's international competitiveness and innovation potential

In the modern world, a country's economic progress is determined by its international competitiveness and innovation potential. These two aspects are interdependent and not only shape the country's economic relations in the global market but also pave the way for long-term success and a high standard of living for its citizens. Examining the factors that shape a country's competitive position in the global market contributes to a better understanding of both internal and external factors.

The Organization for Economic Cooperation and Development (OECD) defines competitiveness as an economy's ability to increase output, resulting in higher real wages and an improved standard of living. The World Economic Forum (WEF) defines competitiveness as a nation's economic capability to achieve sustainable growth rates, measured through changes in GDP per capita.

WEF serves as an International Organization for Public-Private Cooperation, bringing together influential figures from politics, business, and various sectors to shape global, regional, and industrial agendas. The organization plays a crucial role in formalizing discussions on pressing issues through a series of annual sessions, regional and global meetings, and ongoing research initiatives.

The WEF functions as a think tank and engages in extensive research, publishing reports. The Strategic Thinking Team focuses on developing reports related to competitiveness and global risks. Notable reports include:

- Global Competitiveness Report (1979);
- Global Information Technology Report (2001);
- Global Gender Discrimination Report;

- Global Risks Report (2006);
- Global Travel and Tourism Report (2007);
- Financial Development Report (2008);
- Global Trade Report (2008).

The Global Competitiveness Report was first published in 1979 by the World Economic Forum. The Competitiveness Index is a fundamental and influential strategy tool created by governments, scientists, and business leaders to compare the strengths and weaknesses of national economies and to identify ways to improve prosperity. This report presents the factors that determine a country's productivity level, including economic policy and data on relevant organizations and agencies.

The GCI is a tool that measures both short-term and long-term components of economic growth potential. It evaluates macro-level institutions and infrastructure (economic factors), markets for labour, goods, and services (economic efficiency), and the pro-innovation environment (economic innovation). The GCI pillars are inspired by major economic theories, such as classical, neoclassical, Keynesian, development economics, trade theory, and economic growth theory. This integration implies that the determinants of economic growth are key drivers in the GCI pillars [31].

The Report uses public statistics (World Bank, IMF, etc.) and the results of surveys conducted by the World Economic Forum. These surveys are conducted annually with the support of partner organizations (research institutions, business centers).

Global Competitiveness Report analyzes the factors that play an important role in creating favorable business conditions in the country, which is very important in terms of determining the level of competitiveness and production of the country. It sets out some priorities to facilitate the implementation of political reforms, taking into account the strengths and weaknesses of the country. It also analyzes how their resources and competences are managed as a whole to improve the well-being of

countries and notes the importance of labour productivity to ensure sustainability of population and wage growth.

The country's performance level is determined by twelve factors, as shown in Figure 2.1.

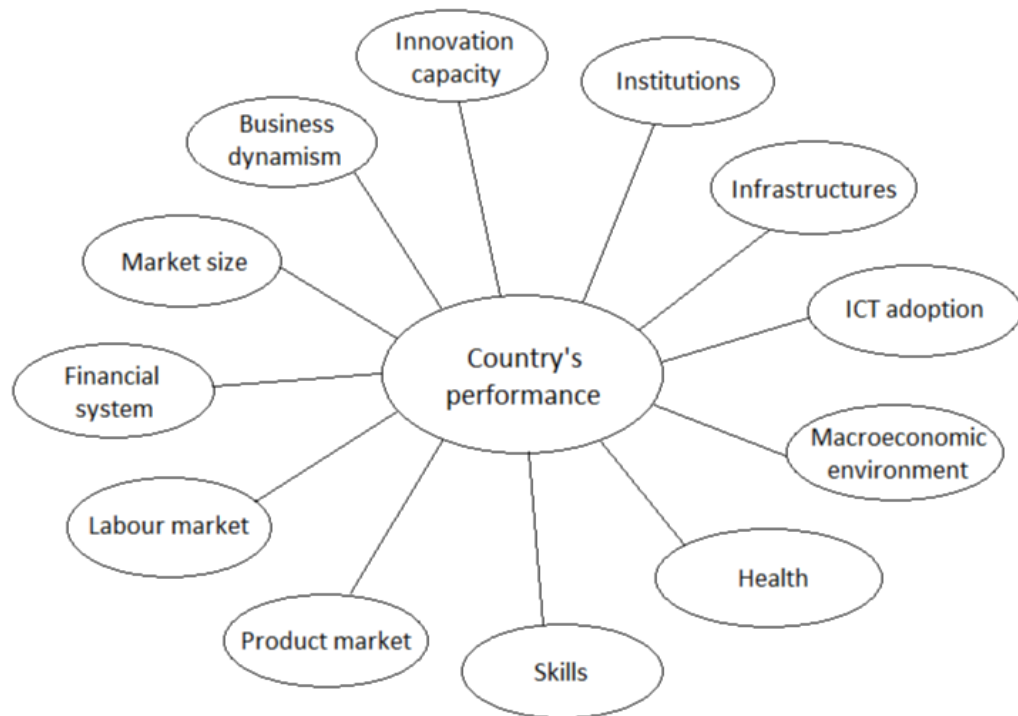


Figure 2.1 – Twelve pillars forming country's performance level

Each factor contributes to the overall score to a varying degree and can either reinforce or detract from it. The following section provides a detailed description of each pillar.

1) Institutions encompass security, property rights, social capital, checks and balances, transparency, ethics, public-sector performance, and corporate governance.

Institutions play a significant role in establishing boundaries that encompass both formal (legal frameworks and enforcement mechanisms) and informal (behavioural norms) constraints. They shape the environment in which individuals

structure both their social interactions and economic activities. The impact of institutions on productivity is significant. This is primarily due to the creation of incentives and the reduction of uncertainty.

2) Infrastructures include assessing the quality and extent of transport and utility infrastructure. This covers road, rail, water and air infrastructure.

The significance of this lies in historical evidence that demonstrates a correlation between well-connected geographic areas and prosperity. A well-developed infrastructure is vital for reducing transport and transaction costs, facilitating the movement of goods and people, and improving the transfer of information within a country and across borders. Additionally, it provides essential access to power and water, both of which are fundamental prerequisites for modern economic activities. In essence, a robust infrastructure is a cornerstone for fostering economic development and efficiency.

3) ICT adoption gauges the extent of the diffusion of specific information and communication technologies (ICTs).

ICT adoption is transformative for the economy. By reducing transaction costs and accelerating the exchange of information and ideas, ICTs contribute to increased efficiency and foster innovation. As ICTs progressively become integral, akin to power and transport infrastructure, they are evolving into essential components for all economies. The widespread adoption of ICTs is not only indicative of technological advancement but also represents a crucial enabler for economic development in the contemporary landscape.

4) Macroeconomic environment assesses the level of inflation and the sustainability of fiscal policy.

A state of moderate and predictable inflation, coupled with sustainable public budgets, serves to reduce uncertainties. This, in turn, establishes return expectations for investments and enhances business confidence, ultimately contributing to heightened productivity. In a globally interconnected landscape where capital can move swiftly, the loss of confidence in macroeconomic stability has the potential to

trigger capital flight, resulting in destabilising economic effects. Therefore, maintaining macroeconomic stability is crucial for fostering a conducive environment for economic growth and resilience.

5) Health evaluates health-adjusted life expectancy (HALE), representing the average number of years a newborn can anticipate living in good health.

Healthier individuals exhibit greater physical and mental capabilities, fostering higher levels of productivity and creativity. Additionally, as life expectancy increases, individuals are more likely to invest in education, contributing to long-term personal and societal development. The cognitive development of children is significantly influenced by their health. A population in good health serves as a foundation for a thriving and resilient society. Therefore, Pillar 5 emphasizes the intrinsic connection between health and economic and social prosperity.

6) Skills assesses the overall proficiency of the workforce and the quantity and quality of education. Notably, educational quality factors include the development of digital literacy, interpersonal skills, and the ability to think critically and creatively.

Education plays the pivotal role in shaping the skills and competencies of the labor force. It serves as a conduit for embedding essential skills and capabilities. Highly educated populations tend to be more productive, as they possess a collective ability to execute tasks efficiently, transfer knowledge swiftly, and innovate by generating new knowledge and applications. Therefore, this pillar underscores the profound impact of education on the workforce's capabilities, directly influencing productivity and the potential for creating and applying new knowledge.

7) Product market evaluates the degree to which a country ensures a fair and level playing field for companies participating in its markets. This assessment considers factors such as market power, openness to foreign firms, and the presence of market distortions.

An equitable marketplace encourages companies to compete on innovation, constantly update their offerings, and refine their organizational structures. Fair competition incentivizes companies to supply high-quality products and services at competitive prices. Ultimately, Pillar 7 emphasizes that a healthy and competitive product market is instrumental in driving productivity gains, as companies strive to innovate and enhance their offerings in order to provide the best products at the most reasonable prices.

8) Labour market includes two key dimensions: “flexibility” which evaluates the extent to which human resources can be reorganized, and “talent management” which assesses the extent to which human resources are leveraged.

Well-functioning labour markets are instrumental in enhancing productivity by effectively aligning workers with jobs that suit their skill sets and by maximizing the potential of talent through strategic talent management practices. Functioning labour markets contribute to resilience in the face of economic shocks by allowing for the re-allocation of production to emerging segments. Additionally, a balance of flexibility and protection of workers' basic rights in these markets encourages risk-taking among workers, attracts and retains talent, and fosters motivation. In essence, Pillar 8 underscores that a well-managed and adaptable labour market is vital for increasing productivity and promoting resilience and innovation in the workforce.

9) Financial system involves the assessment of two crucial aspects: “depth” which measures the availability of financial products such as credit, equity, debt, and insurance, and “stability” which assesses the mitigation of excessive risk-taking and opportunistic behavior within the financial system.

A robust financial system contributes to productivity in several ways: it facilitates the pooling of savings into productive investments, enhances the efficient allocation of capital by monitoring borrowers and reducing information asymmetries, and provides an effective payment system. However, it is crucial to balance these benefits with appropriate regulation to avoid financial crises, which can have long-lasting negative effects on investments and productivity. In essence,

Pillar 9 underscores the vital role of a well-functioning and regulated financial system in fostering productivity and sustaining economic stability.

10) Market size evaluates the magnitude of both domestic and foreign markets accessible to a country's firms. This is quantified by the sum of the value of consumption, investment, and exports.

Larger markets contribute to enhanced productivity through economies of scale, where the unit cost of production decreases with the volume of output. Additionally, large markets act as incentives for innovation; the more potential users, the greater the potential returns on a new idea. Moreover, substantial markets generate positive externalities, fostering the accumulation of human capital and the transmission of knowledge, thereby amplifying the returns to scale inherent in the creation of technology or knowledge. In essence, Pillar 10 underscores that a substantial and accessible market is instrumental in driving productivity and fostering innovation within a country.

11) Business dynamism encapsulates the ability of the private sector to produce and embrace novel technologies and innovative approaches to work organization. This is achieved through a corporate culture that welcomes change, is open to taking risks, explores new business models, and operates under administrative rules facilitating easy market entry and exit for companies.

A nimble and active private sector enhances productivity through the acceptance of business risks, experimentation with novel concepts, and the development of inventive products and services. In a setting marked by continual upheaval and the reshaping of industries and enterprises, prosperous economic systems demonstrate resilience to technological disruptions and possess the ability to consistently adapt and innovate.

12) Innovation capacity is measured by both the quantity and quality of formal research and development. It also evaluates the degree to which a country's environment fosters collaboration, connectivity, creativity, diversity, and confrontation across different perspectives. Additionally, it considers the country's

capacity to transform ideas into new goods and services. Countries excelling in knowledge accumulation and providing robust collaborative and interdisciplinary opportunities typically possess a greater capacity for generating innovative ideas and pioneering new business models. These innovations are widely recognized as the driving forces behind economic growth. In essence, Pillar 12 emphasizes the critical role of innovation in economic development, asserting that nations capable of fostering knowledge generation and collaborative environments are better positioned to drive economic growth through innovative ideas and business models [32].

2.2 Assessing the impact of the education system on the country's economic growth

Education and economic advancement are interlinked. Countries with higher levels of economic development often have workforces with formal education. The accumulation of human capital is connected to economic growth. Elevated literacy rates and ongoing investments in enhancing the educational attainment of the workforce are crucial for the sustainability of economic growth.

In the context of global development, emerging nations have a greater potential to catch up with more advanced economies when equipped with a workforce possessing the necessary skills to innovate, adopt, and apply new technologies. Educated workers are perceived as better equipped to navigate the swift changes in opportunities and technology prevalent in today's competitive markets.

The rise of industries grounded in scientific principles further underscores the significance of education. Scholars argue that the economy's progression is increasingly dependent on a workforce that is not only highly educated but also

possesses specialized training in scientific disciplines. However, education's function extends beyond creating a higher demand for individuals skilled in scientific fields. Economists suggest that education plays a crucial role in fostering innovation and facilitating experiential learning on a broader scale within the context of science-based industries. Education can act as a catalyst for economic growth through two distinct mechanisms. Firstly, by enhancing the skills of the workforce, it can increase their ability to generate more output. Secondly, it can empower workers to innovate, acquire new methods of utilizing existing technology, and even contribute to the development of novel technologies [33].

The assessment of a country's education system and its impact on economic development relies heavily on the use of specific indices and indicators. These quantitative measures serve as invaluable tools, providing a precise and comparative assessment of different dimensions within the education system. In both quantitative and qualitative formats, these indices provide a comprehensive understanding of factors such as access, quality and relevance to economic needs.

While the first two indices presented in the paper (PISA and U21) specifically measure the factors of the education system and rank countries by their achievements in this area, the latter two indices (HDI and HCI) evaluate education in the context of a broader composite index.

PISA (Programme for International Student Assessment) provides a platform for globally comparative insights into the reading, mathematical and scientific literacy of students, typically at the end of compulsory schooling. The primary aim of PISA is to assess the effectiveness of education systems by measuring the practical skills and competencies that students have acquired in these subjects by the age of 15. With an emphasis on literacy, PISA assesses mastery of processes, understanding of concepts, and application of knowledge to real-world situations. This approach goes beyond the school curriculum to include learning experiences that may occur outside the formal educational setting.

PISA introduced optional assessments such as problem-solving (2003, 2012), computer-based assessments (2012, 2015, 2018), financial literacy assessments (2012, 2015, 2018), and collaborative problem-solving (2015, 2018). The assessments are delivered via computer, with paper-based options for countries unable to conduct computer-based testing. Each student undergoes a two-hour assessment, including various question types. Students complete a 30-minute questionnaire on their backgrounds, attitudes, and school experiences. Principals fill out a 45-minute questionnaire about the school's demographics and learning environment. PISA operates on a three-year cycle, focusing on a specific subject each cycle. Although all three subjects (reading, mathematics, and science literacy) are assessed every year, the cycle emphasizes one subject [34].

The Universitas 21 Ranking stands out as a distinctive assessment, evaluating and ranking national higher education systems globally based on factors like resources, environment, connectivity, and output. Unlike traditional university rankings, the focus is on evaluating entire higher education systems within each country rather than individual universities. Developed as a benchmark for governments, educational institutions and individuals, the rankings aim to highlight the importance of creating favourable conditions for higher education institutions. The U21 ranking is designed to stress the contribution that higher education institutions make to economic and cultural development, to the quality of the educational experience for students and to the competitiveness of international applicants. To enable meaningful comparisons, the rankings provide estimates of a country's performance relative to its GDP per capita. This allows benchmarking against countries at similar stages of development [35].

The Human Development Index (HDI) serves as a comprehensive measure of average performance in key dimensions of human development: leading a long and healthy life, acquiring knowledge, and maintaining a decent standard of living. Comprising normalised indices for health, education and living standards, the HDI is calculated as the geometric mean of these components.

The health dimension includes life expectancy at birth, the education dimension includes average years of schooling for adults and expected years of schooling for children, and the standard of living dimension includes gross national income per capita. To take account of the decreasing importance of income as GNI rises, the HDI uses the logarithm of income. The composite index, derived from the geometric mean of the three dimensional indices, provides an overall assessment of human development. While the HDI raises questions about national policy choices by asking why countries with similar levels of GNI per capita have different human development outcomes, it simplifies human development and doesn't take into account issues such as inequality, poverty, human security and empowerment [36].

The Human Capital Index (HCI) is an important tool for determining the amount and quality of human capital that a child born today could potentially acquire by the age of 18. Unlike the Human Development Index (HDI), which provides a summary assessment of average performance in key categories of human development, the HCI focuses primarily on the human capital accumulation of the next generation. Developed and championed by the World Bank Group, the HCI has three essential components that provide a complex view of children's health and education prospects:

1. Survival component emphasises that in order for children to accumulate human capital through formal schooling, they must first survive early childhood. The under-five mortality rate is an important measure that reflects the importance of child survival as a prerequisite for education and skills development.

2. Expected years of schooling component assesses both the quantity and quality of schooling by integrating information on expected years of schooling with a measure of the quality of learning. It provides a more realistic picture of the expected learning outcomes for children in different educational settings by adjusting for differences in the quality of education across countries.

In assessing the education component of the Human Capital Index (HCI), information on the expected quantity of education a child can receive by the age of

18 is integrated with a measure of its quality. This measure of quality is derived from an assessment of how much children learn at school, focusing on each country's performance on international student achievement tests. The result of this combination is the calculation of expected years of schooling adjusted for learning.

Crucially, this adjustment for quality takes account of the fact that children in some countries may learn significantly less than their counterparts in other countries, despite spending comparable amounts of time in school.

3. The health component includes measures of a country's overall health environment, such as stunting rates in children under five and adult survival rates. Stunting is an indicator of early childhood health, while adult survival is a predictor of a child's future adult health outcomes.

The integration of the health and education components of the HCI is inextricably linked to their impact on labour productivity. The resulting index ranges from 0 to 1, with a score of 1 indicating that a child born today can expect to reach his or her full health and educational potential. A score of 0.70, on the other hand, indicates that a child's future productivity as a worker is 30 % lower than the maximum possible with full education and full health.

Several key principles guided the formulation of the Human Capital Index (HCI): prioritising key outcomes, using a coherent approach to bring together different components, and ensuring broad coverage across countries for directly measurable elements. The design of the Index emphasises an outcome-oriented perspective, steering the debate towards tangible results and providing incentives for countries not only to increase investment, but to do so more effectively [37].

The diversity of methods for assessing the impact of the education system on economic growth demonstrates the complexity and multifaceted nature of this important relationship. The variation in the approaches of the researchers reflects the different aspects considered relevant when addressing this issue.

The study conducted by Paravee Maneejuk and Woraphon Yamaka focuses on assessing the influence of education on economic growth in five ASEAN

countries (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) during the period from 2000 to 2018. The evaluation of educational influences incorporates various factors, including public expenditure on tertiary education per student, enrollment rates at primary, secondary, and tertiary levels, the presence of an educated workforce, and the impact of advanced education on unemployment rates. Additionally, the analysis considers several control variables, namely trade openness, foreign direct investment (FDI), research and development, inflation rate, and capital stocks.

To conduct the empirical analysis, the study employs both time-series kink regression and panel kink regression methodologies. The objective is to explore the nonlinear impacts of education on economic growth within the specified time frame.

The authors found a non-linear relationship (non-linear impact of secondary and tertiary enrolment rates) between education and economic growth in the ASEAN-5 countries and the existence of an inflection effect.

Higher secondary and tertiary enrolment rates significantly contribute to economic growth in most countries, especially after crossing critical points (49.5 %, 22.4 % and 64.14 %) in Thailand, Indonesia and Singapore, respectively, where the impact increases significantly.

Secondary and tertiary enrolment rates, as well as unemployment rates among those with tertiary education, also show a non-linear impact on economic growth in most ASEAN-5 countries, as revealed by the country-specific analysis. Except for Thailand and Malaysia, the number of unemployed graduates has a negative impact on economic growth.

The non-linear nature of the impact was confirmed in a panel analysis of the impact of government spending per student in higher education on economic growth in the ASEAN-5 region. Therefore, greater spending on higher education is linked to higher economic growth in the ASEAN-5 region [38].

For measuring impact of education system on economic development in Pakistan researchers used four independent variables which within defined formula formatting dependent variable of Gross Domestic Product:

$$GDP = f(LR, LF, CPI, UN)$$

Where LR is Literacy Rate, LF is Labor Force, CPI is Inflation, and UN is Unemployment. By considering these variables collectively, the authors aim to provide a comprehensive understanding of the living standards and the fiscal and macroeconomic conditions prevailing in Pakistani society. The authors applied Ordinary Least Squares (OLS) statistical method, which used in econometrics and regression analysis to estimate the parameters of a linear regression model.

The results of the analysis reveal next findings regarding the relationships between various variables and Gross Domestic Product (GDP):

- statistically significant positive relationship between the labor force and GDP at a 5 % level of significance. Specifically, a 1 % increase in the labor force is associated with a 0.47 % increase in GDP;
- statistically significant positive relationship is observed between the literacy rate and GDP at a 5 % level of significance. A 1 % change in the literacy rate is associated with a 0.15 % change in GDP;
- statistically significant negative relationship between unemployment and GDP at a 10 % level of significance. An increase of 1 % in the unemployment rate is associated with a 0.29 % decrease in GDP;
- insignificance between the Consumer Price Index (CPI) and GDP. In other words, changes in the CPI do not have a statistically significant impact on GDP;
- The R-Square value, indicating the proportion of the variation in the dependent variable (GDP) explained by the independent variables, is reported to be highly significant. This implies that the model is effective in explaining the

variability in GDP based on the selected independent variables (labor force, literacy rate, unemployment, and CPI) [39].

Another study by Ukrainian researchers focuses on how educational factors influence the socio-economic development of countries around the world, specifically examining the impact of national higher education system indicators on the macroeconomic, innovation and technology determinants of economic development. The approach proposed by authors aims to provide a thorough quantitative understanding of how higher education indicators relate to and impact on broader elements shaping socio-economic progress.

By categorising 50 countries, the study constructs a matrix to assess the relationship between the Universitas 21 Index and the Global Competitiveness Index. Despite an overall strong correlation between the indices (0.96), the study reveals varying degrees of influence within different groups. In particular, education has a significant impact on global competitiveness (0.76) in countries with a medium level of competitiveness, a moderate impact (0.54) in highly competitive countries and a weaker impact (0.38) in countries with a low level of competitiveness.

Using correlation-regression analysis, the study introduces a structural-logic graph to illustrate the relationship between educational and economic indicators and to quantify their links. The results show a strong correlation between higher education competitiveness and key indicators such as global innovation development (0.8 from 2012-2020), knowledge intensity of GDP (0.73) and overall socio-economic development (0.75).

Figure 1 illustrates the relationship established by the authors between education and socio-economic development using a system of quantitative measurement and impact indicators.

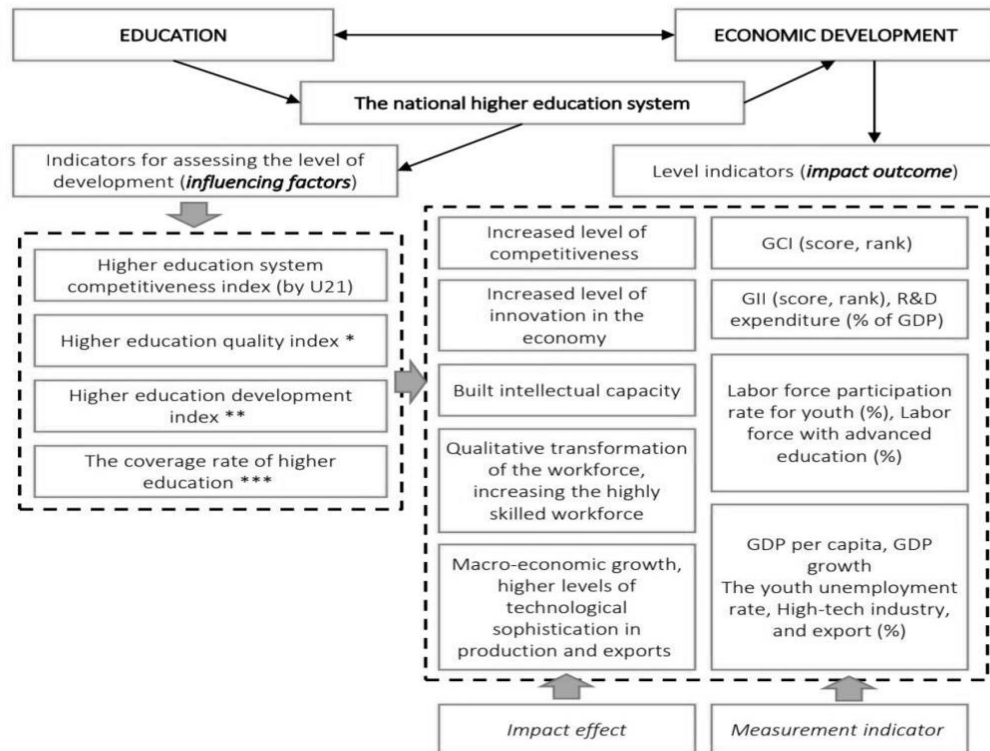


Figure 2.1 – Structural and logical relationships in the system for assessing the impact of education system development and economic security [40]

Figure 2.1, developed by the authors of the study, illustrates the interdependence between education and economic development. Thus, education flows into higher education, which generally produces valuable human resources, and the higher the quality of higher education, the better the economic development indicators. There is a reciprocal relationship between education and economic development, suggesting that changes or improvements in one can influence the other.

2.3 Techniques of measurement the innovation potential of a country

Increased competition between countries due to globalisation processes requires an accurate assessment of the potential of national economies. Innovation plays a key role in economic growth, enhancing a country's ability to develop new

technologies, improve existing product creation technology and make revolutionary achievements in spheres of interest. Assessing a country's innovation capacity requires sophisticated methodologies that delve into various aspects of its research, technology and economic systems. This study includes well-known indices such as the Global Innovation Index (GII), the European Innovation Scoreboard (EIS), the Bloomberg Innovation Index, the The OECD Science, Technology, and Industry (STI) Scoreboard, as well as tools such as the Digital Economy and Society Index (DESI) and its international version I-DESI.

The Global Innovation Index (GII) is an annual report that provides a comprehensive assessment of the innovation capacity and performance of countries around the world. It aims to provide insights into the various factors that contribute to a country's innovation ecosystem and to help policymakers, businesses and other stakeholders understand and promote innovation.

The GII assesses some 132 economies, covering a wide range of innovation-related factors. This makes it one of the most comprehensive and widely recognised indices for assessing a country's innovation capacity. The GII uses around 80 indicators to measure innovation. These indicators cover such aspects of a country's innovation ecosystem as the policy environment, education and human capital, infrastructure, knowledge creation and diffusion, business sophistication, research and development (R&D) activities, and market and business creation [41].

The European Innovation Scoreboard (EIS) is an annual publication that provides a comprehensive assessment of the research and innovation performance of European countries. The Scoreboard is a key initiative of the European Commission and its main objective is to provide a comparative analysis of the innovation performance of EU Member States and other European countries. The assessment helps policy makers, researchers and businesses to understand the dynamics of innovation in different regions and to identify areas for improvement.

This year's European Innovation Scoreboard follows the same indicator framework as the 2021 edition. This framework comprises 32 indicators grouped

into 12 dimensions, including aspects such as the attractiveness of research systems, business investment in research and development and the use of information technology. This continuity in the assessment methodology ensures consistency and makes it easier to track innovation trends over time [42].

The European Innovation Scoreboard (EIS) classifies countries into four groups based on their innovative capacity, as determined by their scores:

- Innovation leaders headed by Denmark, followed by Sweden, Finland, the Netherlands and Belgium. These countries have the highest levels of innovation.
- Strong innovators category includes Austria, Germany, Luxembourg, Ireland, Cyprus and France. The countries in this group, together with the innovation leaders, exceed the European average innovation index.
- Moderate innovators include Estonia, Slovenia, the Czech Republic, Italy, Spain, Malta, Portugal, Lithuania, Greece and Hungary. This group shows a medium level of innovation.
- Emerging innovators including Croatia, Slovakia, Poland, Latvia, Bulgaria and Romania. These countries are considered as newcomers in terms of innovation capacity [43].

The annual Bloomberg Innovation Index ranks 60 nations based on a variety of criteria grouped into seven key metrics. These metrics include factors such as research and development, manufacturing contribution to economic value, labour productivity, density of high-tech companies, concentration of researchers, efficiency of higher education and patent activity.

While the Bloomberg analysis officially focuses on a nation's economic innovation, the categories chosen are broad and all-encompassing. Economies are intricately linked to various aspects of life, and innovation within an economy often influences and is influenced by other societal factors. As a result, the Bloomberg Innovation Index is often interpreted not only as a measure of economic innovation, but also as a broader assessment of innovation in different facets of a nation's life and development [44].

The OECD Science, Technology, and Industry (STI) Scoreboard is a publication released by the Organization for Economic Co-operation and Development (OECD) that provides a comprehensive assessment of the science, technology, and innovation landscape across member and partner countries. The STI Scoreboard is typically published biennially and serves as a valuable tool for policymakers, researchers, and the public to understand trends and developments in these crucial domains.

The STI.Scoreboard platform developed as a result of The OECD Science, Technology, and Industry (STI) Scoreboard initiative serves as a comprehensive resource for science and innovation policymakers, analysts, and the general public. It offers a wealth of statistical indicators related to science, technology, and innovation (STI) systems across OECD countries and several other economies.

The platform provides access to over 1000 indicators covering a wide range of topics, including research and development, science, business innovation, patents, education, and the economy. These indicators are sourced from the latest and quality-assured statistics obtained from the OECD and partner international organizations.

In order to aid in the interpretation of data, the platform offers upfront information about what each indicator captures. It includes key definitions and specificities for each country, providing context and clarity for users ensuring a better understanding of the data presented.

Using the platform users can navigate and search across, easily explore and compare different families of indicators. This functionality allows for a comprehensive analysis of the STI landscape and facilitates efficient retrieval of relevant information. Also users within the platform have the ability to visualize and later save the result of their work with various indicators together: generate own charts, create customized visual representations of the data [45].

The Digital Economy and Society Index (DESI) is a tool for assessing Europe's digital performance and monitoring the progress of EU countries from 2014

to 2022. The DESI has a three-level structure, including dimensions, sub-dimensions and indicators.

DESI include four dimensions: human capital, connectivity, integration of the digital technology and digital public services. Human capital dimension assesses the internet usage skills of citizens and the advanced skills of professionals. It measures basic skills, ICT specialists and female ICT specialists, in line with the goals of the Digital Decade Compass. Connectivity analyses both fixed and mobile broadband, taking into account supply and demand indicators as well as retail prices. Fixed Very High Capacity Network (VHCN) and 5G coverage are indicators in line with the Digital Decade Compass. Integration of the digital technology comprises digital intensity, business adoption of selected technologies and e-commerce. Targets for the Digital Decade Compass include SMEs with at least basic digital intensity and the take-up of big data, cloud and AI. Digital public services dimension describes the demand and supply of e-government and open data policies. Indicators on digital public services for citizens and businesses assess the goals set by the Digital Decade Compass [46].

The extended version of DESI is International Digital Economy and Society Index which incorporates 24 datasets for trend analysis and comparison across 45 countries. These include the EU27 Member States and 18 non-EU countries with a global representation spanning Europe, Asia, the Americas and Australasia. The main purpose of the I-DESI is to help countries identify areas where investment and action are needed to reach levels comparable to the best performing countries in the world. It serves as a valuable tool for monitoring the progress of the EU 2020 Digital Strategy and supports the development of the Recovery and Resilience Facility of the Annual Sustainable Growth Strategy [47].

3 DEVELOPMENT OF EFFECTIVE STATE POLICY IN THE FIELD OF EDUCATION TO STRENGTHEN THE COUNTRY'S POSITION IN THE INTERNATIONAL ENVIRONMENT

3.1 Overview and evaluation of education and economic development indicators in Ukraine

The COVID-19 pandemic has resulted in significant changes in the global education sector, including Ukraine. These changes have given rise to numerous educational challenges that require systemic solutions and adaptations. Education is a fundamental human right, and its importance is emphasised by its enshrinement in the Declaration of Human Rights, the Constitution of Ukraine, and sectoral laws. It is crucial to ensure accessibility and quality of education for all citizens.

The Constitution of Ukraine and the Law of Ukraine “On Education” guarantee the right to quality and accessible education, regardless of social, economic, or personal circumstances. An important principle is to ensure equal access to education and prevent any restrictions on the right to education based on factors such as age, gender, race, health status, disability, citizenship, nationality, religious or political beliefs, language of communication, or any other factors.

The realisation of the right to education can take various forms and occur at different levels, such as pre-school, general secondary, vocational, higher, and adult education. This results in a diverse range of educational opportunities available from early childhood to adulthood.

Furthermore, laws ensure access to public educational, scientific, and informational resources, including the Internet, electronic textbooks, and other multimedia learning materials. It is crucial to ensure widespread access to knowledge and to incorporate modern technologies in education. This is particularly significant during the pandemic, where distance learning has become a necessity [48].

To gain a comprehensive understanding of Ukraine's standing in the global education sector, it is essential to focus on specific indicators that can illuminate its position. Analyzing key metrics will provide valuable insights into the strengths, challenges, and overall performance of Ukraine's education system on the international stage.

In the 2022 PISA evaluation, Ukraine participated and achieved a final score of 439.7, ranking 41st among participating nations. In comparison, in the 2018 assessment, Ukraine ranked 40th, with a score of 462.7, tied with Turkey. This data reflects Ukraine's continued participation in international educational assessments and provides a basis for analyzing trends and identifying potential areas for improvement in its education system over the analyzed period.

Indeed, with Ukraine's participation in PISA occurring only twice, and the second instance taking place amid the challenges of the pandemic and a global education downturn, it is important to exercise caution when drawing conclusions based solely on these limited data points. The unique circumstances surrounding the second assessment may have introduced factors that could significantly impact the interpretation of the results. So let's turn to other indicators. Figure 3.1, which shows the Human Development Index score of Ukraine from 1990 to 2021, is used for further analysis.

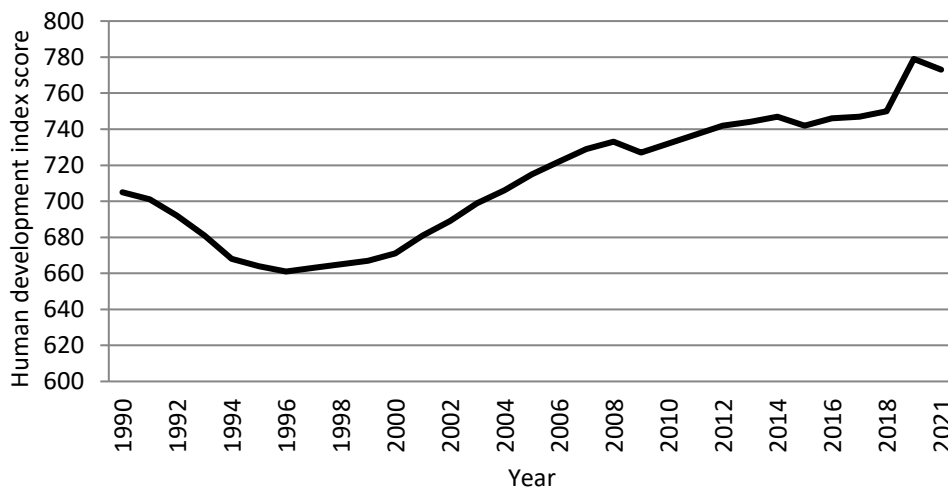


Figure 3.1 – Human development index score of Ukraine from 1990 to 2021 [49]

As of 2021, Ukraine recorded a Human Development Index (HDI) of 0.773, showing a slight decline from the previous assessment. The HDI, which considers life expectancy, education levels, and GDP per capita, categorizes countries with scores above 0.700 as having high development levels. Ukraine's HDI has experienced fluctuations over time. In 1990, the country boasted a high HDI score of 0.705, but by 1995, this figure had decreased to 0.664. These variations reflect changes in key developmental factors, underscoring the dynamic nature of Ukraine's socioeconomic progress.

In the current context of Ukraine's education system, the quality of learning is affected by general sector factors, including political, cultural, and technological aspects.

The political factor, specifically Russia's full-scale invasion of Ukraine, has had a significant impact. The functioning of the education system, including access to education in the conflict zone and the mobility of students and teachers, has been affected by martial law. The transition from Russian to Ukrainian, as well as the rejection of the Russian language, has cultural implications. This has affected the linguistic environment in educational institutions and may require the adaptation of teaching staff and materials. The introduction of mandatory rules for communication on television exclusively in Ukrainian aims to shape the Ukrainian cultural space and is a reflection of the cultural context.

The rapid development of technology is impacting the provision of educational services, leading to the growth of online formats. The rise in demand for online courses, as demonstrated by the indicators of the Coursera educational platform in Figure 3.2, highlights a technological transformation in the field of education.

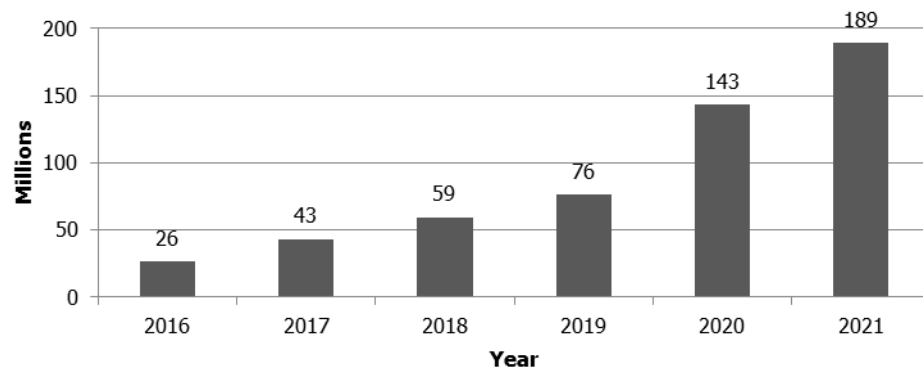


Figure 3.2 – Total number of enrollments on Coursera [50]

Figure 3.2 shows a clear upward trend in the popularity of the Coursera education platform. The platform maintained stability for four consecutive years, characterized by a gradual rather than a sudden increase. In 2020, the number of enrolments exhibited a remarkable surge, more than doubling, and the subsequent year saw an additional increase of 32 %, reaching a peak of 189 million. The significant increase in enrolments indicates a noteworthy shift towards online education, a trend that gained momentum during the pandemic and has continued since.

In response to the COVID-19 epidemic, Ukraine closed all schools on 12 March 2020 with Resolution 211, which prohibited physical access to educational institutions at all levels. The quarantine, initially planned for three weeks, was extended due to the evolving situation.

It is worth noting that the government is committed to maintaining the original end-of-year schedule for schools. As a result, students were given the opportunity to complete the academic year remotely. It is important to note that following the easing of quarantine restrictions, other levels of education resumed their work.

A significant change was made to the certification system, particularly for 11th grade graduates in Ukraine. Instead of the State Final Examination (SFE), which was cancelled, students were given the option to either take the EIT or

determine their average grades based on their annual grades. This decision was significant, particularly for graduates intending to pursue further education.

Since July 2020, Ukraine has been under an adaptive quarantine regulated by Resolution of the Cabinet of Ministers of Ukraine No. 641, dated 22 July 2020. Decisions on the level of quarantine restrictions in cities are made based on epidemiological indicators and the general health of citizens. In green zones, classes continued while complying with sanitary rules. However, in orange and red zones, where a large number of patients were detected, a complete transfer to distance learning was necessary.

The period of distance learning was challenging for the Ukrainian education system due to the Ministry of Education and Science's uncoordinated actions, including:

- At the start of the quarantine in March, general secondary education institutions were granted autonomy to determine the forms of distance learning without any methodological recommendations or guidance for teachers.
- The Ministry of Education and Science's (MES) recommendations to educational institutions before the start of the school year mainly focused on sanitary and hygienic standards and compliance with quarantine conditions.
- Six months later, school staff received recommendations on the conditions for organizing distance learning. However, there was no differentiation by type of educational institution.
- Personal protective equipment was funded from the balances of the educational subvention and local budgets or at the teachers' own expense.
- The distribution of educational subvention balances among local budgets was uneven, making it difficult to finance the purchase of personal protective equipment.
- Teachers without extensive experience in remote teaching had to quickly learn new skills and adapt their programmes to the new reality on their own. This imposed additional stress and required unpaid time [51].

On 24 February 2022, Russia launched a full-scale invasion of Ukraine. As a result, 3798 educational institutions have been affected by bombing and shelling, with 365 of them completely destroyed [52]. Half of the schools that were destroyed or damaged are situated in Donetsk, Kharkiv, and Luhansk regions. Schools located in frontline and border areas are constantly under threat of destruction due to shelling.

The educational process in all Ukrainian schools was suspended for at least two weeks, and in some schools, it was suspended until the end of the school year. Children living in the occupied territories face difficulties in receiving a complete education in Ukrainian schools due to communication barriers and threats from the occupation authorities.

The context of distance learning assumes that students have access to a device and a dedicated workspace within their homes. A survey conducted among parents revealed that the majority of children (90 %) have access to at least one personal device which they use for educational purposes. It is important to acknowledge that families with limited financial resources may not have the means to acquire a laptop or establish a dedicated learning space. As a result, distance learning worsens educational inequalities.

The ongoing conflict has led to disparities in education. Classroom attendance is disrupted by air raids, the constant threat of artillery shelling, and interruptions in power, internet, and mobile phone services resulting from such attacks. In response to these challenges, educators are adapting their teaching methods. They are reducing the volume of material assigned for independent study, employing asynchronous learning approaches, and utilizing electronic platforms to share video recordings of lessons and educational resources.

Skipping classes and experiencing stress can make it harder for students to learn, and can further demotivate them. The ongoing war has negatively affected the psychological and emotional well-being of both students and teachers. A majority

of parents (61 %) report that their children are exhibiting symptoms of stress, such as sleep disturbances, anxiety, difficulty concentrating, and problems communicating with peers and teachers. Children may experience high levels of anxiety and loneliness during periods of forced holidays and distance learning, which can limit their ability to communicate with peers and teachers [53].

Ensuring the physical safety of schoolchildren and teachers is a crucial matter. Currently, there are 60,560 civil protection structures in Ukraine, with the highest number of shelters located in Lviv and Kharkiv regions, as well as in Kyiv. Conversely, the Kherson region has the lowest number of civilian shelters.

The Cabinet of Ministers of Ukraine issued Order No. 568-r on 27 June 2023, which addresses coordination and control over the process of bringing the objects of the Civil Protection Facilities Fund into proper condition. The Minister for Strategic Industries is designated as the person responsible for this process, as these objects are of strategic importance for ensuring the protection of the population [54]. For a comprehensive analysis of the state of higher education in Ukraine, please refer to Table 3.1, which presents a SWOT analysis.

Table 3.1 – SWOT analysis of the Ukrainian national higher education system [14]

Strengths	Weaknesses
<ul style="list-style-type: none"> – A wide network of higher education institutions aimed at making higher education accessible to many people. – An ESG-based higher education quality assurance system has been implemented to ensure high standards of education. – Transparent admission procedures that have gained public trust. – Strong demand for higher education and a high level of education of the population. – Readiness to change in the context of European integration. 	<ul style="list-style-type: none"> – The process of incorporating into the European Education Area and the European Research Area. – The global trend of increasing numbers of international students. – Broadening access to international funding sources for educational and research activities. – The shift towards a high-tech and innovative foundation for the global economy. – The digitization and rapid growth of the IT industry.

<ul style="list-style-type: none"> – Current educational legislation and higher education standards. – Availability of highly qualified academic and research staff. – A combination of academic traditions and experience in implementing changes. – A wide range of educational programmes of various types and directions. – Acceptable cost of educational services. – Sufficient capital facilities to support the educational process. – Experience in international educational and scientific cooperation. 	<ul style="list-style-type: none"> – The availability and accessibility of contemporary educational content. – Recognizing the necessity and goals of lifelong learning. – The potential for synergy between higher education institutions and research organizations. – The interest in collaborating with higher education institutions driven by the demand for skilled professionals from businesses. – The societal need for the development of independent thought centers.
<p>Opportunities</p>	<p>Threats</p>
<ul style="list-style-type: none"> – Insufficient funding allocation to the higher education system and limited development of alternative funding sources. – Discrepancies between graduates' competences and the skills demanded by employers. – Budget legislation that hampers the financial autonomy of higher education institutions. – Inadequate prediction of the economy's workforce requirements and specialization needs. – Inadequate monitoring of professional qualifications and employment outcomes of higher education graduates. – Insufficient translation of the quality of higher education into tangible societal benefits. – Fragmentation and duplication of training profiles within higher education institutions. – Deterioration of scientific schools and a lack of groundbreaking research outcomes. 	<ul style="list-style-type: none"> – Heightened competition in higher education as a result of globalization. – EU education's appeal for employment and emigration prospects. – Increased competition from less reputable foreign universities offering affordable distance learning. – The military and political ramifications stemming from Russia's invasion of Ukraine. – Disparities in social and economic development. – A prolonged absence of comprehensive state-level policy documents pertaining to higher education. – Unfavorable demographic conditions within the country. – Fragmented integration into the European educational landscape. – Alluring opportunities in other nations that contribute to the emigration of highly skilled researchers, academics, and teaching staff. – Limited demand for higher education in complex technical fields, hindering the

<ul style="list-style-type: none"> – Limited autonomy granted to higher education institutions. – Prevalence of unfair practices, imitation, and corruption within the system. – Secondary focus on research and innovation activities. – Low employee motivation within higher education institutions. – Outdated educational spaces, equipment, and research infrastructure. – Limited opportunities for individuals with disabilities and special educational needs. – Insufficient practical training provided to students in higher education institutions. 	<p>growth of technical and knowledge-intensive education.</p> <ul style="list-style-type: none"> – The nation's low technological structure within its economy.
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Mykhailo Fedorov, the Vice Prime Minister for Innovation, Education, Science and Technology Development and Minister of Digital Transformation of Ukraine, has expressed his intention to merge the Ministry of Digital Transformation with the Ministry of Education and Science [55]. The aim of this merger is to combat bureaucracy in the education system, adapt it to the consequences of the war, and restore the educational infrastructure.

Efforts should be made to create effective mechanisms for online learning, while also exploring opportunities to return to offline formats where possible. It is important to measure educational losses and establish a system of compensation. Additionally, creating an international coalition to restore education and science, as well as cooperating with donors to provide financial support for the restoration of educational systems, are crucial steps. Teachers and educational managers should also be encouraged to develop their skills in English, digital technologies, and entrepreneurship. It is important to maintain a balanced and objective approach throughout.

3.2 Practical recommendations for education policy in Ukraine

The education system in Ukraine is currently facing significant challenges due to the pandemic and ongoing conflict. This has highlighted existing weaknesses, providing an opportunity for improvement.

The following recommendations can be put into practice:

– **Regarding security**

1) The primary focus for the Ukrainian education system should be to ensure a safe learning environment and reduce the workload for both students and teachers.

2) Continuous education can be facilitated by constructing and repairing school shelters, creating safe educational spaces, providing educational institutions with generators and internet access, and supplying gadgets to students and teachers who cannot afford them.

3) To improve education, it is important to provide opportunities for seeking help and developing emotional literacy and self-care skills.

4) The Ministry of Education and Science of Ukraine and the authorities should establish unambiguous plans for how the education system responds to crisis situations. It is also important to periodically rehearse these plans in case of an emergency.

5) It is also recommended to provide continuous support from qualified personnel and establish a community of teachers who can openly share useful experiences and practices for coping with complex work processes.

6) To organise an educational space for children who do not have the opportunity to study remotely.

– **Regarding work and study load**

7) To reduce teachers' workload, additional positions can be created, such as teacher-tutors (as in Finland) and educational technologists (as in Estonia). In

addition, it is recommended to implement convenient and understandable technological solutions, such as a platform for communication between educators of different levels of involvement in the educational process.

8) To explore the possibility of introducing artificial intelligence tutoring technology for students who are far behind in the curriculum (as in China).

9) In order to free up time for creativity, it is suggested that bureaucracy and paperwork for teachers be reduced. Alternative solutions, such as the ELIIS programme in Estonia, should be explored. The proposal is to establish support centres for students and leisure centres for schoolchildren.

10) A shift towards a learner-centred educational paradigm involves actively engaging students in the learning process. This can be achieved through interactive lessons, projects, research, and other forms of active learning.

– **Regarding new projects**

11) Developing educational programmes and support aimed at stimulating entrepreneurship among students can promote the creation of start-ups and innovative enterprises.

12) Providing grants for businesses willing to participate in the educational process can stimulate interaction between sectors, including joint projects, workshops, internships, and other forms of cooperation.

13) Establish independent think tanks to facilitate research and analysis of labour market needs. Involve scientists from these centres to teach at universities and share their research experience.

– **Regarding the activities of higher education institutions**

14) It is also crucial to attract foreign investment in Ukrainian educational projects and to cooperate with foreign universities to exchange experiences among teachers and school principals from different countries.

15) Audit and revise educational programmes to include practical experience that meets the needs of the labour market.

16) Establishment of innovative laboratories and research centres in universities and higher education institutions to promote active research and development of new technologies.

17) Reforming legislation to give universities more autonomy in developing programmes, seeking funding and attracting external funding.

18) Creating incentives for universities that actively develop partnerships with the private sector and implement innovative projects.

– **Regarding collaboration**

19) Involve business representatives in the development of curricula to ensure practical relevance of the disciplines.

20) The educational focus should be shifted from providing information to developing practical skills and preparing for employment. To achieve this, a system of mentoring and partnerships with companies should be introduced to provide students with opportunities for practical application of knowledge.

21) Collaboration with industry and business representatives should also be encouraged through guest lectures, consultations, and joint projects.

CONCLUSIONS

A country's competitiveness can determine the standard of living of its citizens. An analysis of modern education systems across countries reveals a landscape rich in diversity, innovations, challenges, and opportunities for improvement. The first section identifies the positive and negative aspects of modern education systems, using China, South Korea, Finland, and Estonia as examples. It has been determined that these countries effectively implemented distance learning during the Covid-19 pandemic. This success can be attributed to several important factors. Firstly, they possessed a well-developed technological infrastructure, a wide-reaching internet network, and utilized online platforms. Secondly, they had sufficient budgetary resources to implement new educational initiatives and provide the population with means of communication. However, it has been found that distance learning has contributed to the growth of inequality between students who have access to gadgets and their own space, and those who do not. The quality of the educational process is influenced by a range of general and internal factors, which vary significantly from country to country. The general factors identified include geography, economics, social dynamics, culture, history, religion, politics, language, and technology. It is important to note that individual factors are influenced by the society of the country being assessed. The quality of the educational process in Ukraine is determined by several important factors, including the mastery of key competencies and cross-cutting skills, overall pupil development, learning interest, and high entrance exam results. The educational process is influenced by several factors, including stakeholder cooperation, safe environments for children, teacher qualifications, academic honesty, and sanitary and hygienic conditions.

In the second section, the issue of indices and methodologies that determine the level of competitiveness of a country was highlighted. These tools are: The

Global Competitiveness Report and its 12 pillars or characteristics that help determine the level of a country's performance

The impact of the education system on the country's economic growth was assessed using several indicators, including the Programme for International Student Assessment (PISA), Universitas 21 Ranking (U21), The Human Development Index (HDI), and The Human Capital Index (HCI). Various methods were identified for measuring the country's innovation potential. They include the Global Innovation Index (GII), the European Innovation Scoreboard (EIS), the Bloomberg Innovation Index, the OECD Science, Technology and Industry (STI) Scoreboard and tools such as the Digital Economy and Society Index (DESI) and its international version I-DESI.

The third chapter is devoted to the assessment of the educational process in Ukraine and its impact on economic growth. The government's actions during the pandemic have been scrutinised, revealing instances of negligence and untimely decision-making. Since 24 February 2022, Russia's full-scale invasion of Ukraine has resulted in the destruction of Ukraine's educational system, both physically (through infrastructure damage and loss of life) and morally (due to families leaving the country, brain drain, moral and psychological pressure, constant instability and stress).

The SWOT analysis of the higher education sector plays a role in identifying weaknesses and developing further recommendations. The recommendations pertain to five areas: ensuring the physical and mental safety of students and teachers, reducing their workload, implementing new educational projects, introducing changes in the process of providing services in higher education, and collaborating with representatives of the business environment and various educational figures. Mentoring should also be introduced at universities.

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