

Частина I



**СТУДЕНТСТВО.  
НАУКА.  
ІНОЗЕМНА МОВА**

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У збірнику подано статті іноземними мовами з викладенням результатів наукових досліджень студентів, аспірантів та молодих науковців у різних галузях, що можуть зацікавити світову наукову спільноту. Регулярні публікації робіт допоможуть виявити талановиту студентську молодь, здатну брати участь у міжнародному професійному, науковому та освітньому обміні та втілювати одержаний досвід у розвиток передових технологій.

Усі матеріали публікуються в авторській редакції.

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# HUMANITIES

**Iliukhina I. D.**  
**FEATURES OF ENGLISH MILITARY AND MEDICAL  
TERMINOLOGY**

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*Language Advisor – Asst. Prof. Dmyterko Ye. V.*

The profound connection between English medical terminology, linguistic evolution, and medical science persists as a dynamic force shaping the discourse in healthcare. The fusion of scientific progress into medical terminology not only reflects the advancements in medicine but also underscores the adaptability of the English language. This continuous enrichment of medical vocabulary with scientific terms is vital in effectively communicating complex concepts within the medical community.

The era of globalized English has notably influenced medical terminology, transcending geographical boundaries. The prominence of the English language in the medical sector on an international scale is a testament to its role as a lingua franca in scientific communication. This dominance has not only led to the widespread acceptance of English medical terms but has also prompted their integration into various European languages. The cross-pollination of languages in the medical field exemplifies the interconnectedness of global healthcare practices and the role of English as a facilitator of international collaboration.

L. Stegnitska adds scholarly weight to this discussion, providing a foundation for understanding the intricate relationship between language, medicine, and globalization. It invites further exploration into how this linguistic dominance impacts medical education, research dissemination, and patient care on a global scale (Стегніцька, 2019).

Thus, the evolution of English medical terminology is a fascinating interplay between linguistic evolution, scientific progress, and the global dynamics of the

medical field. It not only reflects the state of medical science but also serves as a bridge, connecting professionals worldwide through a shared language of precision and clarity.

The integration of military terminology into English reflects the crucial role of the military sphere in modern social and political contexts. In recent decades, advancements in high-tech warfare have enriched this domain, leading to the creation of new terms and their systematic organization (Погонець, 2019).

In the current scenario, as Ukraine safeguards its independence with global military support, the significance of military translation becomes paramount. This is significant for ensuring seamless collaboration between Ukrainian military forces and their international partners, underscoring the importance of precise communication during these critical times (Пуш, Гасюк, 2022).

Within this framework, English military and medical terminology encompass a diverse range of terms related to medical services for military personnel within conflicts and military operations. Beyond facilitating communication among medical professionals, this terminology plays a vital role in describing processes and events within military healthcare.

The features of English military and medical terminology show a comprehensive insight into the specialized language used in the field of military medicine. Through our analysis, it becomes evident that each category of terminology serves a specific purpose, effectively addressing the unique requirements and challenges associated with both military operations and healthcare in the field.

*Abbreviations and acronyms*, such as *IED*, *MRE*, and *POW*, encapsulate complex concepts concisely, allowing for efficient communication in situations where time and clarity are critical.

*Medical codes*, represented by alphanumeric sequences like *F32.9* and *S72.001A*, enable precise documentation and classification of medical conditions and injuries, crucial for accurate medical records and treatment planning.

*Terms related to combat conditions*, such as *blast trauma*, *gunshot wound*, *concussion*, and *chemical burn*, underscore the specific nature of injuries encountered in military settings. This vocabulary is essential for medical professionals to swiftly and accurately assess and address injuries during combat situations.

*The terms related to battlefield medical aid*, including *field hospital*, *casualty evacuation*, and *tourniquet application*, reflect the urgency and complexity of providing medical care during military operations. These terms highlight the need for specialized medical facilities, rapid evacuation procedures, and immediate life-saving interventions.

*Terms addressing mental health aspects*, like *post-traumatic stress*, *combat stress reaction*, *combat fatigue*, and *shell shock*, recognize the psychological toll of military service. This terminology recognizes the distinct difficulties encountered by military personnel and underscores the significance of providing mental health assistance within the military framework.

*Descriptive terms for military medical personnel*, such as *military surgeon*, *combat medic*, *medical corpsman*, and *flight nurse*, delineate the roles and responsibilities of healthcare professionals in the military. These designations highlight the diverse skills and expertise required to address the wide range of medical needs in the military environment.

Finally, *terms related to chemical and biological warfare*, such as *decontamination protocol* and *biological agent*, underscore the potential dangers and specialized protocols involved in addressing threats from unconventional weapons.

So, the features of the English military and medical terminology not only facilitate effective communication within the military medical community but also reflect the unique challenges and exigencies of providing healthcare in the complex and dynamic environment of military operations.

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**Krutko H. R.**

### **HELP FOR MILITARY WITH POST-TRAUMATIC STRESS DISORDER**

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Military personnel who go through combat and extreme situations often face difficulties in restoring their physical and psychological health after returning to civilian life.

One of the most common consequences of military conflicts is post-traumatic stress disorder (PTSD), which can significantly limit the quality of life and functioning of veterans.

In this context, providing assistance to military personnel with PTSD the need of their physical and psychological recovery and successful integration into civilian life becomes urgent.

The purpose of the research is to thoroughly study and analyze effective methods and approaches to providing assistance to military personnel facing post-traumatic stress disorder (PTSD).



### **Post-traumatic stress disorder in military personnel.**

In the conditions of war, post-traumatic stress disorder (PTSD) becomes one of the most common psychological pathologies. Especially if we are talking about military personnel - people who are in the combat zone. PTSD in the military is very often diagnosed, that is why this problem is relevant today and will remain so for a long time.

PTSD is a treatable mental health condition that can develop after a person experiences or witnesses traumatic events. The main symptoms of this disorder include hypervigilance for no reason, panic and tremors due to sharp sounds, anxiety, depressive symptoms, explosive reactions, guilt that you survived and everything is normal now, aggression and rage attacks, suicidal thoughts, problems with memory and concentration.

### **Main symptoms of PTSD**

1. Recurrent, intrusive memories of events that include images, thoughts, or feelings. The traumatic event is experienced over and over again. A person tries to forget about the experience, but memories constantly arise without any external stimuli. There is a feeling of the reality of the event. They can occur while awake, when waking up, during intoxication (alcohol, under the influence of drugs). This group includes repetitive children's games in which elements of a traumatic event are visible.

2. Dreams about the experienced event, which are repeated and cause anxiety.
3. Such actions and feelings, as if psycho-traumatic events are happening again.
4. Significant psychological distress under the influence of external and internal stimuli that symbolize or remind of any aspect of the traumatic event.
5. Physiological reactivity under the influence of external or internal stimuli that symbolize any aspect of the traumatic event or remind of it.
6. Trying to avoid thinking, feeling, or talking about the trauma.
7. Partial or complete amnesia of important aspects of the trauma.
8. Loss of interest in previously significant activities or participation in them.
9. There is a feeling of being cut off from others, loneliness even when there are families and children.
10. Narrowing the range of affective reaction.
11. Inability to focus on a long life perspective.
12. Difficulty in falling asleep and sleep duration disorders.
13. Irritability and outbursts of anger.
14. Difficulty in concentrating.
15. Unmotivated vigilance.
16. Increased fear reaction.

### **Psychologist's recommendation**

The main recommendations are strict adherence to the treatment plan prescribed by the psychiatrist and the psychological counseling plan. Adhering to sleep hygiene, banning the use of alcohol and surfactants, excluding heavy physical exertion, but maintaining minimal physical activity, healthy food, rich in vitamins, which are necessary for the recovery of the body.

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**Merezhko K. O.**

**SEPTEMBER AND NOVEMBER IN THE TRADITIONAL FOLK  
CALENDAR OF UKRAINIANS: HAVE THE SIGNS AND  
TRADITIONS SURVIVED TO THIS DAY?**

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September, which in the traditional Ukrainian folk calendar is associated with the Indian summer and a number of other traditions and signs, was highly valued in the past as a period of special significance.

Over time, people's behaviour, moods and beliefs change. Many things are becoming obvious thanks to science and technology. Therefore, with the changes in modern society and the disappearance of mass manual agriculture, the issue of preserving these traditions is becoming more relevant.

Can we observe the remnants of these traditions, at least on a basic level, in modern life, or are they sinking into oblivion as time changes? And most importantly, have people crossed the threshold of fear of those beliefs that, according to old rumours, could lead to death?

From my experience, I can say that signs about predicting autumn by flying spider webs are quite common in western Ukraine and I have come across them, but I have never had such experience in the east.

Traditions such as the rituals of sowing winter crops on Bartholomew's Day have partially lost their reality, as the majority of the population of modern Ukraine is not connected with agriculture. Many of the name days and signs of September are no longer part of everyday life.

11 September is the feast of the beheading of the holy and glorious prophet, forerunner and baptist John. This holiday has deep roots in the Christian tradition and has gained significance in the Ukrainian cultural context, and it can certainly be assumed that it was a very revered and important holiday in the past.

On this day, there were strict prohibitions: for example, it was forbidden to cut any fruit, vegetables and other round-shaped dishes, and no knives, axes or utensils were allowed, and there were also bans on red-coloured things because they symbolised blood.

At first glance, it may seem that the role of superstition has now faded away, but it is important to take into account the significance of this holiday, so even urban people still actively observe all the rules of this holiday, to say nothing of people in rural areas, where all these rules are strictly observed.

Another equally important holiday is 19 September, the miracle of the Archangel Michael. On this day, people tried not to work, because a disaster could happen... And according to many people, it did happen to those who broke some of the rules of the day.

Mysticism or just a coincidence? There is no decent answer to this question, but many modern people (who have certainly heard of this holiday) still observe the



rules of this holiday, because "God protects the safe," which means that this holiday has not dissolved over time.

November in the Ukrainian folk calendar is a period that impresses with its depth and diversity of traditions, rituals and holidays. However, with the advent of modernity, valuable traditions can face numerous challenges, be influenced by globalization and lose their relevance.

Has November lost its significance today? And is it reasonable to try to preserve these traditions for future generations?

It is important to note that November has not always been November, because for some time it was actually "December", but then the name "November" was used.

In general, how can we assess the state of certain aspects of the past heritage, such as traditions, sayings and signs? We can confidently say that, compared to the past, they are gradually losing ground, but nevertheless, they are still found and used to varying degrees throughout Ukraine.

An example of this is the fourth of November and the related saying (which foreshadowed the future weather) "When the sky cries for Kazan..." I heard this saying and some others very often among the elderly population when I visited my grandmother near Cherkasy, which shows that this culture is still alive, but it is difficult to say to what extent it will be passed on and whether it will do so at all.

I believe that the issue of honoring ancestors and the attitude towards them in general is worth mentioning. This ritual component is based on respect for the dead and the desire to preserve their memory. Ancestor worship in Ukraine manifests itself in various aspects such as religion, rites and ceremonial practices, but this is also subject to the passage of time, so many of the "subtleties" of this practice have been lost, even in our parents' generation.

Again, referring to my grandmother, I can say that she preserved many of the same customs and rituals that she still follows today.

She often gathered the family or its individual members and arranged "visits to the grave", when the family brought food and drinks to the grave for their

ancestors, and she also observed the rules for the Day of the Intercession (14 October) and All Saints' Day (1 November), when they visit graves, decorate them and pray for the repose of the souls of the dead. She also believes in the ritual of "warming the feet of the grandfathers" by burning dead wood in the garden and in the vegetable garden, while saying various spells. I also believe that her hospitality is connected to her faith.

However, it is difficult to say whether there are many such superstitious people left, because who else but these people can be considered "keepers" of the real past)

To sum up, we can say that Ukrainian September is full of traditions and signs, and is revealed in a new light in modern society. Life realities have changed over several decades, but certain elements of the past and folk wisdom are still making their way through the centuries. The issue of preserving these traditions is becoming relevant, especially in the context of the loss of mass agrarianism and technological prosperity.

Ukrainian November is enriched with a wide variety of traditions, rituals and holidays, and is facing the challenges of modernity. Some traditions may lose their relevance as times change, but many of them still resonate with the population.

Folk sayings and omens, although influenced by time, still live on in the culture. For example, the saying about "Cossack November" or the traditional "visit to the grave" indicate that many people are careful to preserve cultural customs. However, it is clear that some of the "subtleties" of these traditions may have been lost, but they still live on in the memory and practice of older generations.

Festive traditions and rituals demonstrate a vital connection with the past, despite technological progress. People's fear of breaking signs and traditions demonstrates the strength of belief in spiritual and national heritage.

Despite the changes, Ukrainians celebrate their national cultural heritage and make efforts to preserve and pass on traditions to future generations.

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**Sakevych A. O.**

**RELIGION ALS DIE URSACHE DER PSYCHISCHEN  
GESUNDHEIT VON DEN RELIGIÖSEN MILITÄRANGEHÖRIGEN**

*Sprachbetreuer – Doktor der psychologischen Wissenschaften,  
Professor Tsymbal S. W.*

Religion hat einen wichtigen Einfluss auf das Leben der Gläubigen und interagiert mit verschiedenen Aspekten ihres Lebens. Sie zeigt und beleuchtet die Momente der Spiritualität und der Psychologie des menschlichen Verhaltens gleichzeitig und kann auch die Gedanken und Handlungen der Person beeinflussen. Die religiösen Überzeugungen helfen den Menschen oft mit dem Stress umzugehen und die Schwierigkeiten zu überwinden. Darüber hinaus ist die Religion die Unterstützungskraft zur Reduzierung des psychischen Drucks und der schädlichen Auswirkungen von den stressigen Situationen und wirkt sich positiv auf die psychische Gesundheit des Menschen aus (Canda and Furman, 2009).

Zweifellos ist die psychische Gesundheit für die Soldaten von entscheidender Bedeutung, da sie mit den großen körperlichen und emotionalen Belastungen kollidieren. Psychische Belastbarkeit ist eine der stärksten Kraftquellen für jeden Krieger. Es gibt viele verschiedene Faktoren, die die Qualität der Psyche und die Stressresistenz des Menschen beeinflussen, darunter auch die Religion.

Viele Wissenschaftler untersuchten und beschrieben die Beziehung zwischen der Religion und der Psyche. William James, Sigmund Freud, Abraham Maslow, Viktor Frankl und andere – alle diesen Forscher und ihre Arbeiten helfen zu

verstehen, dass die Religion solchen starken Einfluss auf die Psyche des Menschen, insbesondere eines Gläubigen, hat.

Die Religionstheorie im Zusammenhang mit der Verbesserung der psychischen Belastbarkeit zeigt eine spezifische aber gleichzeitig populäre psychologische Tendenz. Sie besteht darin, dass wir den Gläubigen die psychologische Hilfe durch ihre Religiosität bieten können, damit sie eine negative Situation und ihre Folgen leichter wahrnehmen und in den Krisenmomenten Stärke in Gott und „höheren Mächten“ suchen. Die Militärangehörige erlernen die Fähigkeit in Notsituationen ruhig und fachlich zu handeln und die Situation schnell einzuschätzen, nicht nur dank angeborenen Methoden, sondern auch dank dem Komplex der persönlichen Manifestationen, die sich im Laufe des Lebens in einem bestimmten sozialen Umfeld gebildet haben (Cobb, 2016, p. 300-314).

Religion beeinflusst das Verhalten der Menschen und verschiedene Aspekte ihres Lebens. Der Glaube des Menschen hat einen erheblichen Einfluss auf seine Weltanschauung, psychische Gesundheit und seine persönliche Entwicklung. Wissenschaftler unterscheiden folgende Funktionen der Religion: weltanschaulich, kompensatorisch, kommunikativ, regulativ, präventiv, rehabilitativ (Barhem, Younies, Muhamad, 2009, p.123–137).

Derzeit findet der Dienst in den Streitkräften der Ukraine unter extremen Bedingungen statt und verbindet mit der Lebensgefahr. Das hat einen erheblichen Einfluss auf die Persönlichkeit des Soldaten und seine individuellen psychologischen Eigenschaften, trägt zu einer Erhöhung der Anzahl der negativen emotionalen Erfahrungen und Stressreaktionen bei, die die Ursachen für die Entstehung und Akkumulation von verlängerten Stresszuständen sind.

Unter Berücksichtigung aller oben genannten Punkte führte eine Untersuchung über den Einfluss der Religion auf die psychische Gesundheit und die Stressresistenz der Militär durch. Zum Vergleich und zur besseren Bewertung der Ergebnisse wurden 18 Gläubigen und 18 ungläubigen Soldaten, die eine Erfahrung

in Kampfeinsätzen hatten, als die empirische Basis der Studie aufgenommen. Davon waren männliche (96%) und weibliche (4%) Militärangehörige.

Die Hauptmethodiken, die verwendet wurden: der Test zur Bestimmung der Struktur der individuellen Religiosität von Scherbatykh; der Fragebogen zur Stressbewältigung von Karver; Blinovs Kampfstress-Fragebogen.

Der Test zur Bestimmung der Struktur der individuellen Religiosität von Scherbatykh beschreibt verschiedene Aspekte der Religiosität des Individuums, die bei der psychologischen Diagnose und Erforschung der religiösen Einstellungen der Person berücksichtigt werden müssen. Es war wichtig zu verstehen, dass die von uns untersuchten Soldaten ihre Religiosität genau als Glauben an Gott wahrnehmen und nicht als Glauben an Magie, das Universum, „höhere Mächte“ oder etwas Übernatürliches. Diese Information hilft zu klären, worauf der Psychologe bei der Kommunikation mit dem religiösen Klienten konzentrieren sollte und welche Empfehlungen für ihn wirksam sind.

Der Fragebogen zur Stressbewältigung von Karver wurde entwickelt, um die situativen Bewältigungsstrategien und die persönlichen Reaktionsstile, die diesen Strategien zugrunde liegen, zu messen.

Die Ergebnisse der Methodik zur Stressbewältigung von Karver (Tabelle 1).

*Tabelle 1. – Die Bewertung der Bewältigungsstrategien von den Militärangehörigen von der Methodik zur Stressbewältigung von Karver*

	Gläubigen			Atheisten		
	<i>Hoch</i>	<i>Mittel</i>	<i>Niedrig</i>	<i>Hoch</i>	<i>Mittel</i>	<i>Niedrig</i>
<b><i>Aktive Handlungen</i></b>	<b>100%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b><i>Die Ablehnung von den konkurrierenden Tätigkeiten</i></b>	<b>91.7%</b>	<b>8.3%</b>	<b>0%</b>	<b>66.7%</b>	<b>33.3%</b>	<b>0%</b>
<b><i>Die Planierung</i></b>	<b>100%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b><i>Die Akzeptierung</i></b>	<b>91.7%</b>	<b>8.3%</b>	<b>0%</b>			

<b>Positive Umformulierung</b>	<b>91.7%</b>	<b>8.3%</b>	<b>0%</b>
<b>Die Anrede zur Religion</b>	<b>58.2%</b>	<b>33,5%</b>	<b>8,3%</b>

Die Tabelle zeigt die wichtigsten Bewältigungsstrategien, die die untersuchten Soldaten benutzen. Das Spektrum der

Stichprobe der religiösen Soldaten ist sehr breit. Alle vorgestellten Strategien mit ihren Besonderheiten zeigen, dass die Religiosität des Menschen unterschiedliche Wege zur Bewältigung von Stresssituationen eröffnen kann.

Die Untersuchungen von der religiösen Bewältigung zeigen, dass sie so einzigartig unter anderen Stressbewältigungsmethoden ist. Es wurde festgestellt, dass die religiöse Bewältigung als Puffer für Psychopathologie wirkt. Die Benutzung der positiven religiösen Bewältigungsstrategien reduziert Angst- oder Depressionssymptome sogar während der negativen und belastenden Ereignisse (Driskell, Johnston, 2021). Daher ist es möglich die Bedeutung der Verbreitung dieser Bewältigungsstrategien für die Religionsoldaten zu verstehen. Sie brauchen diese Strategien, um ihr psychisches Wohlbefinden zu verbessern und sich vor den schädlichen Auswirkungen von Stresssituationen und negativen Lebensereignissen zu schützen.

Blinovs Kampfstress-Fragebogen zeigt den gesamten integrierten Index der Kampfbelastung von Militärateisten und Militärgläubigen.

Der gesamte integrierte Kampfstressindex von Militärateisten und Militärgläubigen wird in den folgenden Histogrammen dargestellt (Abbildung 1).

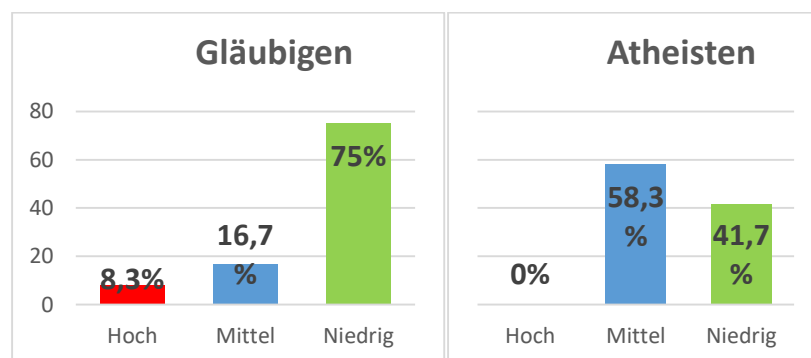


Abbildung 1. – Der Kampfstressindex von Militäranghörigen (Blinovs Methodik)

Die Ergebnisse des gesamten integralen Index von Kampfstress zeigen, dass die gläubigen Militärangehörige den höheren Prozentsatz der Menschen mit dem geringen Kampfstress haben als Atheisten. Diese Ergebnisse unterstützen die Theorie des positiven Einflusses der Religion auf die psychische Gesundheit und Stressresistenz von gläubigen Militärangehörigen.

Religion spielt eine wichtige Rolle als Faktor für die psychische Gesundheit der gläubigen Militärangehörige. Die Einzigartigkeit der Religion liegt in ihrer Fähigkeit den Menschen spirituelle Unterstützung, moralische Prinzipien und Wege der Entspannung zu bieten, die ihnen helfen können den Stress, der mit dem Militärdienst verbindet, zu reduzieren. Einer der Hauptaspekte der Religion, der zur Verbesserung der psychischen Widerstandsfähigkeit beiträgt, ist der Glaube an eine „höhere Macht“ oder Gott. Der Glaube an etwas, das über die bloße menschliche Existenz hinausgeht, gibt den gläubigen Soldaten die Gewissheit, dass ihre Handlungen und Bemühungen den Sinn und die Bedeutung haben. Die Religion kann in den schwierigsten Situationen eine Quelle der Hoffnung und des Glaubens werden. Außer der spirituellen Unterstützung kann die Religion den Militärangehörigen verschiedene Mittel der Entspannung und des Straßenbaues bieten. Solche Praktiken wie Gebete, Meditation, religiöse Rituale und Riten tragen dazu bei, die psychologische Stabilität der religiösen Soldaten zu erhöhen.

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**Skubanova O. O.**  
**THE IMPACT OF CULTURE ON LEARNING**  
**IN THE CONTEXT OF CROSS-CULTURAL PRAGMATICS**

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In order to understand how culture and a person's cultural identity influence the learning process, we first need to analyze the concept of culture.

Historians, archaeologists, anthropologists, sociologists, cultural scientists give a variety of interpretations of this phenomenon (Eagleton, 2000) – from all objects of the material world created by mankind in opposition to the natural habitat, to the set of rules prescribed to the individual. They distinguish its material, spiritual and social components and agree that the individual's cultural affiliation is not hereditary and is acquired through long and complex learning (Burk, 2019). Training here means the process of acquiring skills (knowledge, abilities) that increase the vitality of the individual in a given society.

In the broadest sense, culture is the sum of the encouraged forms of activity and the values inherent in a certain human community (national – regional, urban – rural, popular – mass – elite, religious, political, legal, sub- and counterculture, etc.) (Lenard, 2020). As such, the following cultural attitudes are transmitted to the representative of the community (Nordquist, 2020): basic (inherent in any culture regardless of its multiplicity and type that include differentiation system, i.e. own – foreign; the principle of hierarchization; the system of gender relations; the intergenerational relations, etc.); and epistemological (a source of authority; a basic value system; a type of social relations; aesthetic adherences; attitude towards death (and afterlife concepts, etc.).



In the narrowest sense, culture is the level of individual competence valued in a particular society (De Block, 2022). An indicator of availability of such competences is the definition of a “cultural person” – that is, such an individual who has a sufficient level of education, ethics and aesthetics established in this community.

The “richness” of the culture and personal capacities of the learner are directly related to the speed and efficiency of learning. Thus, the more complex and diverse the culture, the more time, effort and preliminary skills are required for the individual to learn it.

In general, the learner is expected to have the following competences (Schulte, 2023): mandatory (motivation; observation; readiness to a subordinate role towards the educator; the will to know and implement what has been learned in practice), and “accelerators” (ability to generalize; the skill of conceptualizing the studied; general education; knowledge in related fields; the general notion of such cultural norms as ethical, linguistic, legal, and basic understanding of their violation).

As for the personality of the teacher and their competences, it should be noted that the process of learning cultural norms may not imply their presence, as the teacher can be the cultural environment itself and he or she is required of the presence of experience (knowledge, abilities or skills (Goncharenko, 1997) in which the learner is interested (and this is a mandatory factor); desire and will to learn, empathy (Stueber, 2019) regarding the student’s fatigue, misunderstanding, resistance to studies, mastery of teaching methodologies.

All of the above is applied to the learning of culture in general, regardless of its national or geographical affiliation. However, the experience of intercultural communication leaves no doubt that learning cultures of particular civilizations has its own specificity, which is based on the unique historical experience of a specific community.

Based on the ethnographical research by Huntington (2000), the nine leading ethnocultural formations on the contemporary world map can be highlighted.

Thus, *Western or Euro-Atlantic culture* is based on a logos-centric model of cognition, rationalism, empiricism, competition, team games, forming «horizontal» communication, narrow specialization, promotion of personal initiative, stimulation activity, the value of youth (or active maturity), entrepreneurship, audacity, cult of personality, individualism, the idea of freedom, tendency to expand borders and manage, the application of collective discussions to the search for ideas, pragmatism, reliability, essays, debates, the art of argumentation, history, ethnocentrism (inherited from ancient Greeks and later Romans), equal gender access to education and work. The approved type of the actor is a trailblazer.

*Chinese culture* is characterized by inclination to euphemisms, reliance on Confucianism with its hierarchy, importance of subordination, principles of justice and servitude, perception of order as an ethical category, the necessity of “face-saving”, the cult of ancestors and the phenomenon of “filial piety”, priority of duty over initiative, public good over personal. The approved type of the actor is “noble man”.

*Indian civilization* is fully ritualistic and is based on the Vedic tradition. It instills reverence for written sources in its representatives, frugal respect to cultural monuments, holistic worldview, faith in the “laws of action”/“retribution” (karma), reincarnation, illusion of the material world, liberation of one’s soul from rebirth and the pain and sadness understood by them, the general pessimistic attitude towards the future, value of compassion, peace-loving, idea of non-violence, tolerance, circumspection. The way of cognition is meditation, and the source of true knowledge is personal transcendent experience, which is possible only through self-consciousness, self-control, self-discipline, concentration, physical balance, and mental poise. The approved type of the actor is ascetic.

*Islamic culture* is guided by its reliance on the Qur'an and the Greek cognitive tradition. It teaches its adherents conviction in having a “last knowledge”, confidence in its superiority, the idea of destiny and predefining, attitude towards the person as a tool of faith, high level of ethno-religious consciousness, low level of assimilation

and tolerance towards representatives of other cultures, traditionalism, deference to elders, tendency to seek answers to current problems in the past, culture of intermediation, entrusting control over public processes to “people of religion”, significant difference in gender responsibilities and access to education, importance of preservation of honour and reputation. The approved type of the actor is a sage (an expert in the Qur'an).

*East European culture* is characterized by physico-mathematical cognitive approach, orientation towards experience as the main argument, intuition, disregard for communicative technologies, reliance on classical literature, craving for fundamentality, the formation of universal cognitive (with a very late specialization), establishing informal ties, disobeying the rules, rejecting authorities, stimulating personal initiative at the expense of social hierarchy, encouraging savvy as the ability to spontaneously apply knowledge from one sphere to solving problems in another, adaptability, ingenuity, inclination to independent work, but avoiding personal responsibility, resilience to deprivation, low self-discipline, but ability to short-term overeffort, openness to new, adventurism, gambling, equal gender access to education (with male priority in the work sphere). The type of the actor is a daredevil.

*Japanese civilization*, sprung up on synoism, grows contemplation in its representatives, perception of beauty and order as forms of respect, unpretentiousness, deference to history, love of the motherland as a social norm, traditionalism, continuity in the system of moral education, the cult of ancestors and the concept of filial piety, respect for the authorities, reverence for teachers and the learning process, obedience, gratitude, discipline, self-control, diligence as an indicator of dignity, integrity, moderation, self-restraint, slowness, consideration, prudence, courtesy, the concept of will and duty, the priority of the community over the individual, respect for belonging to other communities, the high value of literacy. The way of understanding the world is aesthetic activity (music, art, ikebana, calligraphy, poetry, etc.). The approved type of the actor is aesthete.

It is worth mentioning separately the *Buddhist cultural code*, which is reverse to the idea of socialization. It is distinguished by “looking inward”, the priority of the fact of psychic reality over physical (Еліаде, 2000). Placing the concept of suffering at the centre of its philosophy, Buddhist knowledge is aimed at finding a way out of it (as out of reality itself). The method of cognition is the system of meditative and physical practices, the goal is to achieve stable altered states of consciousness as a source of “direct knowledge”. Culture is characterized by the ideas of spiritual awakening, “Eightfold Noble Path”, “Four Noble Truths”, the rejection of excesses, the overcoming of ignorance as the cause of suffering. The ideal type of the actor is a bodhisattva, that is, an individual already able to stop all social activities (to enter into nirvana), but delaying the achievement of the ultimate goal out of sympathy for others and a desire to help.

*Latin American and African cultural types* are in the process of self-awareness and self-preservation, and the characteristic features of their epistemes have yet to be considered.

Summing up the results of the studies, it is possible to draw a conclusion that culture as a phenomenon cannot be acquired without learning. It is the learning that serves to integrate the individual into the established cultural community, and his or her personal culture, in turn, is a resource for the development and enrichment of the culture of this community in the future. In the process of learning, the individual does not adopt culture in general, but a specific pattern of behavior and thinking that is part of the cultural code of his or her community. Given that the teaching of the cultural code has been taking place since the earliest years of the individual and is inseparable from the cultural environment itself, it seems impossible to transmit it to other communities. However, in the course of a purposeful and consistent study of the cultural norms of alien civilization, it is possible to overcome misunderstanding, to break cultural stereotypes and, therefore, to increase the effectiveness of communication. The study of the cultural heritage of the community – mythology, religion, classical literature, scientific achievements, objects of art, products of mass

culture, narratives of the actual press can help in the process of identifying these norms.

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**Nikiforova S. M., Tsymbal A. Yu.**

#### **ANALYSIS OF WORKING CONDITIONS OF DENTISTS**

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The incidence, disability and mortality rates of health workers are extremely high. The professional group of medical workers is also characterized by the presence of "hidden" morbidity.

Therefore, now of particular importance is the knowledge of the harmful factors of the production environment of medical workers, the peculiarities of their effect on the human body, the main ways to prevent their negative impact.

Dentists are classified as specialists with a high level of professional morbidity, since their work requires physical strength and endurance under the influence of various harmful professional factors.

Effective professional activity of dentists largely depends not only on their qualifications and material and technical equipment of medical institutions, but also on their own health.

Studies of a large number of authors indicate that among the workers of dental specialties there is a high level of morbidity, which ranks third in the level of occupational pathology after infectious diseases doctors, physiologists and psychologists.



For dentists, the most characteristic is the combined and combined effect of negative production factors, among which are:

**Physical:**

- moving parts of production equipment;
- increased dust content of the working area air;
- increased or decreased air temperature of the working area;
- increased or decreased movement of air flows;
- increased voltage of the electrical network;

- increased temperature of equipment surfaces;
- insufficient illumination of the working area; increased brightness of light;
- reduced contrast, increased pulsation of the light flux;
- increased noise level at the workplace;
- increased vibration level;
- sharp edges of tools and equipment;
- ultraviolet, laser beams and ultrasound.

**Chemical:**

- detergent and disinfectant solutions and other surfactants;
- drugs for anesthesia;
- preparations for disinfection;
- mercury vapors in the manufacture of amalgam.

**Biological:**

- biological isolation of the patient.

Among the patients of dental clinics there are those who have tuberculosis, AIDS, diseases transmitted by airborne droplets and contact routes. The possibility of getting sick from such patients is quite large. When teeth are sanitized, carious hollow is treated with a drill, a thick aerosol is created and released from the oral cavity, containing not only solid and liquid particles, but also microbes both virulent and conditionally pathogenic: staphylococci, streptococci, pathogens of tuberculosis, influenza viruses, hepatitis, syphilis, AIDS, etc.

Dentists should treat any patient as potentially infected and take preventive measures to avoid the spread of pathogenic microbes.

**Psychophysiological factors:**

*neuropsychiatric overload:*

- overvoltage of the visual analyzer;
- emotional overload and mental strain;

Every day during their professional activities, dentists are in contact with patients who are excited because of acute toothache and fear of the expected painful manipulations in the oral cavity (first of all it concerns children). The patient's excitation can be transmitted to the doctor, since he receives a fairly large number of patients (depending on the type of admission).

The intensity of the labor process among dentists is noted as one of the harmful factors. This is due to the high responsibility for the result of their own activities, the need for quick decision-making, the likelihood of making a mistake while solving complex clinical problems and working in conditions of limitation and shortage of time.

- monotony of work.

*Physical overloads:*

- static and dynamic overloads;
- forced position of the body.

**Other factors.**

It is generally accepted that irrationally thin handles of instruments lead to overstrain and spasms of the muscles.

Often there is an inconvenient shape of the tips for the drill. The absence of a rotating head makes the doctor turn out his hand when working. Sharp edges on the body contribute to the formation of calluses and cause pain in the fingers, a curvature of the third finger of the hand appears: on the left - due to the inconvenient thin handle of the mirror, on the right - due to the irrational shape of the tip for the drill.

The need to carry out in the process of medical work accurate and subtle manipulations, stereotypical movements, static-dynamic tension of the muscles of the fingers, hands and shoulder girdle, holding tools with the efforts of only the fingers (as when holding a pencil), but with considerable physical effort, leads to hypertrophy of individual muscle groups. In this case, there is the so-called professional pain, which, gradually increasing, causes spastic contraction of the entire group of arm muscles up to the shoulder girdle.



Thus, it can be concluded that the work of dentists has specific features, since doctors of this profile diagnose diseases using a variety of techniques and independently treat them, which makes it possible to qualify their work as visual and manual.

Their work is associated with constant nervous and emotional stress, frequent physical overwork, hypodynamia, infection, with specific working conditions and constant contact with people. In addition, it should be noted that patients have not only dental diseases. Consequently, the dentist has a high risk of being infected from the patient, especially airborne infections.

The leading role in preventing the negative impact of production factors belongs to the employee himself. The dentist must have a high sanitary culture, hygienic knowledge of health protection and promotion and skills to fulfill hygienic requirements.

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**Tykhonova M. Ye.**  
**ABOUT LEARNING NEW VOCABULARY METHODS**

How can we effectively and durably enrich our vocabulary in a new language?

An incredibly effective tool for enriching vocabulary is interactive dictionaries. In society, a dictionary plays a pivotal role as a guiding authority for language users, serving as a social institution that regulates word usage. Unlike their paper counterparts, electronic dictionaries, owing to computer capabilities, surpass in volume and swiftly retrieve required words or phrases within seconds. Typing a word into the command line followed by "Enter" instantly presents the necessary information in a separate window. Interactive dictionaries come in various forms, ranging from concise glossaries to diverse multilingual collections of dictionaries and electronic encyclopedias. They differ in purpose, structure, technological environment, interface, access methods, illustrative environments, and quality. Foreign languages provide flexibility for adaptation in new environments and become essential tools for expanding social connections and professional opportunities.

Let's explore effective methods for learning new words using cards. One of the most efficient techniques ensuring rapid and lasting word retention is mnemonic memorization through cards. Understanding memory involves a wide explanation, including the electrochemical interaction of neurons leading to the formation of chains. However, the microscopic understanding of bio molecular interactions remains limited. To swiftly expand one's vocabulary, cards can be utilized in various ways:

1. Attachment to Objects.

It is about affixing word cards onto objects for frequent visibility and better retention.

2. Visual Associations.

It deals with creating associations between a card with an image and the corresponding word, aiding memorization through visual representation.

3. Two-sided cards.

This way means utilizing one side for the word and the other for its translation or phonetic transcription.

4. Diverse Themes.

It works choosing cards suited to one's preferences—whether for adults or children, general or thematic, containing multiple language combinations.

For effective learning using cards, a few key steps are essential. They are categorization which means dividing words into manageable groups for gradual learning instead of overwhelming yourself with an extensive list; thematic organization which deals with learning words based on themes to simplify memorization and application in real-life situations; active usage needed for applying learned words in sentences and daily communication to reinforce retention; working with synonyms and antonyms in order to expand vocabulary by using words of similar or opposite meanings.

These methods create an interactive and engaging learning experience, facilitating rapid comprehension and retention of new words related, for example, to the theme "Learning Computer. So there are several exercises to your attention.

1. Term Matching.

Create two-sided cards with English terms on one side and their equivalents in your native language on the other. While studying, try to match the terms from both sides of the card.

2. Computer Association.

Write technical terms on the cards and specific examples of their usage on the flip side. The task is to associate the terms with their potential applications.

3. Photo Association.

Use cards with images of computer devices or software. Write corresponding terms on the back of the cards. The objective is to establish a connection between the image and the correct term.

4. Pair Game.

Distribute cards with English terms and cards with their counterparts in the native language to the participants. Their task is to find matching pairs and correctly link them.

5. Thematic Classification.

Create cards with words related to specific aspects of computers: hardware, software, networks, etc. Ask the participants to classify these words according to the themes. These exercises will help understand and memorize new terms associated with computers and their functioning.

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**Shevchenko S. Yu.**

**PHRASEOLOGICAL FUSIONS IN THE NOVEL “THEATRE” BY  
W. S. MAUGHAM AND THEIR TRANSLATION INTO  
THE UKRAINIAN LANGUAGE**

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Translation of English phraseological fusions into Ukrainian poses a particular problem, because English and Ukrainian are not the related languages. Phraseological fusions are specific for every language and do not allow word for word translation into other languages. Studies of English phraseological fusions and their Ukrainian versions help understand the degree of their correspondence.

The purpose of the research was to determine phraseological units in the novel “Theatre”, identify phraseological fusions among them and analyze their versions in one of the Ukrainian translations of the novel.

The material for the research was drawn from the text of the novel “Theatre” by W. S. Maugham, from the text of the Ukrainian version of this novel translated by N. Mykhailovska, and from the works by such scholars as V. Vinogradov, A. Kunin, M. Mostovyi, M. Trifonova, T. Krylova.

The methods employed in the research were the method of semantic identification, the method of phraseological identification, and the contextual method.

Theoretical and practical value of the research is determined by the fact that its results can be used in the course of lectures in English phraseology, in the classroom for home-reading, and by students studying the English language.

Phraseological units of different structures and types can be identified with the use of two acknowledged classifications: V. V. Vinogradov’s classification and O. V. Kunin’s classification.

V. V. Vinogradov’s classification is based on semantic criteria. It contains three classes of phraseological units (Мостовий, 1993): 1) phraseological unities; 2) phraseological combinations; 3) phraseological fusions.

O. V. Kunin’s classification is based on structural and semantic criteria. It includes four classes of phraseological units (Мостовий, 1993): 1) nominative phraseological units; 2) nominative-communicative units; 3) phraseological units of neither nominative nor communicative character; 4) communicative phraseological units.

O. V. Kunin further divides these classes into different categories and subclasses. O. V. Kunin’s classification is considered to be more comprehensive, but, nevertheless, it does not allow for classification of more than 50 types of phraseological units. tasks structure. For example, *Now let's come down to brass tacks* (Maugham, 1985). А тепер перейдімо до суті (Моем, 2023).

In the process of translation of English phraseological fusions into the Ukrainian language, N. Mykhailovska (Моем, 2023) used the following methods:

1. Equivalent translation, which implies that the translated version corresponds the original in meaning, lexical composition, style and grammatical

We chose V. V. Vinogradov's classification since it was more suitable for the

2. Word for word translation. For example, ...*the only thing is to grin and bear it* (Maugham, 1985). ...єдине, що застається, – це усміхатися і терпіти (Моем, 2023).

3. Looking for a Ukrainian phraseological unit that corresponds the original in meaning and style. For example, "*By God, it was a put-up job.*" (Maugham, 1985). Мій Боже, розіграли все як по нотах (Моем, 2023).

4. Lexical translation, when a phraseological unit is translated with the use of a certain lexeme identifier. For example, *I'm quite sure you could get round her if you tried* (Maugham, 1985). Я цілковито певний, що ти могла б її улестити, якби спробувала (Моем, 2023).

5. Semantic or descriptive translation, when a phraseological unit is not translated, but interpreted. For example, *It was just like his good nature to come to the rescue when he knew she was at a loose end* (Maugham, 1985). Як це на нього схоже – прийти їй на допомогу, зрозумівши, що вона не знає, чим зайнятися. (Моем, 2023)

6. Re-interpretation. For example, *You put that where the monkey put the nuts, dearie* (Maugham, 1985). Говорила, балакала, сіла і заплакала (Моем, 2023).

Our special attention was focused on instances where English phraseological fusions were translated into Ukrainian with the use of Ukrainian original idioms. We identified 15 instances of this type of translation. For example:

1. *You put that where the monkey put the nuts, dearie.* (Maugham, 1985). Говорила, балакала, сіла і заплакала (Моем, 2023).

2. *Take my word for it, it won't be long before they find out they've been sold a pup*. [4 – с.26]. Повір мені на слово, небагато часу мине, як довідаються, що купили kota в мішку (Моем, 2023).

3. *Julia was silent for a fraction of a second. It was his champagne and his compartment. Oh, well, in for a penny, in for a pound* (Maugham, 1985). Якусь частку секунди Джулія помовчала. Урешті, це його шампанське і його купе. Ну гаразд, згорів тин, гори й хата (Моем, 2023).

4. *Well, I'll cook his goose all right* (Maugham, 1985). Гаразд, спечу йому книш (Моем, 2023).

5. *...he said you'd be glad to have us off your hands, and I didn't like to make a song and dance about it* (Maugham, 1985). ... він сказав, що ви радо нас здихаєтеся. Мені не хотілося водити довкола цього хороводи (Моем, 2023).

6. *Men were such fools; there wasn't one of them who wouldn't cut off his nose to spite his face*. [4 – с.98]. Чоловіки такі дурні, нема серед них жодного, хто на зло бабусі не відморозив би собі вухо (Моем, 2023).

7. *You could have knocked me down with a feather when he said all those things to me* (Maugham, 1985). Коли він усе це сказав, це було як грім із ясного неба (Моем, 2023).

It should be noted that some phraseological fusions in the text of W. S. Maugham's novel "Theater" may have remained beyond our attention.

### **Conclusion**

1. Our research has made it possible to determine 221 phraseological units of different types on 174 pages of the novel "Theatre" by W. S. Maugham, which testifies to a very high level of idiomacity of the text.

2. The quantity of units that can be considered as phraseological fusions according to the classification by V. V. Vinogradov is 73, which accounts to 30% of the total number of phraseological units found in the novel.

3. A greater number of English phraseological fusions were translated into Ukrainian by means of lexical and semantic interpretation. However, we have

identified 15 instances where the translator used Ukrainian idioms without distorting nuances of the meaning of the original.

4. We have also determined some other phraseological fusions that can be translated into Ukrainian with the use of Ukrainian idioms having a close meaning and stylistic colouring. They are presented in Table 1.

Table 1

№	English version	Version in the translation by N. Mykhalovska	Possible version
1	<i>...and with the possibility that Michael might be killed at any moment - it was true he said he <u>was as safe as a house</u>...</i> (Maugham, 1985)	А ще ж і Майкл щомиті міг загинути. Щоправда, казав, наче він у такій безпеці, <u>як вдома</u> ... (Моем, 2023)	А ще ж і Майкл щомиті міг загинути. Щоправда, казав, наче він у такій безпеці, <u>як за кам'яною горою, (як у Бога за дверима, як у батька за плечима)</u> ...
2	<i>That would get <u>him on the raw</u>.</i> (Maugham, 1985)	Боже, <u>вона зведе з ним порахунки</u> . (Моем, 2023)	Це <u>допече його до серця, (зацепить його за печінки)</u> .
3	<i>Oh, what's the good of <u>beating about the bush</u>?</i> (Maugham, 1985)	<u>Тобі слід було спитати, а я б сказала</u> . (Моем, 2023)	До чого ходити <u>коло та навколо, (ходити околясом)?</u>
4	<i>After a fortnight of rehearsals, Michael was thrown out of the part for which he had been engaged, and for three or four weeks was left to <u>kick his heels about till something else could be found for him</u>.</i> (Maugham, 1985)	Після двох тижнів репетицій Майкла зняли з ролі, на яку його було ангажовано, і залишили на три-чотири тижні <u>тинятися без діла</u> , доки для нього знайдуть щось інше. (Моем, 2023)	Після двох тижнів репетицій Майкла зняли з ролі, на яку його було ангажовано, і залишили на три-чотири тижні <u>бити байдики</u> , доки для нього знайдуть щось інше. (Моем, 2023)

5. The examples from Table 1 show that the Ukrainian language possesses a high idiomatic capacity, which makes it possible to successfully use Ukrainian original idioms for translation of English phraseological fusions without distorting nuances of their meaning and style.



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# ECONOMIC SCIENCES

**Barkova O. H.**

## **ADVANTAGES AND DISADVANTAGES OF STANDARD (TRADITIONAL) AND NON-STANDARD (NON-TRADITIONAL) FORMS OF EMPLOYMENT**

*Language Advisor – Asst. Prof. Chevychelova O. O.*

Employment is an activity that adheres to legislation and addresses the needs of the information society, providing individuals with a source of income. According to Ukrainian legislation, there are various forms of employment, including full-time and part-time employment, explicit and implicit arrangements, primary and secondary roles, as well as flexible forms of employment (The Law of Ukraine, amended in 2023). These employment structures consider diverse working conditions and circumstances, allowing the information society to choose the option that best aligns with their needs and circumstances.

According to the nature of workplace organization and working hours, there are standard (traditional) and non-standard (non-traditional) forms of employment. Standard employment typically implies that an individual is employed by an enterprise or organization, holds an indefinite employment contract, and works full-time under the direct supervision of the employer or managers appointed by the employer. The advantages and disadvantages of standard employment are shown in Table 1.

*Table 1. – Advantages and disadvantages of standard employment*

<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
Income stability	Lack of flexibility
Social benefits	Limited amount of free time
Professional development	Lack of workplace flexibility
Community and teamwork	Risk of job loss

Regarding the advantages of standard employment:

*Income stability.* Permanent employment ensures a consistent income stream, allowing individuals to plan their finances and manage consumer spending effectively.

*Social benefits.* Employees typically have access to social packages such as health insurance, pension plans, vacation time, and other benefits.

*Professional development.* Permanent employment offers opportunities for skill development and career growth through training and professional advancement.

*Community and teamwork.* Standard employment fosters communication and collaboration with colleagues, contributing to a positive working atmosphere and effective interaction.

Regarding the disadvantages of standard employment:

*Lack of flexibility.* Standard employment often comes with a strictly regulated work schedule, limiting the ability to manage time independently.

*Limited free time.* The standard working day typically occurs in an office or at a specific workplace, potentially restricting the amount of free time available for entertainment and personal life.

*Lack of workplace flexibility.* Employees are usually required to work in a fixed office or at a specific location, which may be inconvenient for those seeking more flexible work options.

*Risk of job loss.* Standard employment carries the risk of job loss due to changes in the company, economic difficulties, or other factors that may lead to financial instability

All other forms of employment that differ from the standard are considered non-standard (Huzar, 2013). Non-standard employment includes various variations, such as temporary work, self-employment, remote employment, etc. In these forms of employment, working hours and conditions may be less standardized and more flexible.

In modern conditions, when the post-industrial model of employment is being formed, many new forms of work appear that differ from standard (traditional) employment and can be more adaptable to the needs and capabilities of employees.

L. Davydiuk, in researching trends in the development of the international labour market, observes that at the present stage, non-standard forms of employment are becoming more prevalent (Davydiuk, 2015). Non-standard forms of employment encompass the following types:

- part-time work or part-time employment;
- temporary or short-term employment;
- work from home;
- remote (remote or electronic) employment;
- self-employment;
- pseudo-self-employment;
- work through agency services on a temporary basis, as well as employment through loan personnel (staff leasing, outstaffing, outsourcing).

Today, scientific discussions employ various terms for non-standard (non-traditional) employment that diverges from standard (traditional) employment. These terms encompass "unstable employment," "atypical employment," "flexible employment," and "innovative employment" (Hots, 2021). All these concepts highlight different aspects of employment that deviate from traditional norms and standards. It's worth noting that the definition of standard employment can be relative and may change over time and across different countries.

Table 2 shows the advantages and disadvantages of non-standard employment

Table 2. – Advantages and disadvantages of non-standard employment

<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
Flexibility in the work schedule	Unstable income
Selection of projects	Lack of social benefits
Ability to work remotely	The need for self-motivation
Increased income opportunity	Competition
Expanding the network of connections	Lack of stability

Regarding the advantages of non-standard employment:

*Flexibility in the work schedule.* Freelance work provides the opportunity to choose your own work schedule, allowing you to work at a time that suits you. This is particularly beneficial for those with other commitments or those seeking more time for their personal life.

*Selection of projects.* You can choose projects that align with your interests and skills, enabling you to develop your capabilities while doing what you enjoy.

*Ability to work remotely.* Many freelance jobs offer the flexibility to work from anywhere, allowing you to travel or live in different locations while continuing to work remotely.

*Increased income opportunity.* In some cases, freelancers can earn more than their full-time counterparts. They can participate in several projects at the same time and set their own pricing policy.

*Expanding the network of connections.* Freelance work can assist in building a broad network of connections within your industry or areas of interest. Interacting with various clients and colleagues from different countries and companies can open up new opportunities for collaboration and career development.

Regarding the disadvantages of non-standard employment:

*Unstable income.* Freelance work can be unpredictable, leading to income fluctuations. At times, you may have many projects, while other times, you may need to actively seek new orders.

*Lack of social benefits.* Freelancers typically do not have access to social benefits such as health insurance, vacation and pension contributions, which can be a financial burden.

*The need for self-motivation.* Freelance work requires a high level of self-discipline and self-motivation, as you are solely responsible for your progress.

*Competition.* Markets can be highly competitive, and it's hard to stand out from other freelancers.

*Lack of stability.* Freelancers lack the job stability that comes with full-time positions in a company.

### **Conclusions**

Standard forms of employment generally satisfy employees, while non-standard forms can play a crucial role in addressing unemployment issues, particularly during times of war. The widespread adoption of remote work and work-from-home practices, accelerated by the Covid-19 pandemic, highlights the prevalence of forced remote employment in the current global labour market. Non-standard employment options, including remote work, freelancing, and blogging, lack clear legislative regulation, leading to an increase in precarious work situations among Ukrainians. These alternative employment forms are highly relevant but require precise legal frameworks to safeguard the well-being and rights of those involved.

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**Boyko V. Yu.**

**CONDUCTING A TRAFFIC SAFETY AUDIT AS A KEY TO THE DEVELOPMENT OF THE CITY TRANSPORT NETWORK**

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An extensive transport network has become an integral part of large cities in Ukraine and all over the world. Thanks to the transport network, passengers and goods can move quickly around the city. However, this movement must be not only fast but also safe. Safety means the creation of a complex of conditions and requirements, structures, technical and informational means that ensure the minimum probability of road accidents.

The most up-to-date method of road safety assessment is a traffic safety audit. Thus, a road safety audit is a detailed and systematic check of road design solutions for compliance with road safety requirements at the stages of design, preparation for commissioning and subsequent operation (Abramova et al, 2017).

It should also be noted that according to the Order of the Ministry of Infrastructure No. 204 “On the approval of the procedure for conducting a highway safety audit” (2021), highway safety auditing is mandatory on international and national highways.

The main task of the audit is to identify potentially dangerous sections of the road where the coincidence of parameters of road conditions, traffic modes and possible errors of drivers can cause accidents. Based on the results of the traffic audit, it is possible to assess traffic safety and prepare measures to reduce the risk of dangerous situations.



The road safety audit is conducted using special methods and is performed by specialists from various fields. Since the traffic safety audit is performed at all stages of the life of the road, it is possible to get a more accurate picture of the state of road safety.

The main feature of the audit is its complexity and the use of the experience of specialists in various fields (Table 1).

*Table 1. – Peculiarities of the road traffic safety audit*

Road safety audit
It is conducted independently of the designer
Assessment of the impact on safety of various factors such as behavioral characteristics and psychophysiological perception of road conditions by road users
Performed by road safety specialists
Road safety is considered at meetings of specialists with the participation of the center of traffic organization in the city, the audit group, the customer, the designer, the patrol police
Uses special audit methods containing the analysis of various factors and parameters

There are different ways of organizing the work of audit groups. However, the most effective method for each team member is to conduct their own audit. After that, the audit team members meet and discuss their findings. Based on this discussion, a joint audit group report is drawn up.

Auditors must consider the needs of all road users (including pedestrians and cyclists). Traffic must be safe in all weather and lighting conditions. Auditors also take into account the compliance of the traffic conditions with the standards and laws adopted in their country.

It is important to conduct a traffic safety audit in a definite sequence. This sequence is the same and does not depend on the type and scale of the project being

inspected. However, the amount of work that needs to be done at each step will be different (Road Safety Audit Manual, 2004) (Figure 1).

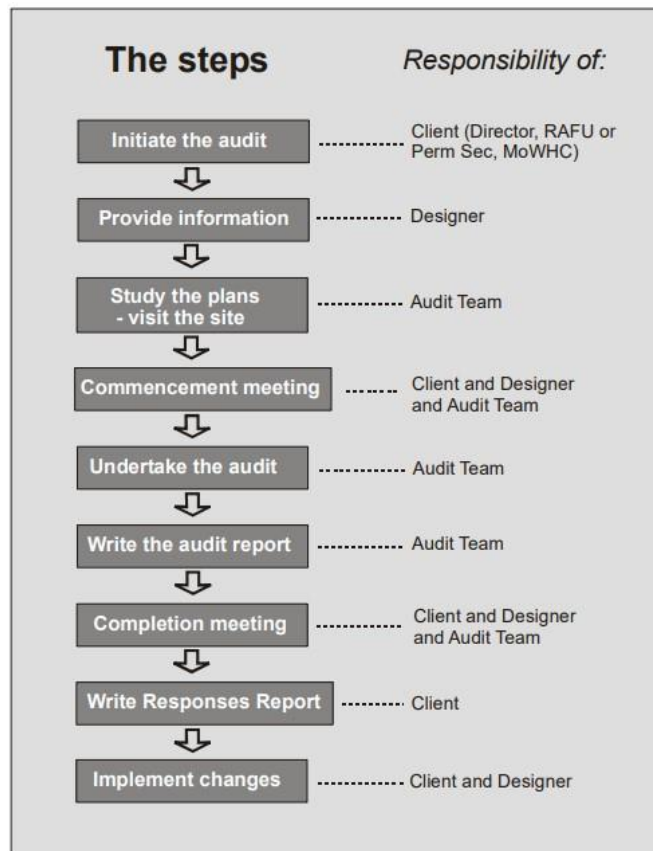


Figure 1. – Steps in the Audit Process

Thus, conducting a traffic audit is a modern method that allows to ensure safety for various road users. The creation of safe conditions of movement makes it possible to increase the efficiency of the transport network and influence the economic situation in the entire city.

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**Danylenko K. O.**  
**ADVANTAGES AND DISADVANTAGES OF CORPORATE  
MODELS IN DEVELOPED COUNTRIES**

*Language Advisor – Asst. Prof. Chevychelova O. O.*

Various models of corporate governance were created based on the type of capitalist systems. EU member states typically adopt two models of corporate governance with distinct characteristics: the Anglo-American model and the continental model.

The Anglo-American model of corporate governance, common to the UK, US, Hong Kong, and Australian companies, tends to prioritize shareholders and encourages aggressive innovation along with cost competition.

It is an outsider-based system used by active capital markets through acquisitions and mergers of public companies. Thus, due to active capital markets, corporate control and securities trading develop under the condition of shareholder dispersion. Countries characterized by this model have highly developed capital markets and investor protection. Therefore, in Anglo-American countries (Great Britain, USA, Australia, and Canada), companies typically have a similar model of corporate governance, featuring an independent board of directors to supervise and control the activities of management with the aim of enhancing, but also overseeing and restoring them.

The continental European or German model of corporate governance, characteristic of continental European and Japanese companies, is a system based on

insiders. It focuses not on how strong the influence of active capital markets is, but on the presence of powerful stakeholders such as banks. The model recognizes multiple interests, starting with the interests of employees, suppliers, managers, buyers, and the community. It promotes the development of innovation and competition. The characteristics of such models derive from the features of the social and business environment in which they first emerged.

Thus, in Germany and Japan, shareholders with large stock portfolios often take an active part in the management of the respective companies. Their role consists of sanctioning poor management, stimulating economic efficiency, and coordinating the interests of the company's social partners, including its employees. In the German model, human capital is considered paramount.

While the Anglo-American model is often based on capital markets, the German model focuses on banking systems. Although German and Japanese banks do not have a high level of ownership in the capital of the companies they finance, they exert strong influence and control over their management systems. The main advantages of this model are monitoring and flexibility of enterprise financing, along with effective communication between the bank and the enterprise. The significant participation of banks in business management gives the system exceptional stability and an increased focus on economic development.

The supervisory board is the central body for implementing the principle of social interaction in company management. Under the Social Security Act 1976, in companies with more than 2,000 employees, half of the board of directors is elected by employees. In the case of a small number of employees, the working group elects one third of the composition of the Supervisory Board. The remaining members of the board of directors are elected by shareholders. The composition of the supervisory board varies from 9 to 22 members, depending on the company. German law provides for large audit commissions. Members of the Supervisory Board are elected by shareholders for four fiscal years according to the term of office. Before its end, members of the Supervisory Board can be re-elected at the General Meeting

by a three-quarters majority. The Supervisory Board elects a chairman and a deputy chairman from among its members. The composition of the Supervisory Board reflects all the main business relations of the company. The German model of corporate governance best reflects the interests of financial investors, such as owners, banks, creditors, etc., and non-financial investors, including employees, suppliers, and government bodies.

It is indisputable that both internal and external systems face inevitable risks. Corporate governance systems are designed to minimize these risks and promote political and economic growth.

The effectiveness of the corporate management system is determined by the successful combination of internal and external control.

Internal control involves measures used within the company to mitigate risks by establishing the relationships between shareholders, managers, stakeholders, and the board of directors. To maintain the effectiveness of these measures, they require the support of various external institutions adapted to national conditions.

A comparison of the advantages and disadvantages of two models of corporate governance – Anglo-American and German-Japanese – reveals that the corporate governance system can be enhanced with the help of the following factors:

- takeovers by companies – in developed countries such as Germany, Japan, the USA, Great Britain, and France, there is a regulated takeover market;
- the competitiveness of services and products has a significant influence on the corporate management of the company. However, this factor acts rather slowly, creating the possibility for shareholders to lose significant sums of money due to a decrease in the quality of products, loss of customers, and certain market segments owing to insufficiently high efficiency of the company's management;
- the capital market, which almost officially recognizes the company's activity and implicitly regulates it by means of the company's price level on the stock market;

- institutional investors who have a significant influence on company management; this is most noticeable in the USA and Great Britain;
- the labour market of managers, which deals with sanctioning managers who receive exaggerated benefits without showing corresponding results, by replacing them.

Although there are considerable differences between the Anglo-American and German systems, they both define the subject of corporate governance.

Contrary to significant differences between the Anglo-American and German systems, they both define the subject of corporate governance in the context of highly developed legal institutions and the functioning of market systems. However, most developing countries and economies in transition lack or have not yet acquired market institutions. Therefore, corporate governance includes a much wider range of issues.

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**Hahunenko O. Yu.**  
**THE ROLE OF SOFT SKILLS IN ENHANCING ENTERPRISE  
MANAGEMENT EFFICIENCY**

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In the ever-evolving landscape of business, the importance of soft skills in the realm of enterprise management cannot be overstated. Soft skills, encompassing a spectrum of interpersonal attributes and personal abilities, play a pivotal role in shaping the efficiency, culture, and success of an organization. As businesses face dynamic challenges, the need for managers with a robust set of soft skills becomes increasingly evident.

1. **Communication skills:** a foundation for success. Effective communication lies at the heart of successful enterprise management. Managers equipped with strong communication skills can articulate their visions, goals, and expectations with clarity. This reduces the likelihood of misunderstandings, aligns team members toward common objectives, and fosters a collaborative work environment. The ability to convey ideas persuasively and actively listen to others creates a foundation for successful leadership.

2. **Interpersonal skills:** nurturing positive relationships. Building positive relationships within and beyond the organization is a hallmark of effective management. Interpersonal skills such as empathy, active listening, and conflict resolution contribute to a harmonious workplace. Managers who can understand and respond to the needs of their team members, clients, and stakeholders create an environment conducive to productivity and job satisfaction.

3. **Leadership abilities:** inspiring and motivating teams. Soft skills such as leadership, motivation, and inspiration are integral to guiding a team toward success. A manager who can inspire and motivate employees fosters a more engaged and productive workforce. Leadership skills go beyond delegation; they involve setting a positive example, instilling confidence, and steering the team through challenges with resilience.

4. **Adaptability:** navigating the dynamics of change. In a business landscape marked by constant change, adaptability is a key soft skill. Managers who can navigate change, embrace innovation, and lead their teams through transitions contribute to the overall resilience of the enterprise. The ability to remain flexible and open-minded positions a manager and their team for success in the face of evolving circumstances.

5. **Problem-solving:** a pillar of decision-making. Soft skills are instrumental in effective problem-solving and decision-making. Managers with analytical thinking and problem-solving abilities can address challenges efficiently, enhancing the organization's ability to overcome obstacles and seize opportunities. A proactive approach to problem-solving ensures a smoother operational flow and helps maintain a proactive stance in the market.

6. **Time management:** optimizing productivity. Efficient time management is a soft skill that empowers managers to prioritize tasks, meet deadlines, and maintain a balanced workload. This skill is crucial for optimizing productivity within the organization and ensuring that strategic objectives are met in a timely manner. A manager who excels in time management sets the pace for the entire team.

7. **Emotional intelligence:** a key to workplace harmony. Emotional intelligence, encompassing self-awareness and empathy, is a soft skill that contributes to workplace harmony. Managers who understand and manage their emotions and those of others create a positive work culture. This skill is particularly vital in handling stress, fostering collaboration, and making decisions with empathy.

8. **Team collaboration:** fostering high-performing teams. Soft skills contribute significantly to effective teamwork. A manager who fosters collaboration, encourages diverse perspectives, and values each team member's contributions can build a high-performing and cohesive team. Team collaboration soft skills ensure that the collective efforts of the team are channeled toward shared goals.

9. **Conflict resolution:** navigating workplace challenges. Conflicts are inevitable in any workplace, but soft skills play a crucial role in resolving them



effectively. Managers with strong conflict resolution skills can address issues promptly, find mutually beneficial solutions, and maintain a healthy work environment. Effective conflict resolution fosters a culture of open communication and problem-solving.

10. Customer relations: building lasting connections. For customer-facing roles, soft skills are pivotal in establishing and maintaining positive customer relationships. This includes effective communication, active listening, and problem-solving skills. Managers who excel in customer relations soft skills contribute to the organization's reputation and long-term success.

Thus, soft skills are crucial for the success of enterprise management, influencing both individual effectiveness and the overall culture, productivity, and success of the organization. Recognizing the significance of soft skills and investing in their development can lead to more resilient and adaptive enterprises in today's competitive business landscape. As businesses strive for sustained success, the cultivation of soft skills among management emerges as a strategic imperative.

In conclusion, the future of effective enterprise management hinges on the continuous development and prioritization of soft skills. Organizations that invest in nurturing these skills among their managerial cadre will thrive in the current business landscape and position themselves as agile, adaptive, and resilient entities prepared to meet the challenges of tomorrow.

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**Honcharov V. F.**  
**ELECTRIC CARS IN UKRAINE: A NEW MARKET AND ITS  
ASSOCIATED CHALLENGES**

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Electric vehicles (EVs) have emerged as a pivotal component of the EU Green Deal, signalling a broader shift towards sustainability across the continent. Encouragingly, Ukrainian consumers are showing an ever-increasing interest in adopting electric cars. Bolstered by fiscal incentives, the electric vehicle market in Ukraine has experienced rapid growth over the past three years. However, this burgeoning industry faces a set of unique challenges and opportunities within the Ukrainian context.

As of September 1, 2021, Ukraine boasted a fleet of 30,062 electric cars, signifying a remarkable 20 % surge over the preceding six months. Beyond environmental considerations, the allure of tax benefits has undoubtedly propelled this trend, including exemptions from customs duties and VAT. Importantly, purchasers are subject to a nominal excise tax of just EUR 1 per 1KW\*h of battery capacity. Moreover, companies exclusively dedicated to the production of electric engines, batteries, chargers, as well as electric and gas vehicles, are exempt from profits tax. A compelling economic case is also being made for EVs, with the cost of traveling 100 kilometres in an electric car amounting to approximately UAH 33, a considerable saving compared to conventional internal combustion engine (ICE) vehicles (Carlier, 2023).

Despite this growth, electric cars remain a minority presence, especially when contrasted with the 14 million ICE cars currently on Ukrainian roads. It's worth noting that all electric cars in Ukraine are imported, with brands like Audi, BMW, Hyundai, JAC, Jaguar, Mercedes-Benz, Nissan, Porsche, and Renault leading the charge. Notably, Tesla has yet to establish an official presence in Ukraine due to the absence of a dedicated sales outlet. Over time, Ukrainian drivers have exhibited a growing preference for cars with higher battery capacities. For instance, the market share of Nissan Leaf has dwindled from 85% to 60% in the last three years.

The primary challenges associated with electric car ownership in Ukraine revolve around limited mileage per charge and lengthy charging durations, necessitating the development of a robust charging infrastructure. Presently, only major cities boast a reliable network of charging stations, while regions grapple with the inconvenience of scarce charging options.

As of August 2021, Ukraine had made significant strides with 11,500 charging points for electric cars, a considerable improvement from a mere 35 chargers in 2014. Interestingly, Ukraine outpaces countries like Spain and Belgium in terms of the sheer number of chargers. Nevertheless, the availability of high-power chargers, those with a capacity of 50 KW and higher, remains limited at just 30%. In recent years, the absence of fast and super-fast charging stations on key highways had posed a significant impediment to long-distance electric travel. While progress has been made, such constraints have only partially been alleviated on routes like Kyiv-Lviv, Kyiv-Odesa, and Kyiv-Poltava (Грома & Глущенко, 2019).

However, the growth of the charging infrastructure in Ukraine is characterized by sporadic development and a lack of standardization. Most charging stations are installed by individuals, who source them from various manufacturers, resulting in varying quality and information protocols. Notably, charging stations also emerge within unconventional settings like restaurants, hotels, parking lots, supermarkets, and entrepreneurial ventures, often registered as street vending objects, transformer boxes, or even advertising installations.

Besides charging considerations, electric car maintenance can be notably expensive. In Germany, for example, insurance premiums for electric vehicles are 10% higher than their ICE counterparts, and repair costs for damaged electric cars run about 30% higher on average. The primary culprits are the costly batteries, which can command prices up to EUR 20,000, and the expensive electric wiring systems, susceptible to damage from rodents and pests, with replacements averaging around EUR 7,000.

Electric car batteries pose additional challenges compared to ICE vehicles, notably in terms of space and weight. Comprised of hundreds of individual lithium-ion cells, disassembling these batteries is a complex task. Moreover, they contain hazardous materials and can pose explosion risks if not handled correctly. A mere 5% of lithium-ion batteries worldwide are currently recycled (Іващук, 2023).

To address these concerns, several manufacturers are taking steps towards battery sustainability. Nissan, for instance, repurposes old batteries from its Leaf cars for use in automated guided vehicles within its factories. Volkswagen makes it in a similar way and they inaugurated its first recycling plant in Salzgitter, Germany, with plans to recycle up to 3,600 battery systems annually during the pilot phase. Renault also takes part in battery recycling, albeit on a smaller scale.

In Ukraine, the proportion of new cars within the total vehicle purchases increased from 9% in August 2020 to 19% in August 2021. Notably, out of the 5,200 electric vehicles registered from January to August 2021, a staggering 89% were pre-owned cars. Consequently, Ukrainians are predominantly importing used electric vehicles, thereby raising concerns about the recycling of retired batteries.

By 2030, an estimated 12 million tons of lithium-ion batteries are expected to reach the end of their life cycle worldwide. In 2019 alone, electric cars placed on the road are projected to generate approximately 500,000 metric tons of battery waste on a global scale. To mitigate the looming challenge of electronic waste, the European Union has proposed comprehensive changes to battery regulations, including targets for a 70% collection rate for lithium-ion batteries, recovery rates of 95% for key metals such as cobalt, copper, lead, and nickel, and a mandate for minimum levels of recycled content in new batteries by 2030.

However, the financial burdens associated with compliance may incentivize some second-hand car sellers to operate outside the EU. An estimated one-fifth of the roughly 400,000 Nissan Leaf electric cars produced by the end of 2018 now find registration in countries like Ukraine, Russia, Jordan, New Zealand, and Sri Lanka, where battery disposal regulations are less stringent.

In light of these challenges, the Ukrainian government finds itself at a crossroads, needing to both encourage the transition to environmentally friendly electric vehicles and formulate plans for the proper disposal of retired lithium-ion batteries. Furthermore, aligning regulatory frameworks with EU standards is not only beneficial for Ukraine but also facilitates international cooperation in addressing these emerging concerns.

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**Kaliuzhnyi V. Yu**

**CHALLENGES IN TRAINING ACCOUNTING AND AUDITING SPECIALISTS IN THE CONTEXT OF EUROPEAN INTEGRATION**

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In the dynamic landscape of European integration, the demand for skilled accounting and auditing specialists has grown exponentially. However, this surge in demand is accompanied by a myriad of challenges in training professionals in these fields. This article delves into the key problems faced in the training of specialists in accounting and auditing against the backdrop of European integration.

**Harmonization of Standards:**

- Discuss the challenges arising from the need to align accounting and auditing standards with European regulations.
- Explore the complexities faced by educators in adapting curriculum to comply with evolving standards.
- Emphasize the importance of a unified approach to standardization to facilitate seamless professional mobility across European countries.

**Cross-Border Regulatory Variations:**

- Examine the hurdles posed by diverse regulatory frameworks across European countries.
- Highlight the importance of training specialists who can navigate and understand the nuances of these variations.

- Discuss potential solutions such as creating a centralized regulatory body or establishing mutual recognition agreements to streamline cross-border professional qualifications.

#### Technological Advancements:

- Address the impact of technological advancements on the traditional roles of accountants and auditors.

- Discuss the challenges in incorporating technology-related curriculum and practical training to meet industry demands.

- Explore the integration of emerging technologies like blockchain and artificial intelligence into accounting and auditing practices, emphasizing the need for adaptive training programs.

As the financial landscape undergoes a profound digital transformation, the role of technology in accounting and auditing cannot be overstated. Emerging technologies such as artificial intelligence (AI) and blockchain are reshaping traditional practices, demanding a paradigm shift in how specialists are trained. Educators face the challenge of not only incorporating these technological advancements into curricula but also fostering an environment that encourages adaptability. The need for specialists with a strong foundation in data analytics, cybersecurity, and technological integration is now more pressing than ever. Training programs must strike a balance between theoretical understanding and practical application, preparing professionals to navigate the complexities of a digitized financial world. Moreover, fostering a mindset of continuous learning is paramount, ensuring that accounting and auditing specialists stay ahead in an ever-evolving technological landscape.

#### Language and Cultural Barriers:

- Explore the difficulties faced by students and educators in overcoming language and cultural differences.

- Highlight the importance of fostering a cross-cultural understanding to enhance effective communication in the professional environment.

- Suggest the incorporation of language proficiency courses and cultural awareness programs within accounting and auditing curricula.

In the context of European integration, where professionals often find themselves working across borders, the significance of cross-cultural competence cannot be underestimated. Language barriers and cultural nuances pose challenges in effective communication and collaboration. Training programs must go beyond the technical aspects of accounting and auditing, incorporating modules that emphasize cross-cultural understanding. Exposure to diverse perspectives and practices equips specialists to navigate the intricacies of multinational collaborations seamlessly. Furthermore, international internships and exchange programs can offer invaluable experiences, providing students with a firsthand understanding of different business environments. By cultivating cross-cultural competence in training, we not only enhance the professional capabilities of specialists but also contribute to the harmonious integration of financial practices across European nations.

#### Continuous Professional Development:

- Discuss the need for ongoing professional development in the rapidly evolving field of accounting and auditing.
- Explore strategies to encourage specialists to engage in continuous learning and skill enhancement, such as mandatory continuing education requirements and industry-led certification programs.
- Emphasize the role of professional associations in facilitating networking and knowledge-sharing opportunities for specialists.

#### Practical Training Opportunities:

- Examine the shortage of practical training opportunities for accounting and auditing students.
- Suggest ways to bridge the gap between theoretical knowledge and practical application through internships and partnerships with industry players.



- Advocate for collaborative initiatives between educational institutions and businesses to provide students with real-world exposure to accounting and auditing practices.

Ethical Considerations:

- Address the ethical challenges faced by professionals in accounting and auditing.

- Discuss the importance of instilling a strong ethical foundation in training programs to uphold the integrity of the profession.

- Explore the role of case studies and ethical dilemma scenarios in training to enhance ethical decision-making skills among specialists.

In conclusion, the training of specialists in accounting and auditing within the context of European integration is a complex and multifaceted endeavor. Overcoming these challenges requires a collaborative effort from educational institutions, regulatory bodies, and industry stakeholders. By addressing issues such as harmonization of standards, technological advancements, and cross-cultural understanding, and implementing innovative solutions, we can ensure that accounting and auditing specialists are well-equipped to navigate the evolving landscape of European integration.

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**Kramarenko O. S.**  
**LES OUTILS MODERNES DE GESTION DES RESSOURCES**  
**HUMAINES**

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Le passage d'une entreprise à l'utilisation active des technologies des ressources humaines indique tout d'abord que l'entreprise a atteint un niveau qualitativement nouveau. Après tout, le succès d'une entreprise ne dépend que des actions des personnes qui y travaillent, et c'est pourquoi la gestion du personnel doit être considérée comme une composante stratégique de l'organisation dans son ensemble.

Les quatre fonctions essentielles de la GRH sont le recrutement des salariés, la rémunération du personnel, la gestion prévisionnelle de l'emploi et des compétences et l'amélioration des conditions de travail. On peut aussi les classer en fonctions managériales et fonctions opérationnelles. Comme tous les métiers, la fonction ressources humaines bénéficie de nombreux outils que les professionnels des ressources humaines peuvent utiliser au quotidien. Ces outils concernent divers aspects de la gestion des ressources humaines

Le gestionnaire des RH joue généralement trois rôles principaux dans une entreprise : administrateur, consultant interne et, de plus en plus, partenaire commercial. Plus la direction associe d'attentes à ses activités, plus l'ensemble des connaissances et des compétences qu'il doit posséder est important. Étant donné qu'il est le lien entre la direction et les employés, et que c'est entre eux que les situations de conflit et de stress surviennent le plus souvent, un gestionnaire des RH devrait avoir les compétences d'un médiateur dans son arsenal, car la connaissance des bases de la médiation sera utile non seulement aux futurs médiateurs professionnels, mais aussi à toutes les personnes qui doivent faire face à des négociations.

La médiation est aujourd'hui activement utilisée pour résoudre les conflits dans les entreprises et entre les entreprises, ainsi que dans les conflits familiaux

(établissement de contrats de mariage, soutien aux procédures de divorce, résolution des problèmes d'héritage) et dans les litiges civils.

Pendant longtemps, l'activité principale des services du personnel des entreprises ukrainiennes a été le travail de bureau. Aujourd'hui, il ne s'agit que d'une partie insignifiante des tâches du responsable des ressources humaines, qui comprennent également le recrutement, la formation du personnel et d'autres questions relatives au personnel de l'entreprise. Pour exercer cette fonction avec succès, un gestionnaire doit, en plus de la médiation, posséder des connaissances et des compétences dans ce domaine. Tout d'abord, il doit être un expert dans son domaine, avoir une bonne connaissance des outils et des technologies nécessaires à la gestion du personnel.

Une compétence très importante pour un spécialiste des ressources humaines consiste à se concentrer sur un client interne (chef d'entreprise, responsable hiérarchique, employé ordinaire) et à s'efforcer de répondre à ses besoins aussi efficacement que possible. En outre, il doit posséder une compétence développée en matière de "gestion de l'exécution", dans laquelle se manifestent des compétences organisationnelles : planification, délégation, etc. Aujourd'hui, le travail d'un gestionnaire des ressources humaines est étroitement lié à des projets, de sorte que la compétence "travailler sur des projets" devient de plus en plus importante. Toutefois, la capacité à établir et à gérer des relations commerciales avec des partenaires - recruteurs, sociétés de formation, organisateurs d'événements d'entreprise, etc. Les responsables des ressources humaines jouent aujourd'hui, d'une manière ou d'une autre, le rôle de consultants internes dans leur entreprise. Il s'agit tout d'abord de la résolution des conflits internes, pour laquelle le gestionnaire des ressources humaines doit avoir la volonté et la capacité de trouver, avec les chefs de service, des solutions à des situations inhabituelles - souvent en utilisant des méthodes non standard. Dans le même temps, un gestionnaire des ressources humaines ne peut se passer d'excellentes compétences en matière de communication, de l'aptitude à exprimer ses idées par écrit et oralement, et de la capacité à mener des discussions de groupe.

Des compétences en matière de conseil sont également nécessaires : par exemple, l'identification des besoins des clients internes ou la capacité à poser les "bonnes" questions.

En tant que consultant, un gestionnaire des ressources humaines doit posséder certaines qualités personnelles, qui peuvent également être attribuées à des compétences telles que le sens du tact, l'éthique, une attitude positive à l'égard des gens et l'ouverture d'esprit. L'empathie - la capacité d'une personne à réagir émotionnellement aux expériences d'une autre personne - est l'une des exigences les plus importantes pour un gestionnaire du personnel. Pour un spécialiste qui n'a pas cette dignité, il est peu probable que les gens aillent parler de leurs problèmes.

Un gestionnaire des ressources humaines moderne est un gestionnaire stratégique, dont les fonctions comprennent l'élaboration de la politique du personnel de l'entreprise, ce qui implique le développement d'un système de formation du personnel, le maintien d'un climat psychologique sain au sein de l'équipe et la motivation des employés. Le gestionnaire du personnel appartient à la catégorie des managers. Sa tâche principale est d'assurer l'efficacité des ressources humaines. Le succès d'une entreprise dépend en grande partie des activités du gestionnaire des ressources humaines. Les cadres décident de tout. Ce vieux slogan est toujours d'actualité. C'est du gestionnaire des ressources humaines que dépendent le nombre de personnes nécessaires, leur développement et leur motivation.

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**Nedaikash V. V.**  
**THE MYTH OF MONOPOLY: NAVIGATING THE RISKS OF BIG BRANDS**

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In the world of business, big brands often carry an aura of invincibility. With their widespread recognition, extensive market share, and seemingly unlimited resources, these giants are often perceived as safe bets for investors and consumers alike. However, it's essential to dispel the myth that big brands are infallible. The landscape of commerce is dynamic, and relying solely on the reputation of a well-established brand may not always guarantee success. This article explores the potential pitfalls of assuming that big brands are a foolproof investment and suggests considerations for a more nuanced approach to navigating the business world.

*Market Saturation and Limited Growth Opportunities:* One common misconception is that big brands can continually expand their customer base. In reality, many operate in mature markets where growth opportunities are limited. Saturation can hinder these brands' ability to attract new consumers, making it crucial for investors to assess the potential for expansion in a given market.

*Agility and Adaptability:* Big brands, often characterized by their size and complex organizational structures, may struggle to adapt quickly to changes in consumer preferences or emerging market trends. Startups and smaller competitors, unburdened by bureaucracy, can pivot more swiftly, capitalizing on new opportunities and leaving larger counterparts playing catch-up.

*Innovation Challenges:* Innovation is a key driver of success in the business world. While big brands may have a history of innovation, they can sometimes become complacent, relying on past successes rather than actively seeking new and creative solutions. Smaller, more agile companies may be better positioned to experiment with groundbreaking ideas and technologies.

*Risk Aversion:* The risk-averse nature of large corporations can hinder their ability to embrace unconventional strategies. Fear of failure may lead big brands to

miss out on potential growth opportunities and innovations, limiting their competitiveness in dynamic markets.

*Brand Fatigue:* Consumer preferences are ever-changing, and loyalty to big brands is not guaranteed. Over time, consumers may seek variety and novelty, turning to newer, fresher options. Maintaining consumer interest and excitement is a perpetual challenge for big brands, and their failure to do so can result in a decline in market share.

*Erosion of Consumer Trust:* The relationship between consumers and big brands relies heavily on trust. Any breach of that trust, whether through ethical controversies or perceived dishonest practices, can have far-reaching consequences. Large corporations, with their extensive public profiles, are often under intense scrutiny. A loss of trust can lead to a decline in consumer loyalty, damaging the very foundation upon which big brands build their success.

*High Operating Costs and Economic Uncertainty:* Maintaining a dominant market presence comes at a price, often in the form of high operating costs. Marketing campaigns, expansive infrastructures, and executive salaries contribute to these expenses. During periods of economic uncertainty, these costs can become particularly burdensome. Investors should be mindful of a company's financial health, as heavy operating expenses may impact its ability to weather economic downturns.

*Digital Disruption:* In the age of digital transformation, businesses that fail to embrace technological advancements risk falling behind. Big brands, sometimes constrained by legacy systems and a reluctance to adopt new technologies, may struggle to compete with nimbler, tech-savvy startups. The ability to adapt to digital trends and leverage online platforms is increasingly crucial in maintaining market relevance.

*Changing Demographics and Consumer Behavior:* Societal shifts and evolving demographics can present challenges for big brands accustomed to catering to specific consumer segments. The preferences of new generations, as well as

changing cultural norms, can catch established brands off guard. Companies that fail to adapt to these shifts may find themselves losing relevance and struggling to connect with emerging consumer groups.

*Competitive Landscape and Emerging Players:* The business world is dynamic, and the competitive landscape is in constant flux. Emerging players, often startups with innovative business models or unique value propositions, can disrupt established markets. Investors should remain vigilant to potential disruptors, as these newcomers can quickly gain traction and redirect consumer attention away from traditionally dominant brands.

While big brands undeniably offer stability and recognition, assuming they are foolproof investments can be a costly misconception. Investors and consumers alike should approach the market with a nuanced perspective, recognizing that success requires adaptability, innovation, and an understanding of the dynamic nature of commerce. Diversification of investments, staying informed about industry trends, and considering the potential of emerging players are essential steps in navigating the complexities of the business world. In an era of constant change, embracing a more nuanced approach can lead to more informed decisions and greater resilience in the face of evolving market dynamics.

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**Panchenko A. S.**  
**CURRENT TRENDS IN LOGISTICS SERVICE**

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Logistics plays a crucial role in the competitiveness of enterprises, ensuring timely delivery of goods, minimizing costs and improving customer service. The complexity of modern business emphasizes the importance of effective logistics management.

Logistics service is a key aspect of modern business, aimed at effectively managing the flow of goods from producer to consumer. This is a set of measures that includes planning, controlling and optimization of all stages of the supply chain.

A literature review confirms that logistics services are a key aspect of modern business. Logistics services include inventory planning, transportation, warehouse logistics, order management, and information technology. Optimization of these processes allows us to shorten the supply cycle and improve the level of service.

Inventory management plays a critical role in logistics, influencing financial results and a company's ability to meet demand. The use of modern forecasting methods, RFID (Radio Frequency Identification – a contemporary automatic identification technology that automates the process of collecting and processing information in a contactless way), and automation systems allows for the optimization of inventory levels.

Existing strategies such as Just-In-Time (JIT) and cross-docking are recognized to be effective in reducing inventory and optimizing costs. Consideration of strategies includes JIT (Just-In-Time), which reduces inventory and storage costs, and cross-docking strategies for efficient movement of goods without long stops in warehouses. Personalizing strategies according to product characteristics and market conditions is a key element of successful logistics management. However, to improve logistics systems, it is necessary to consider the latest technologies and strategies that can adapt to changes in the modern business environment.



Types of logistics services can be diverse and encompass various aspects of the supply chain. Here are some common categories:

1. Distribution and transportation of goods.

Efficient transportation and distribution are the cornerstones of logistics. The choice of optimal routes, cooperation with transport companies and the use of freight technologies have a significant impact on delivery times and costs.

2. Warehouse and warehouse logistics management.

Efficient warehouse and logistics management involve the organization of optimal warehouse space, the implementation of intelligent warehouse systems, and the utilization of order-making technologies. These practices aim to minimize time and financial costs, ultimately enhancing operational efficiency.

3. Cargo tracking and monitoring

The use of cargo tracking and monitoring technologies reduces the risk of loss and damage to goods, and also provides more accurate delivery planning, which is especially important in global networks.

The integration of modern technologies such as blockchain, machine learning and others is becoming an integral part of modern logistics, providing transparency, traceability and automation of processes. Modern information systems such as ERP (Enterprise Resource Planning) and WMS (Warehouse Management System) allow you to automate and coordinate logistics processes. The use of IoT (Internet of Things) technologies and data analysis improves the accuracy of forecasting and the efficiency of logistics solutions.

Inventory Management Systems (IMS) play a key role in ensuring the proper level of inventory. Understanding demand, seasonality, and using techniques such as ABC analysis allows for effective inventory management, balancing costs and availability. Models such as EOQ (economic order quantity) and ROP (reorder point) are important tools for inventory management.

Globalization requires more complex supply chain management systems due to the large number of parties. E-commerce provides new challenges in the form of

increasing the volume of small orders. Innovative approaches, such as the use of drones for delivery, are becoming more real.

Service quality and delivery time directly impact customer satisfaction. Optimizing processes, from order fulfillment to delivery, enhances the customer experience and reinforces loyalty. In addition to the accuracy and timeliness of delivery, personalized service, tracking, and convenience in processing returns become crucial elements for satisfying the modern consumer.

All these aspects emphasize the importance of logistics services for modern business. The use of modern technologies, such as blockchain, machine learning and others, allows enterprises to ensure transparency, traceability and automation of processes. Inventory management systems such as EOQ and ROP play an important role in ensuring proper levels of inventory, and understanding global challenges allows the development of innovative approaches to overcome their impact.

The future of logistics services is tied to addressing global challenges such as globalization, climate change and sustainability requirements. However, these challenges open up new opportunities for innovation, new business models and the development of sustainable practices in logistics. Improving logistics services becomes a strategic task for enterprises seeking to achieve not only effective management, but also a high level of competitiveness in the modern business world.

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**Panchenko K. O.**  
**THE ESSENCE OF QUALITY PERSONNEL MANAGEMENT**  
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The significance of studying the quality of human resources management lies in the ongoing necessity to improve the functioning of any company. This importance sees positive trends and increasing popularity every year.

Analysing the existing approaches to the disclosure of the category "quality of personnel management" and determining the directions and methods of its evaluation and improvement, it can be concluded that there is no single theoretical and methodological basis. For this reason, it is necessary to conduct special studies, first of all, to establish the essence of the concept of "quality of personnel management".

Human resources management is a strategic function that includes the development of a human resources strategy, recruitment based on the company's philosophy, encouraging collective efforts aimed at the company's development, stimulating individual efficiency, minimising labour costs and creating a positive social and psychological climate in the workplace (Derykhovska, 2013, p. 343).

The essence of modern human resource management is as follows:

1. Human resource management is a skilled level of enterprise management;
2. Employee collaboration in determining the company's strategy and organisational structure;
3. Unite managers and executives in all departments and at all levels to achieve the goals.

One of the main factors that determine competitive growth, the pace of development of an enterprise, customer satisfaction with the quality of services and the overall efficiency of an enterprise is the quality of the company's human resources.

However, despite the fact that the quality of human resources management is gaining momentum today, these concepts have already been interpreted by well-known scholars.

The Greek encyclopedist Aristotle explored the concept of "quality" in his work *Metaphysics* in the fourth century AD, stating, "Quality is the species distinction of existence."

According to D. P. Boginin and O. A. Grishnov, the quality of the labour force encompasses a range of human characteristics that manifest themselves in the work process. These include the qualifications and personal qualities of the employee, as well as factors such as health, mental abilities, adaptability, flexibility, mobility, motivation, innovation, professional suitability, and moral qualities.

The logical content of the concept "quality" in a generalised form is defined by Y. V. Kuryanov and M. A. Kuznetsov. They identify the following areas of understanding quality:

- Substrate: characteristic of ancient cultures, it is reduced to the characterisation of the basic elements of the universe, the "elements of life" (fire, water, earth, air, etc.);
- Subjective: as a result of the influence of production activity and the formation of scientific and technical disciplines, it is reduced to the consideration of things and their properties;
- Significant: due to the fact that the subject of scientific research is a system;
- Functional: expresses the tendency to define quality by quantitative indicators;
- Integral-oriented: oriented to the comprehensive and holistic coverage of all elements.

The German Association for Quality also defines quality from the perspective of an integral approach: "Quality is a set of characteristics of the properties of a product or process that determine the degree of its suitability for its intended use".

A. Subetto, in his work, treats quality as a multidimensional category and describes it from the perspective of the internal certainty of the category itself and the dialectic of interaction of moments, principles, and aspects. The author emphasises the relevance of the external certainty of the category "quality", on the basis of which individuals are able to distinguish, define and make choices about the subject.

According to many domestic and international experts, the category of "quality" is associated with criteria such as "reliability" and "efficiency". Efficiency is a performance characteristic that reflects the relationship of the results of an activity to its goals, costs, values and needs, and was one of the first to be discussed in the field of management.

In general, improvements in reliability are reflected in various forms of efficiency gains, which tend to remain constant or even increase or decrease, due to the dynamics of the cost structure. In recent years, reliability has become increasingly important in the definition of efficiency.

According to the experience of many companies operating on the principles of quality, quality is error-free work, free from defects both at the stage of the final product and at all other stages of the production process. However, error-free work is one of the main conditions for reliability. In other words, reliability is a property that ensures the proper functioning of a system.

Today, the concepts of quality and human resource management automatically become integral, as they are fundamental components of effective enterprise management:

Firstly, quality should be defined through its "constructiveness", i.e. the set of properties and characteristics as the essential definition of a "thing" that distinguishes it from other "things".

Secondly, this definition should take into account that the level of properties and characteristics is shaped by the interacting parties, i.e. the company represented by management and the employees of the company.

The quality of human resources management is a set of characteristics of the management process (a set of factors introduced for the more successful functioning and development of human resources) that determine the possibility of creating appropriate conditions for the effective functioning, development and use of employees to achieve organisational and personal goals by improving the quality of staff performance.

In other words, staff strive to realise their goals more effectively and achieve corporate goals.

Thus, the importance of quality is gradually increasing, which requires addressing the issue of quality of HRM in organisations. The directions of further research are to determine the criteria for assessing the level of quality of HRM, develop a method of evaluation and ensure the required level of quality.

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**Peleshenko V. O.**

### **SUSTAINABLE DEVELOPMENT AND ACHIEVING ITS GOALS IN UKRAINE**

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The concept of sustainable development formed the basis of the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, which included what is now considered the "classic" definition of sustainable

development: “need-satisfying development in the present, without jeopardizing the ability of future generations to meet their needs”. It was then that leading world leaders recognized sustainable development as the main task, which it remains to this day. The summit was the first international attempt to develop action plans and strategies for the transition to a more sustainable development model. Sustainable development was the solution to the problems of environmental degradation discussed by the Brundtland Commission in its report “Our Common Future” in 1987, whose task was to research the many concerns expressed in previous decades that human activities were having serious and negative impact on planet and that patterns of growth and development will be unsustainable if they continue unchecked.

The Sustainable Development Goals, also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to reduce poverty, protect the planet and ensure that all people live in peace and prosperity by 2030.



*Figure 1. – Sustainable Development Goals*

In 2019, the President of Ukraine by his decree supported the achievement of the Sustainable Development Goals and the results of their adaptation, taking into account the specifics of Ukraine's development, set out in the National Report "Sustainable Development Goals: Ukraine". In December 2020, the Cabinet of Ministers of Ukraine made changes to the Regulations, which henceforth established that the need to achieve the Sustainable Development Goals is taken into account in the process of forming and implementing the state policy of Ukraine. Thus, at the state level, the Sustainable Development Goals are fixed as guidelines for the development of program and forecast documents. And already in July 2020, at the

High-level Political Forum on Sustainable Development under the auspices of the UN Economic and Social Council, Ukraine presented to the world community the first voluntary national review of the state of achieving the sustainable development goals.

As a result of 2019, Ukraine as a whole achieved progress on 15 out of 17 goals. The main achievement is the reduction of the scale of poverty: from 58.3% in 2015 to 43.2% in 2018. Noticeable progress was achieved thanks to the improvement of labor standards and the increase in the coverage of the population with housing subsidies (from 12% in 2014 to 64% in 2017). Ukraine implemented the concept of educational reform "New Ukrainian School" and joined the international study of the quality of education PISA-2018. Since 2019, a retail electricity market and a full-scale electricity market have been introduced in Ukraine. As a result of the improvement of conditions for the development of small and medium-sized businesses in 2016-2019, the positive balance of foreign trade in ICT services increased by 2.5 times, 4G high-speed Internet was implemented, and frequencies in the 900 MHz range were reformed. Since 2015, 1,029 united territorial communities have been created in Ukraine, state support for local and regional development has increased by 41.5 times. But the main obstacles on the way to development remain the temporary occupation of the Autonomous Republic of Crimea, Sevastopol and parts of the territories in Donetsk and Luhansk regions, shabbiness of infrastructure, insufficient resource provision and limited funding.

Therefore, the implementation of sustainable development goals in Ukraine has many difficulties, such as problems with corruption, economic development, energy efficiency, but the country has taken certain steps to achieve them (reducing poverty and hunger, ensuring access to water and sanitation, improving the level of education and health care) and committed to achieving all 17 sustainable development goals by 2030.



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**Puhach K. S.**

### **CAUSES AND CONSEQUENCES OF INFLATIONARY PROCESSES IN UKRAINE**

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Inflation is an inherent aspect of a country's economic life, playing a vital role in shaping its financial landscape. It represents the process of a general increase in prices within a country, resulting from a disruption in the laws of monetary circulation. This phenomenon occurs when an excessive amount of money, both in cash and non-cash forms, enters circulation, leading to the depreciation of currency and a tendency for prices to rise. In essence, inflation is a complex socio-economic issue, born out of imbalances in various sectors of a market economy, and it remains one of the most pressing problems in developed countries worldwide.

Regardless of the state of the monetary sphere, commodity prices can rise for various reasons, such as changes in production dynamics, cyclical and seasonal fluctuations, structural shifts in production, market monopolization, government economic regulation, introduction of new taxes, market conjuncture changes, external economic influences, natural disasters, and more. Thus, price increases can be caused by various factors, and not all of them can be considered inflationary. Among the mentioned reasons for price growth, it is important to distinguish those that genuinely have an inflationary character.

Price increases associated with cyclical market fluctuations are not always considered inflationary. It is noted that during different phases of the economic cycle, prices may change their dynamics, rising during booms and falling during periods of

crisis and depression, only to rise again during recovery. It is also crucial to consider that an increase in labor productivity, under unchanged conditions, should lead to a decrease in prices, except in cases where wage increases precede it. This phenomenon is known as cost-push inflation.

Changes in prices caused by natural disasters can be temporary since, for example, the destruction of buildings due to a flood may lead to a temporary increase in the prices of construction materials. However, this stimulates producers to expand supply, ultimately leading to price reductions after market saturation.

Truly inflationary causes include the disproportionality of government expenditures and revenues, manifested in a state budget deficit. Financing this deficit through the “printing press” leads to an increase in the money supply in circulation and induces inflation. Another inflationary factor is financing investments through similar methods, especially in the case of military economic militarization. Often, increased military spending is a primary cause of state budget deficits and an increase in national debt, resulting in the growth of the money supply.

Inflation, on the flip side, can arise from the "openness" of the economy and increased participation in global economic relations, leading to an elevated risk of “imported” inflation. Additionally, inflationary expectations play a crucial role, preserving inflationary pressure, and overcoming these expectations becomes a key task of anti-inflationary policies.

Throughout history, inflation emerged concurrently with the introduction of paper money, as a surplus of money couldn't arise under the gold standard. Two distinct forms of inflation are highlighted: “classical” inflation, characteristic of the 18th-19th centuries, arising from extraordinary circumstances such as prolonged wars, and contemporary inflation, which is chronic and constant, becoming a permanent element of the reproduction process. The demonetization of gold and the severance of ties between paper, check, and credit money and gold gave the money supply an autonomous character, relatively independent of the circulation of goods.

Inflation can manifest moderately, known as “creepin” inflation, where prices do not rise more than 10% per year, allowing for effective adjustment of prices according to changes in production and demand.

Hyperinflation, where prices rise from 20% to 200% annually, poses a serious problem for the economy, even if price growth can be predicted and included in contract and agreement parameters. The most destructive is hyperinflation, characterized by an astronomical increase in the money supply, leading to a catastrophic rise in prices for goods. In such conditions, the role of money significantly diminishes, and both the population and businesses seek less efficient forms of exchange, such as barter. Hyperinflation can severely impact even the wealthiest layers of society.

In demand-driven inflation, an excess of money arises due to increased monetary spending by businesses, government, and households. The overall demand in the country exceeds the total supply of goods and services, leading to rising prices. Cost-push inflation, where prices increase due to rising production costs, can also be perilous. Increased prices require additional spending on necessary production resources, fueling further price hikes. This mutually reinforcing effect can result in sudden spikes in prices over time.

Two crucial sources feeding cost-push inflation are the growth of nominal wages and the prices of raw materials and energy. Rapid wage growth often generates inflation, as labor unions, demanding constant wage increases, must consider the country's economic situation and the average wage level. The increase in production costs, leading to rising prices, particularly affects raw materials and energy, which is highly relevant for the economy of Ukraine.

Another threat posed by inflation is inflationary psychology, arising when the public is confident in the continued rise of prices. This can lead to demands for increased wages "for future price increases," and businesses incorporating expected increases in costs for resources, energy, labor, and credit into their pricing. This cycle can complicate economic trends and deepen inflationary expectations.

It is essential to note that all forms of inflation take place in an open market where free competition exists. In the case of “hidden” inflation, the rise in prices may go unnoticed, while the depreciation of money manifests itself in a deficit of supply. Inflation can be balanced or unbalanced. In the case of balanced inflation, prices rise moderately and simultaneously for most goods and services. In unbalanced inflation, prices for different goods and services rise not simultaneously but at different rates.

Overall, inflation is a complex economic phenomenon that requires careful observation and proper regulation. Managing inflation can ensure economic stability and growth, fostering mutually beneficial conditions for citizens and businesses.

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**Rykov R. P.**  
**NECESSITY OF RETRAINING IN THE LABOR MARKET OF  
THE AUTOMATION SECTOR: DEMAND AND CAPABILITY**  
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In today's world, automation is becoming not only a technological trend, but also a significant change in the working environment. On the one hand, it brings efficiency, increased productivity and new opportunities; on the other hand, it threatens traditional jobs and requires people to adapt to new conditions.

One of the key challenges of automation is the loss of jobs, which requires a review of employment and training strategies. Changes in the economy and technology create a need for constant training and retraining of employees.

To confront this problem, it is necessary to create retraining programs aimed at developing new skills and competencies that meet the needs of the modern labor market. This may include courses in programming, data analysis, project management, communication and collaboration skills with machines and automated systems.

Among the possible solutions is an emphasis on the development of soft skills (skills of interpersonal communication, creativity, problem thinking), which are important in conditions where many routine tasks are performed by machines. It is also important to take into account the needs of the market and facilitate the creation of programs aimed at real vacancies and the needs of employers.

The retraining process requires cooperation between government agencies, educational institutions and the private sector. The support for retraining programs can include financing educational institutions, creating specialized courses and guidelines for workers who intend to retrain.

The need for retraining in the face of automation is a challenge, but also an opportunity to develop new skills and adapt to change. People can review their career paths, develop themselves in new directions and use this opportunity to improve their own potential.

The overall idea is to prepare the workforce for the future challenges that automation will bring and to ensure a sustainable and competitive labor market for all.

Due to the rapid development of technology and the rapid implementation of automated systems in manufacturing, service and other industries, we are faced with drastic changes in the requirements for the workforce. The concept of "work of the future" is constantly evolving, creating a need for new skills and knowledge in modern workers.

One of the key problems arising in connection with automation is the lack of adaptive skills of participants in the labor market. Technology changes rapidly, and those who are not prepared for these changes risk being left behind. Therefore, retraining becomes necessary not only to find new jobs, but also to ensure competitiveness in the labor market.

One of the main strategies for solving this problem is the development of flexible education and training systems that would allow people to acquire new skills throughout their lives. It can be the introduction of new courses, online learning platforms, or even support of internships and professional development courses in companies.

In addition, it is important to create training programs that take into account the specifics of regions and industries. For example, in regions where information technology dominates, there may be an emphasis on courses in programming and data analysis. While in the manufacturing sectors, training programs can be created to learn how to work with automated systems and develop maintenance skills.

Changes in learning methods will also require changes in organizational culture and government structures. Promoting retraining and lifelong learning will be an important challenge for companies seeking a highly skilled workforce and for governments concerned with social stability and economic development.

In general, retraining the condition of necessity in the context of automation is a difficult, but at the same time important task to ensure equal access to the

opportunities that this rapid technological development will bring. Appropriate training can be the key to success for both workers and the economy as a whole.

Ukraine, like many other countries, faces the problem of the need to retrain workers in conditions of rapid technological development and automation. One of the main problems associated with this Ukrainian labor market is the lagging of the education and training system from the modern needs of the economy.

Educational programs and educational institutions in many cases do not successfully take into account new technologies and labor market requirements. As a result, graduates often lack up-to-date skills and cannot quickly adapt to new market requirements. This leads to a shortage of personnel in certain areas where new expertise is required, as well as to failure to use the full potential of people in solving modern tasks.

Another problem is the lack of systematic retraining programs or insufficient availability of opportunities for workers who want to improve their skills. Many people, especially those with experience in fields that are rapidly changing due to automation, may need retraining to change specializations or refocus on new fields. However, the lack of adequate retraining programs and insufficient financial support for such initiatives make this process difficult for many workers.

In addition, the lack of up-to-date information about the needs of the labor market is usually a problem in Ukraine. Employers do not always openly share information about which skills or specialties are most in demand in today's business.

In this regard, active cooperation between the government, educational institutions and business becomes necessary for the development and implementation of effective retraining and advanced training programs that meet the modern requirements of the labor market in Ukraine.

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**Semenova T. Yu.**

### **EXPLORING THE ESSENCE OF OUTSOURCING AND EMPLOYEE OUTSOURCING**

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Today, outsourcing is gaining popularity in the global business market because of its ability to enhance the competitiveness of enterprises, lower the costs of production processes, and alleviate the tax burden, allowing companies to reduce their workforce by outsourcing.

It seems that the term “outsourcing”, originating from the English phrase “outside resource using”, inherently implies the use of external resources. However, this does not offer a comprehensive understanding. Therefore, this article will explore interpretations provided by scholars such as R. Chapman and K. Endreid, G. Cassidy, J. Brian Haywood, B. Reisberg, O. Zorii and T. Kovalenko, O. Achkasova to provide a more intricate comprehension of outsourcing.

Outsourcing, according to J. Brian Haywood, is defined as ‘the transfer of an internal unit or units of an enterprise and all related assets to an organization that provides services for a specified period of time at a specified price’ (Chaikovska, 2022).



However, even today, the concept of “outsourcing” has not been fully established. American economists R. Chapman and C. Endreid note that ‘this term is used as an umbrella to reflect different areas of business activity,’ and Canadian G. Cassidy considers the main distinguishing feature of outsourcing to be the transfer of the contract to the party, introducing the term “contract out”.

According to O. Zorii and T. Kovalenko, “Outsourcing is the borrowing of resources from outside. It involves the performance by a third-party organization of certain tasks or business processes that are not core to the enterprise, but are necessary for its full functioning. In this case, the company does not buy the labour of specific employees, but a service” (Zorii, 2013).

The National Classifier of Ukraine “Classification of Types of Economic Activity DK 009:2010” defines outsourcing as an agreement under which the customer entrusts the contractor with certain tasks, in particular, part of the production process or the entire production process, recruitment services, and support functions. However, there is currently no legislative regulation of outsourcing.

Outsourcing is gaining popularity among large, medium, and small enterprises across all forms of management and regardless of the type of activity. A significant aspect involves the delegation of tasks related to employee management, aiming to avoid issues with HR records and enhance overall labour productivity.

Examples of outsourcing include entering into legal or accounting service agreements with specialized companies. Cleaning services are also frequently outsourced.

Employee outsourcing is an agreement between companies in which one party takes over certain work of the other with the assistance of its staff.

According to O. V. Achkasova, employee outsourcing means ‘the process of transferring personnel from the company that orders services to the outsourcing company’ (Achkasova, 2023).

Employee outsourcing is categorized into the following types:

- working personnel outsourcing (used for unskilled labour);
- outsourced accounting (used by companies that do not have their own accountants);
- temporary staff outsourcing (staff is recruited for a certain period or season);
- technical personnel outsourcing (generally hired for maintenance, repair, installation and adjustment of electrical equipment of companies);
- warehouse personnel outsourcing (ensuring the duties of warehouse workers and logisticians at the enterprise);
- production personnel outsourcing (hiring industrial specialists)
- service personnel outsourcing (including unskilled professionals such as security guards and couriers).

Outsourcing functions in HR management include:

- staff recruitment and adaptation;
- motivation and incentives for employees;
- analysis of staff performance;
- personnel records management;
- payroll calculation;
- preparation of tax, pension and insurance contributions (Horuchunova, 2022).

This type of outsourcing makes it possible to reduce the burden on the accounting and HR departments of enterprises and simplifies the tasks of managers at all levels. In other words, through outsourcing, managers can focus the company's attention on the core business without being distracted by auxiliary processes. This, in turn, positively impacts the quality of the goods and services offered and enhances the overall prestige of the company.

Employee outsourcing allows you to maintain the number of company employees unchanged. The client organization enters into a service agreement with the contractor and makes payments within the time period specified in the agreement.

This greatly helps private entrepreneurs maintain a small staff to remain on the simplified taxation system.

The disadvantages of employee outsourcing are the following:

- possibility of poor quality solution of delegated tasks;
- the risk of confidential information leakage;
- dependence on external contractors;
- lack of direct control over delegated processes.

However, these shortcomings can be avoided with the help of a properly drafted contract with clearly defined terms of its implementation.

Thus, the main problem with the concept of outsourcing is the lack of consensus on its interpretation among scientists, leading to difficulties in defining a unified concept for its effective use in the modern development of the economy. However, after analysing various research definitions, it can be concluded that outsourcing is the transfer of certain functions and business processes by the customer company to external entities for a specified period at an agreed-upon price. Specifically, personnel outsourcing can be considered an effective method of managing personnel in an enterprise while maintaining a consistent staff size.

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**Silchenko K. O.**  
**UTILITIES: CONTRACTUAL RELATIONS AND LEGAL CONFLICTS**

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It is well known that in the current difficult times for Ukraine, there is an urgent need to create a strategic management of the housing stock of settlements. Despite the fact that management specialists have developed several concepts of strategic and especially synergistic management of the development of the collective housing sector in Ukraine, contradictions in the current legislation delay this development. This is especially true for the contractual relations between housing offices and utilities.

It is known that in Ukraine the activities of enterprises providing housing and communal services are regulated by the following legislative acts:

- The Law of Ukraine "On Housing and Communal Services";
- The Law of Ukraine "On Local Self-Government in Ukraine";
- The Law of Ukraine "On the Natural Gas Market";
- The Law of Ukraine "On State Regulation in the Sphere of Public Utilities";
- The Law of Ukraine "On State Regulation in the Sphere of Housing and Communal Services";
- The Law of Ukraine "On Heat Supply";
- The Law of Ukraine "On Metrology and Metrological Activities";
- The Law of Ukraine "On Peculiarities of Exercising Ownership in an Apartment Building", etc.

Over the past decade, the Law of Ukraine "On Management of Condominium Associations" has been amended several times. One of the peculiarities of these changes is that the legislator abolished the term "balance sheet holder" and amended the standards, norms and procedures in the field of housing and communal services.

Unfortunately, the Ukrainian legislation governing relations in the field of housing and communal services still contains various risks, including radical changes. In addition, there are a number of unresolved issues in the contractual relations between utility companies and housing and communal services providers that need to be addressed urgently.

One of these issues is the lack of the ability of the management company of an apartment building (hereinafter referred to as the manager) to enter into contracts for the purchase of electricity to ensure the functioning of the common property of the apartment building. Thus, according to Article 5 of the Law of Ukraine "On Housing and Communal Services", housing and communal services also include management services for apartment buildings.

Management services for an apartment building include, in particular, the purchase of electricity to ensure the functioning of the common property in an apartment building, in accordance with Article 9 of the Regulation on the provision of management services for an apartment building, approved by the Resolution of the Cabinet of Ministers of Ukraine of September 5, 2018. According to No. 712, management services include, in particular, the maintenance of common property in an apartment building, maintenance and purchase of electricity to ensure the functioning of the common property in an apartment building.

The Order of the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine No. 190 dated 27.07.2018 approved a mandatory list of works (services) included in the costs of maintaining buildings and structures and adjacent territories, including the purchase of electricity necessary for lighting common areas, power supply to elevators and ensuring the functioning of other common property of an apartment building.

At the same time, in accordance with paragraph 2.1.8 of the Rules of the Retail Electricity Market approved by the Resolution of the National Commission for State Regulation of Energy and Public Utilities of March 13, 2018 312, in order to conclude an agreement with the consumer on the provision of distribution/transmission services, the applicant shall provide the consumer with a copy of the document determining the ownership or right to use the facility (site), if the form of ownership or ownership of the electrical installation has changed, or a document confirming the ownership or right to use A copy of the document must be provided to the operator.

The Law of Ukraine "On Peculiarities of Exercising Ownership in an Apartment Building" does not contain a provision on transferring an apartment building to the balance sheet of the manager when providing management services for an apartment building. Thus, it is not possible to transfer the right of ownership or use of the object, residential complex and/or the right of ownership or use of the land plot (or part thereof) to the manager. In view of the above, the legislator believes that the provisions on the purchase of electricity must comply with the law in order to ensure the functioning of the common property in an apartment building and the effective functioning of the organization. For the efficient operation of the organization, it would be advisable to use an individual approach to each case.

Another issue that deserves attention is the development of the gas supply network within condominiums.

Accordingly, pursuant to Article 14(3) of the Law of Ukraine "On Housing and Communal Services", maintenance and current repair of the in-building electricity and gas supply system is carried out by a person designated by the co-owner of the apartment at the expense of the co-owner Resolution of the National Commission for State Regulation in Energy and Public Utilities of September 30, 2015. Pursuant to paragraph 2 of Chapter 3, Section 1 of the Code of Gas Distribution Systems, approved by Resolution No. 2494, maintenance and repair of the intra-building gas network of an apartment building is carried out on the basis of an

agreement concluded between the co-owner and a business entity that has the right to perform such work. In accordance with paragraph 1 of part 3 of Article 19 of the Law of Ukraine "On Housing and Communal Services", in order to ensure the continuity and safety of gas supply, gas distribution system operators are obliged to maintain in-building gas supply systems in the building. On May 27, 2020, the Ministry of Energy and Environmental Protection of Ukraine published Order No. 342 "On Approval of the List of Types of Works Included in the Maintenance of In-Building Gas Supply Systems in Residential Buildings" (Official Gazette of Ukraine No. 63 of August 14, 2020, pp. 454, article 2061, act code 100350/2020). Chapter III of the Gas Supply System Safety Rules, approved by Order of the Ministry of Energy and Coal Industry of Ukraine No. 285 dated May 15, 2015 (hereinafter referred to as the Gas Supply System Safety Rules), is entitled "Safety of Gas Pipelines and Gas-Use Installations of Industrial and Agricultural Enterprises, Boiler Houses, Industrial Utilities".

Maintenance and repair of equipment and facilities of gas supply systems of industrial and agricultural enterprises, public utilities and production utilities should be carried out in accordance with Section 3.2 "Operating Requirements" of the Gas Supply System Safety Rules. According to Procedure 9, the manufacturer or supplier must apply for:

- the performance of hazardous works;
- the operation of high-risk machines, mechanisms and equipment;
- expert opinion on the state of labour protection of the business entity and the safety of industrial production during the operation of high-risk machinery, mechanisms, and equipment;
- expert opinion on the operation of high-risk machinery, mechanisms, and equipment;
- expert opinion on the compliance of high-risk machinery, mechanisms, and equipment with the requirements of the legislation on labour protection and industrial safety.

Based on the above, it can be concluded that companies that manage residential complexes cannot provide maintenance and repair services for intra-building gas supply systems for the following reasons:

- As a rule, the manager is not a person designated by the co-owners of the condominium to perform maintenance and repair of the intra-building gas supply network in the building. The manager, as a rule, does not enter into an agreement with the co-owner/authorized person for the maintenance and repair of the intra-building gas supply network in the condominium.

- Special legislation (the Gas Supply Systems Code, the Law of Ukraine "On Housing and Communal Services", and the Gas Supply Systems Safety Rules) does not contain clear provisions on the right of business entities to perform maintenance of the in-building gas supply system in the housing stock.

- The existence of provisions in special legislation (the Law of Ukraine "On Gas Supply Systems", the Law of Ukraine "On Housing and Utility Services" and the Rules for the Safety of Gas Supply Systems) that stipulate that it is the gas supply system operator that performs maintenance and inspection of the intra-building gas supply system in the building.

- That the manager is not entitled to perform high-risk work.

Therefore, in view of the above, the legislator believes that the same line, in addition to the provision on the purchase of electricity to ensure the functioning of the common property of an apartment building, should include issues related to the maintenance of the gas distribution network by the gas distribution system operator. The resolution of these and other issues related to the joint effective functioning of housing companies and joint ventures will accelerate the strategic development of the housing stock of Ukraine.



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**Skuharevskyi A. V.**

### **ENHANCING EMPLOYEE MOTIVATION: A COMPREHENSIVE APPROACH**

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Employee motivation is a pivotal aspect of modern management, influencing productivity, job satisfaction, and overall organizational success. This article explores the multifaceted nature of work motivation, highlighting both material and non-material approaches to create a robust motivation system within an organization.

Work motivation is more than a financial transaction; it's about creating conditions that satisfy the fundamental needs of individuals. This involves recognizing the significance of motivation and implementing strategies to encourage employees to achieve both organizational and personal goals.

Motivation is a complex process comprising various elements, including material incentives such as monetary rewards and non-material factors like job

security, achievement recognition, and responsibility. A balanced combination of these components contributes to a holistic and effective motivation system.

The primary goals of motivation include instilling an understanding of its essence among employees, teaching psychological communication skills, and fostering a leadership approach that incorporates modern motivational methods. By achieving these objectives, organizations can enhance their overall work environment and performance.

Monetary rewards, such as bonuses linked to profit provision, are common methods to boost work efficiency. However, non-material incentives play a crucial role, encouraging commitment and dedication. These include job security, personal goal achievement, and a culture that values employee responsibility.

Regular monitoring is essential to assess the effectiveness of the motivation system. This involves analyzing the existing system, evaluating the qualitative composition of employees, and determining the need for adjustments. Objectivity, predictability, transparency, and fairness are key criteria for a successful motivation system.

An efficient motivation system yields numerous benefits for organizations, including increased productivity, timely goal attainment, a clear link between performance and rewards, reduced staff turnover, improved psychological well-being, and enhanced teamwork.

Material incentives, often associated with financial rewards, are crucial components of a motivation system. They include monetary bonuses, profit-sharing schemes, and benefits such as health insurance. These incentives directly link individual and collective efforts to tangible rewards, providing employees with a clear understanding of the relationship between performance and compensation.

Non-material incentives are equally vital for a holistic motivation strategy. Job security, career advancement opportunities, and recognition for achievements contribute to employee satisfaction. Empowering employees with responsibilities

and involving them in decision-making processes enhances their sense of ownership and commitment to organizational goals.

Understanding the psychological aspects of motivation is essential. This involves recognizing that employees are driven by a combination of intrinsic and extrinsic factors. Intrinsic motivation arises from personal satisfaction and the enjoyment of the work itself, while extrinsic motivation involves external rewards. A well-crafted motivation system caters to both dimensions, fostering a balanced and sustainable motivational environment.

Investing in employee development programs is a proactive approach to motivation. Continuous learning opportunities, skill development workshops, and mentorship programs contribute to employees' professional growth and job satisfaction. These initiatives signal the organization's commitment to its workforce's long-term development, fostering a positive and motivated atmosphere.

Adopting flexible work arrangements is another effective motivational strategy. Offering options such as remote work, flexible hours, or compressed workweeks demonstrates trust in employees' ability to manage their tasks effectively. This flexibility aligns with the changing dynamics of the modern workplace, catering to the diverse needs and preferences of the workforce.

Regular acknowledgment of employees' contributions is a powerful motivator. Recognizing achievements publicly, providing constructive feedback, and expressing appreciation for hard work contribute to a positive work culture. Recognition can take various forms, from informal verbal praise to formal awards ceremonies, reinforcing a sense of value and belonging among employees.

Promoting employee well-being is integral to motivation. Initiatives focused on physical health, mental health, and work-life balance contribute to a positive work environment. Wellness programs, access to counseling services, and creating a supportive workplace culture prioritize employees' holistic well-being, fostering motivation and job satisfaction.

Establishing effective feedback mechanisms is crucial for motivation. Regular performance evaluations, one-on-one feedback sessions, and employee surveys provide valuable insights into individual and collective needs. This feedback loop enables organizations to tailor their motivation strategies, ensuring they align with employees' expectations and aspirations.

In conclusion, employee motivation is a dynamic process that requires a comprehensive and adaptable approach. Balancing material and non-material incentives, setting clear objectives, and regularly evaluating the system contribute to creating a workplace where individuals are motivated to excel. Organizations that prioritize and invest in a robust motivation system will not only achieve short-term goals but also foster long-term success in today's competitive business landscape. Incorporating a diverse range of material and non-material incentives, understanding psychological aspects, investing in employee development, offering flexible work arrangements, recognizing achievements, prioritizing well-being, and establishing feedback mechanisms collectively contribute to a comprehensive motivation system. Organizations that embrace these elements create an environment where employees are not only motivated but also actively engaged and committed to organizational success.

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**Tonkonoh K. H.**  
**EVOLUTION OF ECONOMIC THOUGHT: FROM ANCIENT  
CIVILIZATIONS TO CLASSICAL ECONOMISTS AND BEYOND**  
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Economic science, as a system of views, knowledge, and laws reflecting the economic life of human society, developed relatively recently, in the 18<sup>th</sup> – 19<sup>th</sup> centuries. However, it is challenging to imagine a time when people were not concerned with issues related to wealth, such as its acquisition, accumulation, and utilization. Consequently, we encounter the exploration of certain economic problems in the oldest monuments of human history.

In the oldest written sources of Egypt, Mesopotamia, India, and China, the focus is primarily on issues of economic policy and state management. For instance, the "Laws of King Hammurabi" (Mesopotamia, Babylon, 18<sup>th</sup> century BC) prohibited the sale of land plots for military and certain other categories of subjects to settle debts. Debt slavery was restricted to a maximum of 3 years regardless of the debt amount. The legislation also imposed limits on loan interest rates (20% for cash loans, 33% for in-kind loans), and it aimed to protect the property rights and interests of the parties involved in economic and legal agreements.

In the works of thinkers from Ancient Greece, there are already concepts related to economic theory, encompassing the objective regularities of economic life. Notably, Xenophon (around 430 – 355 BC) highlights the correlation between skill and the degree of division of labour. Furthermore, he observes that the extent of the division of labour is contingent on the size or capacity of the market. Xenophon also makes a distinction between money as a medium of circulation and money as a store of value.

Plato (428 or 427 – 348 or 347 BC) makes one of the earliest attempts to formulate blueprints for an ideal society in his works "The Republic" and "Laws." In "The Republic" or "The State," Plato organizes human needs and links their satisfaction to the division of labour, underscoring that the emergence of cities is rooted in needs and the division of labour. According to Plato, money serves not only

as a medium of exchange and a store of value but also as a measure of value. In his treatise "Laws," the philosopher addresses the issue of the relationship between wealth and poverty.

The pinnacle of economic thought in antiquity was achieved in the writings of Aristotle (384 – 322 BC), particularly in "Nicomachean Ethics" and "Politics." Aristotle coined the term "economy" to describe economic activity aimed at meeting needs, deriving from the Greek words "oikos" (house) and "nomos" (law). In contrast, economic thought during the Middle Ages drew primarily from economic ideas found in religious texts such as the Bible and the Koran. The prevalent natural economy of the time did not necessitate extensive theoretical generalizations.

The revitalization of economic life and the emergence of a new way of conducting business primarily originated in trade. Consequently, theoretical generalizations of economic issues also predominantly focused on trade-related problems. This strand of economic thought later (in the 18<sup>th</sup> century) became known as mercantilism, deriving its name from the Italian word "mercante," meaning merchant. Subsequently, the main research focus shifted from the sphere of circulation to the sphere of production. French economists, who referred to themselves as physiocrats (from French "physiocrates," rooted in Greek "physis" – nature, and "cratos" – power), were the first to delve into the field of production. The core ideas that unified the physiocratic school included: a) advocating for minimal state interference in the economy; b) asserting that only agricultural work is truly productive; and c) advocating for the introduction of a single land tax.

The creation of the "Economic Table" in 1758, which was the first diagram illustrating the process of social reproduction and portraying the economy as a circular flow of products and incomes, was a notable achievement by François Quesnay. The English classical political economy exerted a significant influence on the development of global economic thought. One of the most prominent figures in this school of thought was Adam Smith (1723 – 1790). His seminal work, "An Inquiry into the Nature and Causes of the Wealth of Nations" (1776), commonly

referred to as "The Wealth of Nations," stands as a model of profound, thorough, and impartial analysis. This work is considered by some researchers as encompassing all major facets of modern economic analysis. The main research directions in Smith's work include:

1. Division of labour:

a) universality (from operations to professions and further to classes and the division of the country into cities and villages);

b) the degree of division of labour opens the door to phenomena such as technical progress (the division of labour provides the foundation for the creation of machines).

2. Concept of value:

a) usefulness of a thing ("value" for consumption);

b) exchange value ("value in exchange"). Adam Smith draws attention to the process of exchange as an economy of labour. In this process, each craftsman, by exchanging the products of their labour, receives in return something they cannot produce themselves, and for the production of which they would have to expend much more labour than a specialist. In essence, in the exchange, everyone receives more than they give. Before Smith, the profit in the exchange of one party was always considered as a loss for the other.

3. According to Adam Smith, the price of any item comprises three parts: payment for labour, land rent, and profit on capital. Based on the sources of income, society is divided into three classes: wage labourers, landowners, and capitalist-entrepreneurs.

4. Effects of free competition and monopoly on the economy.

5. States of the economy: growth, decline, and stagnation.

6. Investigated the process of capital accumulation and social reproduction.

7. Defending the principles of natural freedom, Adam Smith defines quite essential functions of the state:

a) to provide activities that are impossible or not profitable for private capital (education, communication, transport, etc.);

b) maintain the regime of natural freedom (legal and economic protection of freedom of competition);

c) protection of life, freedom, and property of citizens.

8. Formulates the concept of an "invisible hand" that directs producers who aim for their own benefits to take care of the needs and interests of society. This concept is now referred to as a system of economic laws.

The most famous follower of Adam Smith was David Ricardo (1772 – 1823). He analysed economic processes during the period of the so-called industrial revolution, marked by the transition from manufacturing to large-scale machine production. Ricardo believed that the source of value is solely human labour. The economist paid considerable attention to various economic issues, encompassing money (including paper money), wages, profits, land rent, and capital turnover. He staunchly defended the principles of economic liberalism. Concurrently, Ricardo developed the theory of comparative advantages, which remains influential in research related to mutually beneficial foreign trade and the international division of labour.

In 1817, his main work "Principles of Political Economy and Taxation" was published. In it, Ricardo developed a quantitative theory of money, positing that the value of money is determined in the sphere of circulation and depends on its quantity. He advocated for replacing metal money with paper money and believed that paper money should not be issued in excess of necessity. When studying wages, the economist distinguished between the nominal wage as a monetary expression of the price of labor and the real wage as its physical expression.

D. Ricardo, like A. Smith, proved that the entrepreneur's profit embodies the unpaid work of hired workers. He believed that the value of goods always breaks down into wages and profits, and these two components are in an inverse relationship: an increase or decrease in wages causes opposite changes in profits.



The English political economy classics, Adam Smith and David Ricardo, initiated the labour theory of value. The studies of Karl Marx had a significant influence on the world development of economic thought. In "Capital" (Volume 1, 1867), he conducted an in-depth analysis of the production process of his time, focusing on its shortcomings and contradictions. Marx paid special attention to the problems of creating profit or additional value. He elevated to the level of a scientific theory the idea of the political economy classics about the dual nature of labour, developed the labour theory of value, substantiated the progressive role of share ownership, and revealed the essence of absolute rent, among other contributions.

In conclusion, the journey of economic thought encompasses ancient civilizations, classical economists, and the critical analyses of Marx. Each stage contributed to shaping fundamental economic principles that continue to influence our understanding of wealth, production, and societal structures.

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### **HOW THE WAR HAS AFFECTED THE DEVELOPMENT OF UKRAINE'S ECONOMY AND WAYS OF ITS RECOVERY**

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Since the beginning of the war until today, Ukraine has experienced extensive destruction of productive capital and infrastructure, resulting in human sacrifices and

social costs. This has led to a reduction in jobs and incomes, a decrease in purchasing power, and a decline in the accumulation of assets.

The war has destroyed almost a third of Ukraine's GDP. In 2022, the country's national economy experienced a 30% decrease in real GDP, compelling a majority of the population to leave their homes and become migrants due to the war. These individuals are valuable working hands, consisting of experienced and highly qualified personnel, essential for the sustainable recovery of Ukraine and the growth of the economy.

The energy terror slowed the recovery of the economy by 5%. Ukraine faced the potential loss of at least \$3 billion in GDP from November to March due to power outages. As a result, the state budget missed out on approximately \$500 million in income.

Despite the fact that front-line regions (as classified by the Ministry of Reconstruction) accounted for only a third of the total number of enterprises, they generated more than half of pre-war sales. That is why the strike on these regions caused particular damage to the Ukrainian economy.

Due to the war, large industrial enterprises suffered losses of at least 13 billion dollars, which is more than the average amount of direct foreign investments that Ukraine attracted annually.

Relocation (moving a business to another country or region) covered less than 2% of the total number of registered businesses in the front-line regions, although in the country as a whole, about 20% of Ukrainian enterprises faced it – some had employees (IT) moved, some moved production or individual subdivisions.

The relocation made it possible to preserve part of the production of Lysychansk, Rubizhny and other temporarily occupied or destroyed cities. Relatively speaking, 1/5 of the business in the country "moved" together with 5 million people (IDPs), and this has already changed the economic map of the country.

Medium-sized enterprises are the largest category affected by the war. Their share in the regions currently recovering and those remaining on the front line is

52%. A large number of businesses are located in a war zone or frontline area and cannot relocate, leaving businesses with high risks of physical destruction, labor shortages due to migration, and reduced demand in the region due to population outflows.

This is a high-risk zone because such enterprises are not saved by micro-grants; they need substantial grants, affordable loans, war risk insurance, and restoration of purchasing power. This is the sector to which international allies need to pay attention to ensure the long-term sustainability of the Ukrainian economy.

Why allies? Because, let me remind you, all the resources that the government receives through the tax system go to the security and defense sector, while social and economic development depends on the financial support of allies and international donors.

For the process of recovery and economic growth to become a more realistic goal, Ukraine must address key problems.

Human capital – it is necessary to implement a policy to encourage able-bodied Ukrainians to remain on the labor market, to encourage forced migrants to return home, and to attract foreigners to visit and live in Ukraine.

Ukrainian MSMEs (Micro, small and medium-sized enterprises) – to preserve the functioning and support of MSMEs, create a comfortable business climate, review the spheres of state supervision and control, the work of the tax and customs authorities, complete the reform of the economic security bureau, and this is a task for both the authorities and for our allies.

Most of the key production sectors of the Ukrainian economy suffered significant material and technical problems caused by the war. Here, we propose a six-stage approach: support, rethinking, transformation, stimulation, strengthening, and direction.

As international experience shows, investments are critically sensitive to distances, logistics, and infrastructure. The future European integration will primarily affect the western and central regions, tentatively 300-350 km from the

border, and a separate approach to development needs to be created for the east of the country (which will obviously remain a logistical dead end for a long time).

Add to this climate changes that will affect Ukraine diagonally from the northeast to the southwest, the expansion of risky farming zones and temperature extremes. In a few decades, we may not recognize the economic geography of Ukraine.

Front-line regions lost up to 30-40% of GDP, in the central and western regions GDP decreased by 10-30%. But in Zakarpattia, Ivano-Frankivsk, and Kirovohrad regions, population growth compensated for economic losses and ensured partial recovery and transformation of the regional economy.

This makes it possible to differentiate the level of threat due to military operations in different regions of Ukraine. The government can provide various incentives to encourage specific types of economic activity, thus supporting the processes of economic recovery in different regions.

Lack of financial independence – it is worth improving the tools of affordable financing for Ukrainian manufacturers by implementing sustainability standards, strengthening monitoring of credit loans, and allocating grant funds on a competitive basis.

The Russian-Ukrainian war has entered the phase of attrition. Deploying air defense systems in Ukraine, 'closing the sky' with F-16 or Gripen, are now measures for economic development, and NATO membership is the most desirable risk insurance measure.

It is hard not to agree with the recommendation of The Economist, according to which the Allies should do everything in their power to create a sustainable economy in Ukraine – create incentives for investment by their companies, risk insurance, nearshoring and friendshoring from Asia to Ukraine, provide cheap financial resources if not for Ukrainian companies, but at least for foreign investors.

On the other hand, Ukraine has a huge task ahead in creating appropriate conditions for doing business and ensuring the rule of law. These steps, coupled with

a balanced approach to forming a recovery strategy that takes into account the impact of the war on the country's economy, will contribute to sustainable development, strengthen the stability of the state, and enable the successful completion of the post-war recovery process.

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**Yesina Yu. V.**

### **COST AUDIT IN THE INTERNAL AUDIT SYSTEM OF ENTERPRISES**

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The subject of entrepreneurial activity conducts its operations with the aim of making a profit. Profitability is only achievable when revenues exceed expenses. Therefore, expenses play a crucial role in the effective functioning of the enterprise. The primary goal of the enterprise is its efficient operation, which depends on the functioning of the entire enterprise management system. Accounting is a vital component of this system and plays a significant role in its operation. Cost accounting is an essential part of the overall system and must ensure that the implemented accounting system aligns with the enterprise's goals. The production activity of the enterprise is a risky endeavour, and to minimize these risks, it is

necessary to control both the production process and the accounts of production costs. As a control measure, a cost audit may be required to identify factors that influence both the process itself and the costs associated with its implementation.

A considerable number of scientists, including T. Butynets, S. Holov, A. Cherep, A. Makarenko, O. Shelkovnykova, N. Fatiukha, O. Karliuha, and others, were engaged in examining the methodology of cost audit. In our view, it would be beneficial to further their research and focus on the role of cost audit within the framework of the internal audit system of business activity.

The implementation of internal audit is considered a means of enhancing cost management by identifying non-targeted expenses. According to NP(S)BO 16, "Expenses are a decrease in assets or an increase in liabilities that results in a decrease in the company's equity (excluding a reduction in capital due to withdrawal or distribution by owners), provided these expenses can be reliably evaluated". This definition emphasizes the central role of costs in accounting, influencing all aspects of the enterprise's activities. Internal audit, as an artificial system integrated into the broader framework of enterprise management, assumes the responsibility of overseeing specific accounting elements that encompass the entire enterprise.

According to N. Fatiukha and O. Karliuha, "the object of the cost audit is the economic operations of cost accounting reflected in the primary documents. Therefore, its purpose is to obtain reliable information on the cost accounting of business activities and production" (Fatiukha, 2013). A. Cherep and V. Yarmosh support the scientists' opinion that "the purpose of the cost audit is to establish the reliability of the data of the primary documents regarding the determination of costs, the completeness, and timeliness of their reflection in the accounting registers, the compliance of the cost accounting methodology with current regulations" (Cherep, 2010).

The tasks of the internal audit of the company's expenses include verifying the accuracy of the registration of accounting documents related to the company's

expenditures, enhancing the efficiency of the company's operations, and identifying factors contributing to changes in the expense structure.

The methods employed for conducting such an audit encompass document verification, confirmation, counting, surveys, and analytical procedures, which are used to obtain corroborating information. Summarizing procedures involve formulating a conclusion based on the results of the inspection, summarizing the information from the internal audit of costs, evaluating the effectiveness of the decisions made in cost management, and developing recommendations.

Additionally, the auditor's work requires a plan, for which the auditor must prepare a written document containing the audit tasks for a specific object, the scope, terms, and procedures essential for task fulfilment. This document is referred to as an audit program.

Researchers N. Fatiukha and O. Karliuha specified a set of typical actions for the internal audit program of expenses. These actions outline what aspects should be examined during the inspection:

- Verification of synthetic and analytical accounting, involving the reconciliation of expenditure accounts in the General Ledger with primary documents.
- Examination of accounting for the write-off of overhead costs.
- Ensuring compliance with the chosen method of accounting for enterprise costs and accurate allocation of costs to the accounting object (verification of accounting policy information, accounting registers, and primary documents).
- Assessment of the accrual and assignment of labour costs, as well as deductions for social events to the cost of production, with a focus on time sheets and accounting and payment information.
- Scrutiny of the write-off of accrued depreciation amounts on fixed assets to the cost of production.
- Review of the reflection on accounting accounts of production costs operations and the accuracy of accounting for work-in-progress, involving

reconciliation of the Accounting Policy, accounting registers, primary documents, work plan of accounts, and the General Ledger, among other considerations.

– The conclusion drawn from the audit process is that accounting registers and tangible assets are examined for the accuracy of registration and the completeness of reflection in accounting (Fatiukha, 2013).

A. Cherep and V. Yarmosh introduced an enhanced audit methodology, which "provides a list of the main indicators of the industrial enterprise's activity that should be prioritized for examination. When scrutinizing production costs at an industrial enterprise, special attention should be given to the following key indicators:

– identification of amounts not directly related to the cost of products (works, services) being categorized as either decreasing or increasing the cost of production;

– accuracy in attributing costs of future periods to the cost of production;

– collection and allocation to the cost of non-production costs" (Cherep, 2010).

– In addition to the audit program, the auditor also utilizes various documents, including:

– internal control test;

– verification of the completeness of primary documents;

– a list of missing primary documents;

– a list of taxes and fees included in operating costs;

– a list of expenses not reflected in the accounting;

– grouping of expenses by categories.

O. Shelkovnikova proposed an internal audit standard for expenses, which can be used by auditors when conducting an external audit of costs. It includes general provisions, features of accounting and internal control systems, factors influencing the risk of accounting distortions, sources and procedures for obtaining audit evidence, the audit procedure, principles for presenting audit results in a written



report on the outcomes of the audit, submitted to the management of the enterprise, and the process for forming an audit opinion based on audit results (Shelkovnykova, 2010). The use of this standard by internal auditors will enhance the quality of their work when conducting an audit of the company's expenses and will provide "reasonable assurance that the information in the accounting documentation and other data sources on verification issues is reliable and sufficient; to decide whether the relevant information is correctly reproduced in accounting and reporting" (Cherep, 2010).

### **Conclusion**

In summary, it is crucial to emphasize that internal audit, particularly cost audit, holds a significant role in the enterprise management system. Cost audit adheres to a specific sequence of actions detailed in the internal cost audit program, along with a list of documents for showcasing inspection results and defined inspection methods. To enhance the effectiveness of internal auditors during cost audits, a focus on O. Shelkovnykova's internal audit standard for costs is recommended.

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# INFORMATION TECHNOLOGIES

**Babenko M. A.**

## **AUTOMATIC IDENTIFICATION SYSTEM DURING FEEDING**

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One of the main ways to develop agriculture is through concentration and specialization of production, creation of livestock and agro-industrial complexes with widespread use of modern production methods, achievements of scientific and technological progress and international experience.

Modern livestock farms and complexes are highly electrified systems, including machines, units and electrical lines. New electrical equipment is largely used in drive, heating and radiation systems, as well as new systems for automatic remote monitoring and control of technological processes, which can provide full mechanization and automation of many technological processes. The level of mechanization of technological processes in the calf farm can be estimated as follows: complex mechanization - 66%, feeding - 67%, water supply - 95%, manure removal - 90%.

In recent years, significant mechanization of production on livestock farms has been achieved. Improved production of automated machines and collective production lines for some technological processes in livestock and poultry farming, as well as the development of new devices for mechanization and automation of auxiliary operations (veterinary and sanitary treatment and treatment of animals).

Automatic calf feeding systems have been introduced to reduce physical labor while focusing on monitoring and managing calf health and performance on a more flexible schedule. Increasing the feeding rate and the number of portions fed per day can improve body weight gain, increase starting intake, improve feed efficiency, and increase calf survival during the first lactation. Feeding calves in groups also allows calves to exhibit some natural behaviors that may not be expressed in individual housing.

Automatic identification of animals is carried out using a radio-technical device - a sensor attached to the ear or a special collar. The most successful design of such a sensor is a transmitter that combines a receiving and transmitting device in one housing. The transmitter circuit is powered through the receiving ferrite antenna from the generator included in the identifying device. The transmitting device produces a sequence of pulses in accordance with an individual code stored in the transmitter's memory. This signal is emitted by the transmitting device at a fixed frequency, received by the identifying device, decoded and used by the control device of the automatic feeding system as an animal identifier (Koshkin, 2023).

The demand for animal identification and traceability is constantly increasing, driven by the need for quality control and welfare management in agricultural animals. Furthermore, the dramatic effects of infectious diseases in the environment and the agricultural economy have highlighted the importance of well-organized monitoring platforms of animal capital. Technological evolution, on the other hand, has provided a comprehensive toolset, far surpassing traditional methods of traceability and identification. The wide adoption of RFID technologies and the progress made on standardization, has established the use of RFID technology for providing the technological framework, over which accurate and highly sophisticated management of animal capital can be performed (Voulodimos, 2010).

Radio-Frequency Identification (RFID) technology is a wireless sensor technology which is based on the detection of electromagnetic signals (McCarthy, 2003). A typical RFID system includes three components: an antenna or coil, a transceiver (with decoder) and a transponder electronically programmed with unique information. There is emission of radio signals by the antenna in order for the tag to be activated and data to be read and written to it. Antennas establish the communication between the tag and the transceiver. The transceiver is responsible for the data acquisition. The antenna can be packaged with the transceiver and decoder in order to become a reader. The reader can be configured either as a handheld or a fixed-mount device. There is emission of radio waves from the reader

in ranges which can reach up to 100 feet or more, depending on its power output and the radio frequency which is used. In case an RFID tag is found in the electromagnetic zone which is produced by the antenna, it detects the activation signal of the reader. The reader decodes the data which are encoded in the integrated circuit of the tag and the data can then be transferred to any computer system for processing (Hnatiuc & Caracostea, 2017).

RFID tags consist of two main elements: an integrated circuit and an antenna. The integrated circuit consists of a microprocessor, memory, and an antenna. The role of the antenna is to determine the reading range of the tag (Domdouzis, 2007).

RFID tags can be divided into two categories depending on their ability to store data: Read-only tags and read/write tags. Most read-only tags have no data storage capacity. They only have a pre-recorded unique identifier that points to a database, thus providing information about the object to which the tag is attached (Domdouzis, 2007).

RFID tags can also be distinguished into active and passive tags. Passive tags depend on the electromagnetic field generated by the RFID reader to be activated. Active tags have built-in batteries, which increases the range of the system because the tags do not depend on the electromagnetic field of the reader to be activated. The power of the tags, however, can be reduced by the actual size of the tags as well as local radio frequency licensing regulations (Domdouzis, 2007).

Automatic animal identification systems greatly simplify livestock management and provide accurate information about each animal. They can be used to keep accurate herd records, track medical procedures, conduct genetic analysis, and solve various tasks related to effective livestock management.

All animals are RFID-tagged to identify the system with a receiving antenna located on the side of each feeder. Once the tag is identified, the microcontroller sends signals via relays to the screw conveyor to deliver the required amount of milk powder to the mixer, to the dosing pump to supply hot and/or cold water, to the mixer,

and to the pumps for dosing vitamins and medicines. The mixture is prepared according to the age and health status of the calves.

A human-machine interface is used to control and monitor the feeding system. The user can read the following information about the two feeding stations: last visit; next visit; concentration of additive and mixture; additive dosing pump; additive dosing pump; feeding rate; feeding time, calf ID; group; age; amount of milk given; amount of milk consumed; calf condition.

The information from the RFID sensor signal is filtered using the Kalman filter method to identify only the calf ID that has entered the feeding station. The Kalman filter is a recursive estimator, it is the optimal minimum mean square error (MMSE) estimator for linear, Gaussian systems (Hnatiuc, 2017).

The feeding system can be adapted to different calves using an intelligent algorithm to determine individual characteristics that are useful in the preparation of the formula. The number of visits to the feeding station, feeding speed, frequency of visits and body movement during feeding are the most important elements in the health assessment. The number of visits is more important than the amount of feed consumed per day and/or the rate of consumption. A higher number of visits indicates that the calf is more active. The amount of concentrate and supplement is prepared according to the calf's weight, drinking rate, age of the calf, group, behavior during the feeding process, and number of visits. These parameters can be input to a diagnostic system that classifies calves during the feeding process. The output parameters are recipes prepared according to weight, health status, to establish the cultivation of calves for meat or for reproduction. The rate of drinking from the nipple is another parameter that provided information about the condition of the calf. If the rate is slow, the animal has health problems and the system can increase or decrease the feeding time, as well as add supplements or vitamins. The flow meter is used to record the feeding rate. The number of visits to the feeding station is collected using an RFID sensor. Body movement during the feeding process is recorded by a microwave digital motion sensor or by floor force pressure sensors (Ionescu, 2015).

RFID has many advantages over other electronic identification technologies such as barcodes. These advantages include the ability to store more information, good readability, high read speeds, and no operational costs once implemented. In addition, because they use radio waves rather than line-of-sight technology, RFID tags do not need to be visually visible to be read - they simply need to fall within the scanning field of the reader. This therefore greatly increases ease of use, as well as providing greater reliability in light of general wear and tear and exposure to environmental elements such as dirt and humidity. Such elements can render other line-of-sight identification technologies, such as barcodes, unreadable.

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**Batura M. V.**

**VIRTUAL REALITY IN EDUCATION: PRONS AND CONS**

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In this era of rapid technological evolution, virtual reality (VR) has emerged as a pivotal innovation in the field of education. As a transformative tool, VR not only enriches the learning experience but also prepares students for the complexities of future technological landscapes. The immersive nature of VR represents a significant leap from traditional learning methods, providing an experiential form of education that engages students in a way that was previously unattainable. However, integrating VR into educational systems is not without challenges. These include the need for specialized equipment, the development of engaging and interactive educational content, and ensuring that these technological advancements align with current educational standards. This article aims to explore these complexities in detail, offering a comprehensive examination of VR's multifaceted roles and the challenges it presents in the realm of education.

Within the school education system, VR introduces a radical shift in pedagogy. By enabling interactive subject learning through immersive experiences, such as virtual tours of historical sites or in-depth explorations of scientific concepts at a



microscopic level, VR revolutionizes traditional teaching methods. These virtual experiences captivate students' imaginations, making learning more engaging and fostering a deeper understanding of complex subjects. This is particularly impactful in subjects where abstract concepts or distant historical events can be brought to life, allowing students to experience them in a way that textbooks alone cannot provide.

As education progresses to higher levels, the applications of VR become increasingly specialized and sophisticated. In medical education, for instance, VR offers realistic simulations of surgical procedures, allowing students to practice and refine their skills in a controlled environment. This hands-on approach bridges the gap between theoretical knowledge and practical application, that is a crucial aspect of medical training. Engineering students also benefit from VR technology, as it allows them to engage in advanced design and prototyping activities. Using virtual reality, they can experiment and visualize complex engineering concepts and designs, expanding their creativity and problem-solving abilities.

In the sphere of special education, VR demonstrates significant potential by offering personalized learning experiences. It creates a barrier-free learning environment, which is particularly beneficial for students with physical or cognitive disabilities. VR can be tailored to meet the unique needs of these students, providing them with equal opportunities to learn and engage with educational content that might otherwise be inaccessible to them.

Navigating the challenges of integrating virtual reality into educational curricula is a multifaceted task, requiring careful consideration and strategic planning to address the various hurdles that arise. While the benefits of VR in education are numerous, the path to its successful implementation is lined with significant challenges.

One of the foremost challenges is the financial aspect. The cost of VR equipment and software can be quite high, making it a daunting investment for many educational institutions, especially those operating with limited budgets. This financial barrier is not just about the initial purchase but also encompasses ongoing

maintenance and updates required to keep the technology current and effective. For schools and colleges with constrained financial resources, justifying and acquiring the funds for such advanced technology can be a major obstacle.

Technical challenges also play a significant role in the integration of VR in education. Issues such as latency in VR imagery, where there is a delay between the user's actions and the response in the virtual environment, can significantly detract from the immersive experience. Such technical glitches can disrupt the learning process, causing frustration and disengagement among students. Ensuring that the VR hardware and software are capable of delivering a seamless and responsive experience is critical for maintaining the effectiveness of VR-based learning.

Furthermore, the health implications associated with prolonged VR use cannot be overlooked. Virtual reality sickness, characterized by symptoms like dizziness, nausea, and headaches, is a concern that necessitates careful consideration. This is particularly important in educational settings where students might be using VR equipment for extended periods. Developing strategies to mitigate these health risks, such as setting time limits for VR use, incorporating regular breaks, and ensuring the ergonomic design of VR equipment, is essential for the safe integration of VR in educational settings.

The introduction of virtual reality in education not only reshapes the learning experience but also opens up a vast array of opportunities. By integrating VR into educational settings, students are exposed to a learning environment that is both innovative and highly interactive. This approach significantly boosts student engagement and enhances the overall effectiveness of education. One of the most transformative aspects of VR in education is its ability to democratize learning. VR enables access to high-quality educational resources for students regardless of their geographical location, effectively bridging educational gaps and providing equal learning opportunities to a diverse range of students.

Additionally, the immersive nature of VR provides students with practical skills and experience that are increasingly valued in today's job market. Through

virtual reality, students can participate in realistic simulations and scenarios, preparing them for real-world challenges and developing essential 21st century skills such as critical thinking, creativity and problem solving. This training is critical in a professional environment that is rapidly evolving due to technological advancements and changing industry demands.

Integrating virtual reality into educational institutions is a promising but challenging endeavor. Successfully meeting these challenges requires a strategic and multifaceted approach that combines financial ingenuity, collaborative efforts, technical expertise, health awareness and adaptability.

Addressing financial constraints is of utmost importance. Seeking educational grants, forming partnerships with technology companies, and initiating crowdfunding campaigns are effective strategies to alleviate the cost burden of VR integration. These ways not only provide the necessary financial support, but also help to involve the society in improving educational technologies.

The development VR content, another major challenge, can be solved through joint efforts. Forming partnerships with VR content developers and engaging in cross-institutional collaborations can lead to the sharing of resources and the creation of a variety of VR educational materials. The use of open source VR content further enriches the learning resources available to educators and students.

Technical support and training form the backbone of effective VR implementation. Establishing dedicated technical support teams within educational institutions ensures prompt resolution of technical issues and uninterrupted operation of VR. Educators should receive regular training to effectively integrate virtual reality in their teaching methods.

Health and safety concerns related to VR usage, such as virtual reality sickness, require careful consideration. Developing guidelines on the safe use of VR, focusing on ergonomic equipment design, and educating users about maintaining proper posture and taking regular breaks are essential measures to safeguard users' well-being.

Thus, the results of the study show that the integration of VR in education represents not just the addition of a new tool but a significant leap towards redefining educational paradigms. VR offers a spectrum of personalized and immersive learning experiences, laying the groundwork for an education system that is adaptive, inclusive, and prepared for the future. As we navigate the intricacies of introducing VR into educational systems, its potential to transform the landscape of learning and teaching becomes more obvious. VR is not only a novel technological advancement, but also a cornerstone in shaping the future of education. It prepares students for a world where the boundaries between the virtuality and reality merge, giving them the skills and knowledge needed to thrive in a digitally connected world.

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**Belov O. O.**

### **LASER SCANNING AS THE FUTURE OF SUCCESSFUL INNOVATION**

*Language Advisor – Asst. Prof. Ponikarovska S. V.*

Following modern computer programs and electronic geodetic instruments, innovative methods of territory exploration are emerging. One such new approach to obtaining more precise and detailed data during geodetic work is laser scanning.

Laser scanning is a technology of continuous measurements that allows for high-speed and accurate determination of the geometric parameters of scanned objects. With its help, it is possible to remotely capture specific objects or areas in three-dimensional space. The primary goal of this procedure is the further creation of three-dimensional models of objects and surveyed areas, capturing all the details.

Special devices called laser scanners are used for 3D scanning of objects. Using them, one can obtain coordinates of points that convey detailed information about a specific location or element. Measurement procedures are conducted with a laser rangefinder to all key points of the investigated element. The scanner is easily controlled with a portable computer, significantly simplifying the operational process. Moreover, all information is recorded in real-time – the signal is captured simultaneously with its reception.

A laser scanner is equipped with a high-speed non-reflective laser rangefinder and a system for changing the direction of the laser beam – a special rotating mirror. By defining the scanning area (the so-called mirror rotation sector) and the scanning step in each direction, a detailed capture of the object of interest can be achieved.

The laser scanning system consists of two main components: the laser 3D scanner models the shape of the scanning object, and the digital video camera is necessary for accurately transmitting the colour of objects. The results of laser scanning can be used to construct a three-dimensional model of the object or terrain.

A three-dimensional plane allows determining a point not by two coordinates but by three. This significantly enhances the precision of information. Data obtained through a laser 3D scanner can be used in any graphic program.

The scanner measures the slope distance, horizontal, and vertical angles to points on the surface of scanned objects. Scanning is carried out at a very high speed – several thousand measurements per second. In a matter of minutes, the scanner performs measurements of millions of points, forming a three-dimensional image in the form of a point cloud. The result of the capture is an array of discrete points, each with 3 spatial coordinates (X, Y, Z) and colour information.

The current position of a modern laser scanner is determined using a built-in GNSS receiver of geodetic class. For mobile and aerial systems, laser scanning during movement utilizes GNSS and an inertial navigation system (INS). The use of INS allows accounting for the real dynamics of the moving scanner and unambiguously determining the coordinates of each point of the laser scanning object in space.

The use of laser scanners is not yet widespread. Not every company specializing in engineering-geodetic services can offer 3D scanning. However, it is not practical to apply this research method to every area. There are specific objects where laser scanning significantly simplifies and expedites work. Primarily, these include hard-to-reach places on objects, hazardous areas requiring monitoring and control. Another area is engineering constructions, where 3D scanning allows monitoring the construction process, making adjustments to project documentation, and conducting monitoring during the operation of engineering systems.

Road scanning is relevant during the laying of new road surfaces and other works on these objects.

Laser scanning enables not only the creation of topographic plans for various scales but also digital three-dimensional models of objects or terrain and its relief. The use of 3D scanners is relevant in industries such as heavy industry, oil and gas, and similar fields. In these cases, three-dimensional scanning allows the exploration of resource deposits, as well as the assessment of the location and condition of pipelines. Laser scanning is also valuable in construction, reconstruction, or major repairs.

Laser scanning has become an integral part of geological research, facilitating a detailed examination of geological formations, determining their location, and analyzing their composition. This is crucial for mining operations and planning in the mining industry. Additionally, it is employed to study geographical features and changes in terrain, aiding in climate zone management and adaptation to climate

change. The technology provides vital data for developing strategies to adapt to extreme weather conditions.

In the field of surveying, laser scanning has gained popularity for measurements in architectural projects. It provides accurate data on the positioning of buildings and their elements for further use in design and urban planning.

This research method offers several advantages, primarily its speed, making it the fastest way to obtain a comprehensive set of information. However, challenges arise, especially in airborne laser scanning, where the process may be prolonged due to the need for aerial shooting permits. The main obstacle hindering widespread use in surveying is the high cost of 3D scanners and the requirement for skilled professionals in this field.

Laser scanning in surveying opens up new possibilities for precise and detailed measurements of objects in three-dimensional space. Its integration into modern surveying practices is essential, providing comprehensive and accurate data for addressing various challenges in the field. Continued research and refinement of this technology are necessary for further enhancing its effectiveness and expanding its application areas.

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**Bondarieva K. S.**

## MICROPROCESSOR TECHNOLOGY. ROBOTS

*Language Advisor – Asst. Prof. Ponikarovska S. V.*

Electronic technology has rapidly entered the everyday life and activities of a person in the form of office and industrial computers, powerful electronic computing machines and in the form of controllers and microcontrollers, which today are built into almost all household appliances and industrial installations and perform the functions of management, control, protection and diagnostics.

### *Technologies of creation and functioning of electronic equipment*

Microprocessor systems (MPS) fundamentally changed the technology of creating electronic equipment, significantly raised the technological culture and level of knowledge of new equipment developers, users and repair personnel.

Reaching the level of nanotechnology led to a radical change in the physics of processes, while classical laws, as it turned out, do not work at this level.

Modern electronic devices require an element base that meets such requirements as: high data processing speed, compactness and low energy consumption.

### *Principles of MPS organization in electric power*

The basic principles of the organization of microprocessor systems in the power industry include:

1. The principle of hardware and software redundancy. This principle provides for such an organization of the MPS, in which malfunctions in the hardware and software parts are eliminated due to the fact that the performance of functional tasks is taken over by reserve units or there is a priority redistribution of performed tasks according to importance and urgency. In this way, the probability of MPS failure as a whole decrease, i.e. instead of the "failure" event in such a system, the "deterioration of quality" event is considered.

2. The principle of multiprocessing. This principle consists in using to build a system a number of the same type of computing elements that interact with



each other either through the common memory field or with the help of special communication channels and switching structures.

3. The principle of modularity. This principle consists in the fact that the entire system is created in the form of independent interchangeable modules of the same type. This allows you to expand the system and make it less vulnerable to failures. The principle of modularity increases the maintainability of the system and, as a result, the reliability of its operation over a long period of time. The principle of modular construction of the MPS hardware also determines the modularity of its software. The latter is achieved by selecting independent software modules that are optimally placed in the MPS memory.

4. The principle of functional decentralization. According to it, the functional tasks are distributed between MPS processors (the so-called decomposition of tasks), which ensures their parallel execution in time.

5. The principle of dynamic redistribution of functions. Allows, in the presence of redundant computing modules, to ensure automatic reconfiguration of the MPS in order to preserve its main computing functions in the event of a failure, with the help of a software subsystem. At the same time, the less loaded module takes over the tasks of the failed module. Redistribution software must be complemented by hardware.

6. The principle of a single information base. It characterizes a systematic approach to information processing. Its application in MPS allows to accumulate and constantly update the information necessary for the functioning of the system. At the same time, in the main arrays, unjustified duplication is excluded, which inevitably occurs in the case of creating information arrays for each task separately. A single information base allows one-time input and repeated use of primary operational information.

7. The principle of the complex design method. It provides for the creation of MPS in the form of a single information complex that solves all the tasks of control, protection, diagnostics and management. At the same time, a specific MPS

is considered not autonomously, but as a subsystem of a complex ACS of a power grid facility.

8. The principle of continuous development of the system. It provides for the possibility of changing its structure, adding computing modules and functions, as well as modifying the software. At the same time, the sets of work programs are built in such a way that, if necessary, it is possible to easily change not only individual programs and subprograms, but also the criteria by which tasks are performed.

9. The principle of new tasks. It allows to change the algorithms embedded in the system in accordance with the new capabilities of computing equipment, and thus to increase the technical perfection of MPS.

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**Burda V. S.**

### **CHALLENGES OF INNOVATIVE TECHNOLOGIES THAT ENGINEERS WILL FACE. THE ROLE OF AUTOMATION AND ROBOTICS IN DEVELOPMENT AND IMPACT ON EMPLOYMENT**

*Language Advisor – Asst. Prof. Ponikarovska S. V.*

Autonomous systems are developing very quickly, especially artificial intelligence. Ethical issues in robotics are becoming increasingly important. Understanding and addressing the significant ethical challenges that arise in the course of these technologies is important. The article will be conditionally divided into two stages. In the first, we will describe the problems that greatly concern humanity in cooperation with robotics, and in the second, we will describe real

solutions and what future engineers face to improve the interaction of humanity with their "dangerous" invention.

Creating algorithms that enable robots to make morally difficult or surprising decisions in an ethically sound manner is one of the major challenges. How, for instance, can we decide what to do in a potentially fatal circumstance where the rules are unclear? Moreover, complicated situations with artificial intelligence are becoming more and more common. Recently, there was a high-profile case when an AI drone in the US Army fatally attacked its operator so that he would not interfere with the execution of an order. However, in order not to frighten people, we should point out that the use of these technologies is aimed at reducing injuries, which is quite real and is already being used in other areas.

The challenge is to define common ethical standards that will be applied to robotics. How do we determine what actions are morally acceptable to perform in different areas, such as medicine, the military, or everyday life?

The development of robotics can lead to increased social inequalities, such as limited access to high-tech solutions or job losses. How to make robotics fair?

Fortunately, the latest technology is primarily a tool, and there will always be people who are afraid of something new and uncertain. It is true that people who will use the latest technologies will replace those who will not, because that is why engineers exist to introduce the world to AI and its capabilities.

Using the example of the introduction of robotics in medicine, we will present methods for addressing ethical problems.

Ethicists, engineers, and human rights advocates can work together to create ethical standards for autonomous surgical robotics. Algorithms built into the system can be used to ensure that ethical rules are followed at every stage of the operation. In addition, monitoring and reporting systems can be used to automatically record incidents or non-compliance with ethical standards to ensure transparency and allow for further analysis. The creation of ethical systems of interaction between robots and

medical professionals can ensure the safe and ethical use of autonomous surgical systems in medical practice.

Ethical issues are very important, but the most resonant question are: will I lose my job if my employer wants to implement automated systems?

Automation is not a new phenomenon at all, so you can build on existing examples. It is difficult to determine the risks for individual professions, but we can identify one pattern: the more algorithmic the work, the more likely it is that you will lose your job. And in many cases, everyone wins, except of course the person who was fired.

In fact, there are many examples where progress seems to take away work, but it has not happened. After the introduction of ATMs, cashiers seem to be in danger, but people are still sitting in the windows of banks and working. Internet banking is also a threat, but only the number of employees has changed. Currently, there are a lot of services on your phone that can help you quickly book flights and hotels online, but many people still work with travel agencies.

In conclusion, it is possible to identify trends that process automation has reduced the number of employees in a particular department, but there is an interesting effect in some countries. There were more branches and employees overall as a result of lower operating costs and a decline in the average number of employees per branch.

In conclusion, it is not necessary to make predictions, because only the units were true to our time, and the majority, respectively, are not. Changes will obviously be, for many people they will be difficult, and just to hire new ones will not work, it will be necessary to requalify. With progress always so, but, unfortunately, some get lost in it.

In the new phase of industry development, engineers and professionals are creating programs and initiatives aimed at increasing social sustainability as part of the support of social responsibility. It contains:

- requalification programmes: create training programmes that help employees remain competitive in the new technological environment. This can include retraining programmes, training and courses that help maintain and develop the skills needed for the modern labour market;
- creation of mechanisms for interaction with the public to take into account their needs and opinions about new technologies. In order to ensure transparency and public involvement in the process of technology development, public consultations, educational activities and open debates must be conducted;
- create campaigns that explain the essence of new technologies and how they affect society. This contributes to the fact that the public gets objective understanding and supports the transition to new stages of industry development;
- to ensure that new technologies take into account different social, cultural and financial needs of different groups of the population. This may include campaigns to address diversity, equal opportunities and access.

The goal is to create an industry that is sustainable and moral, that takes into account the needs of workers and society as a whole, and also helps to move to new technological realities that are mutually beneficial. There is an enlightenment issue since people working with technology need to try to communicate accurate information to prevent miscommunications. Additionally, to do every effort to ensure that humanity gains far more from it than it has lost.

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**Drobotenko O. D.**

**RELEVANCE OF MODERN SOFTWARE SYSTEMS FOR BRIDGE CONSTRUCTION. USE OF BIM TECHNOLOGIES**

*Language Advisor - Asst. Prof. Vorobiova S. V.*

Bridge construction is an important branch of infrastructure construction that ensures the safety and convenience of transportation. Modern software systems for bridge design and analysis have a number of advantages over traditional methods, which makes them increasingly relevant.

For example, the advantages include:

1. Increased accuracy and reliability of calculations.

The software package uses modern calculation methods that take into account all factors affecting the durability and stability of the bridge. This significantly increases the accuracy and reliability of the project.

2. Reduce design and construction time.

Such technologies automate many design and construction processes, which can significantly reduce work time. One such example is BIM technology, which also makes the next point possible.

3. Improved interaction between design and construction participants.

They provide general access to project information, facilitating interaction between designers, builders and customers.

But such programs also have disadvantages, including:

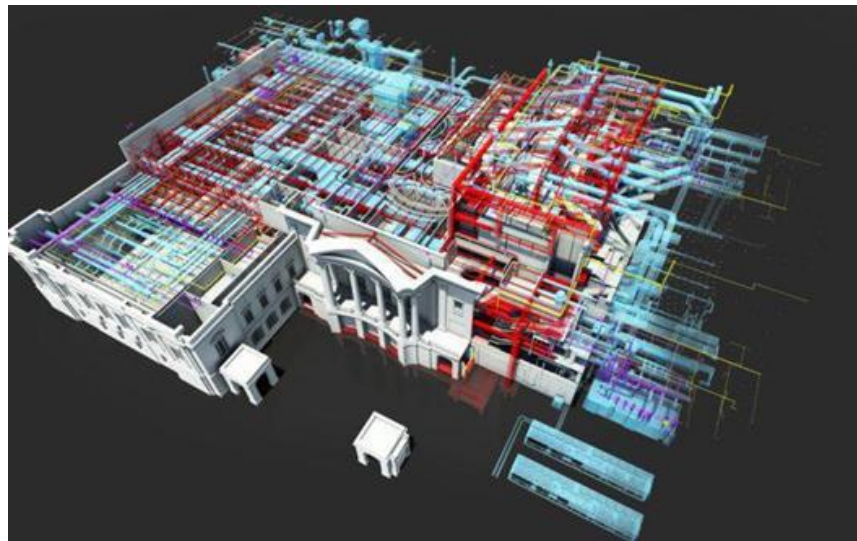
1. High cost.
2. The need for qualified personnel.

Moreover, the latter point is even more problematic than the former. Since the use of programs came to bridge construction not so long ago. And due to the fact that

it is developing very quickly, not everyone has time to master new knowledge and modern needs.

1. One of these modern but little used technologies is BIM.

BIM is an abbreviation for Building Information Modeling, which means information modeling of buildings. It is the process of creating a digital model of a building or other structure that contains information about its geometry, materials, properties, and other data (Figure 1).



*Figure 1. – Building Information Modeling*

BIM has significant advantages in bridge construction, including those already mentioned, namely:

1. Improved communication and coordination between different stakeholders.

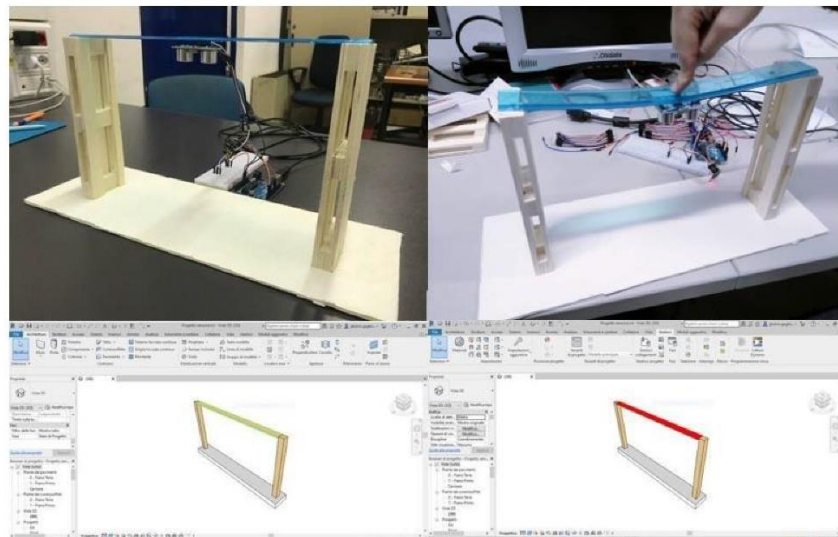
BIM models can be used to exchange information between engineers, architects, contractors and other project participants. This can help avoid mistakes and delays (Fig. 2).



*Figure 2. – Cooperation between BIM and stakeholders*

2. Reducing the risk of errors.

BIM models can be used to analyze the structural strength of a bridge and other characteristics thanks to IoT. This can help identify potential problems at an early stage before they lead to delays or accidents during the bridge's operation (Figure 3).



*Figure 3. – Modeling the behavior of a tilted beam*

3. Improving the quality of construction.

BIM models can be used to create digital working documents that can be used for construction quality control. This can help ensure that the bridge meets the design requirements.

4. Waste reduction.



BIM models can be used to optimize the use of materials and resources. This can help save money and reduce environmental impact.

5. Saving time and money.

BIM can help reduce the time and cost of building a bridge.

In conclusion, BIM has the potential to revolutionize bridge construction by making it more efficient, safer, and more sustainable. It is already widely used in bridge construction in many countries around the world. However, in Ukraine, BIM is only gaining popularity, as there are a number of obstacles to its widespread implementation.

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**Dudetskyi I. S.**

### **FEATURES OF USING RFID TAGS IN THE MODERN WORLD**

*Language Advisor – Asst. Prof. Ponikarovska S. V.*

Modern technologies are in a constant state of evolution, bringing about simplifications in human life. An example of this is the radio frequency identification (RFID) system, which enables the recognition and registration of objects through radio frequency radiation.

An RFID tag is a tiny memory device consisting of a microchip for information storage and an antenna for data transmission. While these tags can be active,

operating with a power source, in most cases, they function without the need for power.

The memory within an RFID tag contains unique information and a numerical identifier. When the tag enters the registration zone, the reader perceives and reads the stored information.

As businesses across diverse sectors comprehend the functionality of RFID technology, they actively embrace its applications. This technology finds active usage in monitoring the movement of various objects and implementing intelligent automated solutions. The systems operate seamlessly, devoid of errors, ensuring efficiency and reliability.

For instance, this technology proves invaluable in the meticulous registration of raw materials and overseeing operations at the technological level. RFID systems play a pivotal role in ensuring product quality and stability.

Furthermore, it facilitates swift and transparent tracking of the movement of goods, expediting the processes of goods acceptance and shipment. This contributes to an enhanced level of transparency and reliability in operations, minimizing the impact of the "human factor". RFID systems also serve as a safeguard, preventing tampering or unauthorized movement of goods.

Furthermore, the RFID system is indispensable for tracking goods from the delivery stage to their sale at the counter. This includes product display on shelves and their distribution to stores based on demand.

The process of finding specific goods is significantly streamlined, thanks to the insertion of a special label and identification mark inside each product. With each passing day, new possibilities and applications for this technology emerge.

To comprehend the components of the RFID system, three key elements are identified. Firstly, there is the tag, which serves as a device for storing and transmitting data. The "memory" of the label contains an identification code, and some tags even have a memory rewrite function.

Secondly, readers are special devices that read data from tags and store them. These readers connect to the system and operate independently. Depending on the system configuration and equipment used, readers may be equipped with additional antennas.

Lastly, accounting systems are programs that accumulate and analyze information, connecting all elements into a unified system.

In our daily lives, RFID cards, featuring a built-in radio frequency tag, are commonplace. These contactless cards are utilized for personal identification and making payments in various scenarios such as parking lots, communication services, and attractions. The dimensions of these cards align with standard magnetic products, albeit with a slightly larger thickness. The field of application for these cards is extensive, ranging from public transport and student tickets to hotel keys, fitness club subscriptions, and bonus cards. The effective utilization of the RFID system contributes to simplifying services across diverse business sectors.

The primary benefits of Radio Frequency Identification include the capability to rewrite labels, allowing for multiple additions. In contrast, the information on barcodes remains unchanged and is inputted only once during printing.

Reader systems do not require direct visibility of the tag to "read" the data. Labels are detected through packaging, ensuring concealed placement. For data reading, the tag enters the registration zone, even when the device is moving at high speed.

RFID tags can be read from a greater distance compared to barcodes, and these labels can store a substantially higher amount of relevant information—up to 10,000 bytes.

Moreover, RFID tags exhibit enhanced invulnerability and resistance to the natural environment. This proves advantageous in the identification of various return containers. Passive types of tags don't have limitations in terms of service life.

The practical application of RFID tags serves as both a device for storing information and an intelligent tool with a wide range of uses. This versatility is achieved through a unique identifier.

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**Funkendorf V. V.**  
**AUTOMATED CONTROL SYSTEMS FOR ASPHALT CONCRETE  
PLANT AGGREGATE FEEDING**

*Language Advisor – Asst. Prof. Ponikarovska S. V.*

Modern methods of managing production processes based on computer technologies have become widespread in most industrial enterprises across various industries. Supervisory Control And Data Acquisition (SCADA) systems, which involve dispatch management and data collection, are now the primary methods for automated control of complex dynamic systems and processes in vital and safety-critical industries. Large automated systems in industries such as manufacturing, energy, transportation, military, aerospace, as well as in various government structures and private companies, are built on the principles of supervisory control.

The traditional concept of designing control systems for production processes involves a highly limited formalization of stages in designing the Process Control System (PCS), treating these actions (such as goal analysis and synthesis of control criteria) as creative acts. The success of these creative acts is largely determined by the professional and personal qualities of the management personnel.

However, the practice of operating complex production systems shows that limited formalization of fundamental stages in designing the PCS can lead to the

impossibility of achieving set goals, obtaining results different from expected ones, and a mismatch between changed conditions and goals and unchanged models, methods, algorithms, and criteria. Quality software support (software engineering) for process automation plays a crucial role not only in the performance and reliability of technological units but also in the life cycle of the designed and implemented PCS in industrial operation.

Currently, in the practice of designing PCS, so-called "box" solutions have emerged in the field of designing lower-level (controller level) and upper-level (SCADA system level) PCS, as well as at the enterprise level (Enterprise Level Control Systems - MES and ERP systems). However, the application of SCADA systems, especially for project developers, involves a vast array of technologies.

The automation of thermal processes has not only technical and economic but also social importance. Comprehensive automation allows for increased productivity and improved working conditions, increased quantity and quality of products, freeing workers from heavy physical and monotonous mental work, reducing losses and production costs, and extending the service life of equipment.

### *Analysis of Existing Technological Processes of Bulk Material Handling and Dosing*

#### *Types of Bulk Material Regulation*

The regulation of bulk materials such as granules, powders, or grains plays a crucial role in various industries, including civil engineering, pharmaceuticals, food, and others. The principles and technologies applied in the regulation of bulk materials can vary depending on the specific tasks and process requirements. However, there are several general principles and technologies used in this field.

Let's consider some of them:

– *Gravity Regulation:* This principle is based on using gravity to move bulk materials. An example is the use of conveyor systems with chutes and valves to regulate the flow of bulk materials.

- *Pneumatic Regulation:* Pneumatic systems use compressed air or gases to move bulk materials. Regulation is achieved by changing the pressure, flow, or velocity of air. Examples include pneumatic conveyors or pneumatic valves.
- *Vibrational Regulation:* This method uses vibrations to control the flow of bulk materials. By adjusting vibration parameters such as amplitude and frequency, the flow and uniform distribution of materials can be regulated.
- *Electromagnetic Regulation:* Electromagnetic systems use magnetic fields to move and regulate bulk materials. This can be achieved through electromagnetic valves or vibrational feeding devices.
- *Hydraulic Regulation:* Hydraulic systems use fluids to move bulk materials. Regulation can be achieved by changing the pressure, flow, or direction of the fluid.
- *Automated Regulation:* With the advancement of automation and control technologies, automated systems are widely used in bulk material regulation.
- *Automatic Control:* Instead of manual valve adjustment, automated systems allow controlling the valve through software and sensors. This eliminates the need for manual intervention and provides more precise and reliable control.
- *Level Sensors:* In an automated valve system, level sensors can be installed to monitor the level of bulk material before the valve. They provide information about the current material level, enabling real-time decision-making for valve regulation.
- *Flow Regulation:* An automated system can control and regulate the flow of bulk material through the valve. Using information from level sensors and other sensors, the system can determine the optimal position of the valve to achieve the required material flow.
- *Integration with Other Systems:* An automated valve system can be integrated with other systems in the production process. For example, it can connect with automatic weighing, mixing, or transportation systems to ensure consistency and efficiency throughout the process.

– *Remote Control and Monitoring*: An automated system allows remote control and monitoring of the valve's operation. Operators can adjust parameters, monitor processes, and receive notifications of anomalies or issues through a centralized control system.

– *Process Analysis and Optimization*: Automation of the valve system enables data collection on system operation, material flow, parameters, and other factors.

These data can be analyzed to optimize the regulation process, improve efficiency, and identify areas for improvement in the overall process.

In summary, the regulation of bulk materials involves various principles and technologies, ranging from traditional gravity-based methods to advanced automated systems. The choice of the appropriate method depends on the specific requirements of the process and the desired level of control and automation.

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**Komkov M. A.**  
**IMPLEMENTATION OF AUGMENTED REALITY TECHNOLOGY  
INTO CLINICAL PRACTICE**

*Language Advisor –Asst. Prof. Ivanova I. L.*

With the advent of advanced technologies, the medical field is experiencing a period of significant innovation, among which augmented reality (AR) technology holds a special place. AR is bringing revolutionary changes to surgical practice, offering new opportunities for improving treatment quality and enhancing patient safety. This technology, initially popular in the gaming and entertainment sectors, is now increasing finding applications in serious fields like medicine, particularly in surgery.

In a surgical context, AR allows doctors to see virtual images superimposed on the patient's real body. This can include visualizations of anatomical structures, such as blood vessels or nerves, or even detailed representations of the surgical area. This approach significantly improves the precision of surgical interventions, reduces risks to patients, and shortens the duration of operations.

However, along with its advantages, AR also faces challenges, especially regarding integration into the clinical environment. This includes the need for accurate calibration, high-quality imaging, and ergonomic equipment. Despite these challenges, the continuous development of technology heralds a new era in surgical practice, where AR will play a key role in improving patient experience and treatment.

The application of augmented reality (AR) in surgery represents one of the most promising and dynamically developing areas in medical technology. Across various surgical specialties, from neurosurgery to orthopedics, AR is demonstrating its potential in enhancing the accuracy and safety of operations. Advanced research and clinical trials underscore the importance of AR in modern medical practice.



In neurosurgery, for instance, AR is used for visualizing complex anatomical structures, allowing surgeons to better plan and execute operations. An example of such application is described in a study by Johns Hopkins Medicine, where doctors used AR for spinal surgeries. The technology enabled surgeons to see a virtual image of the patient's spine, significantly improving the accuracy of screw placement and reducing risks.

In orthopedics, AR is used to improve the outcomes of bone and joint surgeries. A study in *BMC Musculoskeletal Disorders* showed that the use of AR in orthopedic surgeries could increase precision and reduce the duration of procedures. This is particularly relevant in complex procedures like deformity corrections, where AR allows surgeons to receive real-time visualization of the patient's anatomy.

Additionally, AR finds application in surgical training, where it is used for simulations and practice. According to a systematic review in PubMed, AR shows promising results in improving surgeons' skills, particularly in the context of reducing operation times and postoperative complications.

It is important to note that AR also has potential in improving communication between surgeons and patients. Using AR, doctors can visually demonstrate planned surgical interventions to patients, which can help in reducing patient anxiety and enhancing understanding of the medical process.

Overall, the use of AR in surgery is a vivid example of how advanced technologies can enhance medical procedures, increasing their safety and efficiency. However, it's crucial to consider the challenges associated with integrating this technology into clinical practice, particularly the need for accurate calibration of equipment, high-quality imaging, and user interface refinement.

Innovative clinical applications of augmented reality (AR) in surgery are opening new opportunities for improving surgical interventions and enhancing patient safety. These technologies not only improve the precision of surgical procedures but also extend the boundaries of traditional surgery, offering new methods for treatment and rehabilitation.

The use of AR also facilitates better communication between surgeons and patients. Doctors can use AR to demonstrate planned surgical procedures, helping patients to better understand the treatment process and reducing their level of anxiety.

Thus, AR in surgery is opening new prospects for medical professionals, enhancing the quality and safety of surgical procedures. This technology is not just changing the way surgical operations are conducted, but it also provides significant advantages in planning and executing medical interventions, increasing efficiency and reducing risks for patients.

The use of AR in clinical settings offers innovative solutions for improving the accuracy of surgical interventions, reducing risks, and enhancing the level of patient care.

One example of AR's use in a clinical environment was demonstrated by doctors from Johns Hopkins Medicine. In 2020, a team of surgeons performed one of the first operations using AR to remove a cancerous tumor from a patient's spine. The use of AR allowed surgeons to visualize the patient's anatomical structures more accurately, significantly contributing to the success of the operation and reducing the risk of complications.

Another significant clinical case was documented in a study published in *BMC Musculoskeletal Disorders*. This research involved the use of AR during orthopedic surgical procedures, where surgeons used holographic AR glasses to improve visualization during operations. This equipment allowed surgeons to receive additional information about the patient's anatomy in real time, increasing the precision and safety of the procedures.

Additionally, AR has been used for educational purposes, helping young surgeons gain practical experience without risking patient safety. According to PubMed, AR is used to create simulations of surgical procedures, which help medical professionals improve their skills and reduce the number of errors in real clinical conditions.

These and other clinical examples confirm the potential of AR in surgery, opening new possibilities for more precise and safer treatment.

The application of augmented reality in surgery brings new opportunities, but there are technical challenges such as:

**Integration with medical data:** AR must accurately interact with medical imaging, requiring precise calibration and quick response to ensure surgical precision.

**Image quality and visualization:** High resolution and clarity are important for accurate interventions, and surgeons face challenges related to the image quality and interactivity of AR systems.

**Integration into sterile conditions:** Equipment must meet sterile requirements to avoid risks of infections or contamination.

**Cost and accessibility:** High development and implementation costs of AR systems can be a limiting factor, especially for medical institutions with limited budgets.

The conclusion regarding the role and impact of augmented reality (AR) in surgery highlights the importance of this technology as a promising tool in medicine. AR, used in surgical procedures, significantly changes the way surgeons plan and perform operations, offering new opportunities to enhance accuracy, safety, and treatment efficacy.

However, along with its advantages, AR faces a number of challenges that need to be considered. Technical limitations related to integration, image quality, and ergonomics require further research and development. Additionally, the high costs of developing and implementing these systems can be a limiting factor for their broader use, especially in institutions with limited budgets.

Despite these challenges, the potential of AR in surgery cannot be underestimated. This technology has the potential to radically transform surgical practice, offering new treatment methods that would be impossible with traditional techniques. The further development and implementation of AR into clinical practice

will depend on the joint efforts of medical professionals, engineers, and researchers, as well as the support of medical institutions and health authorities.

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### **Korniienko V. R.** **THE OVERVIEW OF SOC AUDIO PROCESSING** **IMPLEMENTATION METHODS**

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The modern requirements for the audio quality on the embedded device force the software architecture decomposition accordingly. There are strict existing requirements for the allowed delay in the frames processing meanwhile the real time limitations should be fulfilled. One of the possible approaches to reach the goal of the flexible audio processing involves usage of SoCs (System-on-Chips) where both CPU cores are available with the customizable FPGA unit connected to the same shared bus interface. Also, the partial reconfiguration option allows to implement a kind of reloadable decomposed algorithms representation in a separate bitstream module which can be flashed or parametrized on demand by the high-level embedded software.

The goal of this thesis is to present the possible ways of implementing flexible audio-processing applications with the meet of real time requirements.

First of all, it's necessary to define the common interfaces which are widely used in the audio industry. The typical and standard ones are I2S and SPDIF blocks. The Integrated Inter-IC Sound Bus (I2S) is a serial bus interface standard used for connecting digital audio devices together. The specification is from Philips Semiconductor (I2S bus specification; February 1986, revised June 5, 1996). The I2S component operates in master mode only. It also operates in two directions: as a transmitter (Tx) and a receiver (Rx). The data for Tx and Rx are independent byte streams. The byte streams are packed with the most significant byte first and the most significant bit in bit 7 of the first word. The number of bytes used for each sample (a sample for the left or right channel) is the minimum number of bytes to hold a sample ("Inter-IC sound bus (I2S)", б. д.).

S/PDIF (Sony/Phillips Digital Interface) is a consumer audio connection standard for transmitting high-quality digital audio. It is primarily used for connecting home cinema (home theatre) systems, Hi-Fi, games consoles, set top boxes, computers, and other consumer entertainment devices. S/PDIF can carry two channels of uncompressed PCM audio or compressed 5.1/7.1 surround sound such as Dolby Digital or DTS audio. The S/PDIF interface and the associated connectors can be implemented in two different ways "optical and coaxial" ("Tech tips - spdif connections explained", б. д.).

The corresponding IP blocks are available in Xilinx SoCs to be used for the audio stream handling. The first method forces the whole pipeline processing setup on the FPGA part using either vendor-provided IP cores or internally developed in Verilog/VHDL hardware description languages. There is also a possibility to use the High Level Synthesis tools as the IP flow variant. The IP cores from Xilinx for that purpose include the I2S receiver and transmitter blocks for steering the audio stream, Audio Formatter for sending the obtained stream via DMA(Direct Memory Access) to ARM part of the SoC. In a case of having the whole pipeline implemented on the

FPGA part the only data which is referred to ARM core is the AXI-Lite transactions for the IP cores initialization and applying initial settings to the pipeline.

The typical design for testing Audio Formatter on the Xilinx ZYNQ chip is shown on figure 1. where the audio stream generator and the stream checker are involved simultaneously. Also, the samples are shared through the BRAM memory blocks of the corresponding FPGA ("Tech tips - spdif connections explained", б. д.).

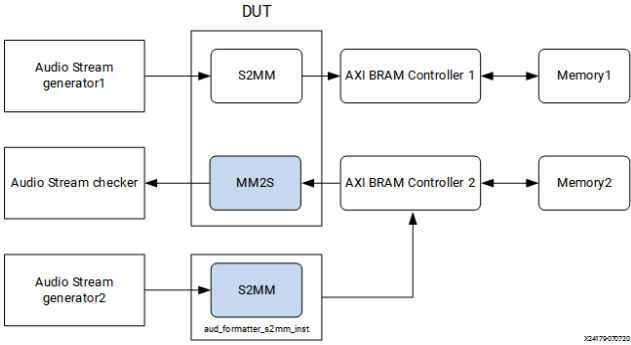


Figure 1. – Audio Formatter testing on the ZYNQ FPGA

The second method of the real-time audio processing involves the decomposition of computations between ARM and FPGA parts for reducing the bottlenecks and improving the overall performance of the system. For audio applications performance improvement reduces the delay between the signal input and the output samples production. This method involves the hot-path execution profiling and determining the optimal data path through the available peripherals. Also, the complex logic routing can be implemented on the separate softcore CPUs synthesized directly on the FPGA meanwhile the hardware ARM cores can be loaded with the efficient DSP processing using CMSIS-DSP library on it. The extra pre-processing can be performed directly on the incoming AXI-streams without involving CPU somehow. Later on, all of the pre-processed data can be submitted to the application part via DMA.

Typically softcore architectures are based either on the vendor-provided ones or open source implementations of RISC-V architecture. Some of them are available as frameworks for building the complex SoCs based on high-level hardware-agnostic

description languages such as Scala or Migen. One of their representatives is Litex SoC builder. The facilities include several softcore CPUs implementations with the rich feature set of the peripheral modules and interconnect buses. Also, it's known for providing the full SDK to their soft-IP cores. The generalized SoC structure is shown on Figure 2.

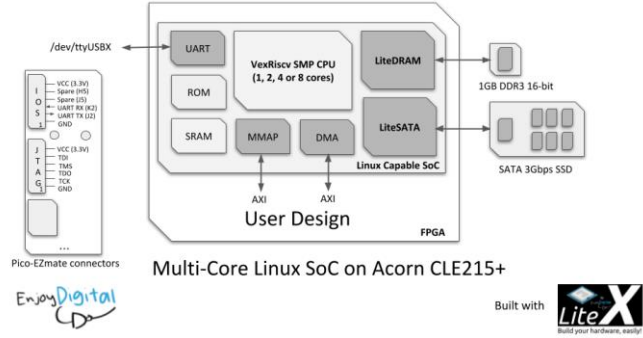


Figure 2. – SoC architecture based on the Litex framework

Consequently, the softcore architecture opens the third method of designing real-time audio processing systems. The specialized DSP-oriented platform can be implemented as ISA extensions for the target CPU. They might involve an impact on the target platform compiler. Exploring the expansion of architecture stands out as a promising realm in research, focusing on both potential and applied approaches to integrating specialized components into RISC-V. In reference to (Scott, 2020) the examination delves into the process of ISA expansion and assesses the viability of incorporating the chosen architecture. This exploration reveals a discernible inclination toward crafting the novel ISA to meet future requirements. The study outlined in (Waterman, 2016) scrutinizes and contrasts the capabilities of established architectures like OpenRISC, ARMv8, and 80x86. It introduces a new ISA, supported by an in-depth analysis of existing RISC extensions and their performance.

**Conclusions**

The overview of the methods related to development of the SoC audio processing pipeline was shown. The analysis of the potential ways of implementing them on the certain hardware platform was given. The future research directions

involve OpenCL tools examination for hybrid computing and the custom hardware accelerators development. Also, there is a potential field with the customizable platforms based on SoCs with the partial reconfigurations features included. However, the most suitable method should be benchmarked as well for the proper data path examination. Moreover, there is no existing simple way of audio scoring metrics except well known SNR and VISQOL tools.

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**Kotsur Z. V.**  
**USING ARTIFICIAL INTELLIGENCE IN THE FIELD OF  
PROGRAMMING**

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Working with program code using Artificial Intelligence (AI) is rapidly evolving and finding increasing applications in a variety of fields, including software development.

AI technology helps developers perform a variety of code-related tasks, including:

Code generation.

You can write a task for artificial intelligence, for example, request the writing of code for a simple console program in the c++ programming language.

*Generate a program code in c++ that evaluates the expression 2+3 and print the result.*

The received code:

```
#include <iostream>
int main() {
    // Calculating the expression 2 + 3
    int result = 2 + 3;
    // Outputting the result
    std::cout << "Result: " << result << std::endl;
    return 0;
}
```

Code testing.

Testing is a very important aspect of the software lifecycle, so it is very important to properly test the product before it is used, and artificial intelligence can be used for this. For example, if you ask ChatGPT 3.5 to test the code that was generated earlier, it will provide advices on how to improve it, if the code was really incorrect, it would point out the errors and generate new correct code that preserves the idea of the program.

Modeling software behavior.

You can ask artificial intelligence to model the behavior of the program that was generated above.

*Model the behavior of the provided program*

The task of this program is to calculate the sum of two numbers (2 and 3) and display the result on the screen. Let's take a look at the steps to complete it:

The expression `int result = 2 + 3;` defines an integer variable `result` and assigns it the value of the sum of 2 and 3. So, `result` will have the value 5.

Instruction `std::cout << "Result: " << result << std::endl;` uses standard C++ output to print the text "Result: " along with the value of the `result` variable on the screen. In this case, the output would be "Result: 5".

The `return 0;` statement signals that the program has completed successfully and returns an exit code of 0.

So, after executing this program, the expected output will be on the screen:

Result: 5

Using artificial intelligence (AI) to generate code, test code, and model software behavior can face many challenges. It is important to consider these challenges to effectively and securely implement AI in software development.

Here are some possible issues:

*Code Generation:*

It is very important to set queries to artificial intelligence correctly, because if the query is formulated incorrectly, the user may get a result that was not expected. That is why there are even some specialists who know how to correctly ask artificial intelligence queries. Artificial intelligence works according to an algorithm set for it, so it is very difficult for it to use creative approaches to code generation.

*Code Tests:*

Artificial intelligence may not analyze all scenarios or data inputs that can be used. Therefore, the code may not be fully tested correctly.

*Modeling software behavior:*

As mentioned earlier, AI uses scenarios, even for testing code, so it may not be able to see the options in unforeseen situations and attacks, for example. Insufficient consideration of ethical aspects may lead to inappropriate use of the system, including the generation of malicious code. Therefore, it is important to take all these aspects into account when using artificial intelligence to speed up code writing and testing or model software behavior.

### *Education*

Artificial intelligence (AI) has the potential to change the way we learn to code. AI technology can be used to automate many tasks related to learning to code, including:

#### Providing Recommendations

AI systems can be used to provide recommendations to students learning to code.

These recommendations include:

Areas of study, resources for learning, practice locations

*I want to learn the c++ programming language, I need recommendations on areas of study, resources for learning and places to practice*

It's great that you've decided to learn the C++ programming language! It is a powerful and high-performance language used to develop a variety of programs, including operating systems, games, embedded systems, and much more.

Here are a few steps and tips to help you learn C++ effectively:

1. Language basics: Start by learning the basic concepts of the language, such as variables, data types, operators, loops, and functions.
2. OOP (Object Oriented Programming): OOP fundamentals are a key element of C++. Learn concepts such as classes, objects, inheritance, polymorphism, and more.
3. C++ Standard Library: Learn about the C++ standard library, including container handling (e.g., vectors, lists), string handling, streams, and other useful features.

4. Development environments: Install a C++ development environment such as Code::Blocks, Visual Studio, or CLion. They provide a user-friendly interface for writing and testing code.

5. Online resources: Use online resources to learn C++. A few popular ones include: [cplusplus.com](http://cplusplus.com): The official online tutorial for C++. GeeksforGeeks C++: Assignments, articles, and examples.

6. Books: Read books about C++. Some recommended ones:

"Accelerated C++" by Andrew Koenig and Barbara E. Moo.

"Effective C++" by Scott Meyers.

"C++ Primer" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo.

7. Projects and practice: Try creating your own projects to practice. It can be a console program, game, or other task that interests you.

8. Online platforms: Use online platforms to learn and practice, such as LeetCode, HackerRank, or CodeSignal.

9. Communities and forums: Join C++ communities on forums like Stack Overflow where you can ask questions and get help from other developers.

Remember that the most effective learning happens through practice, so don't be afraid to use what you've learned to solve problems and create your own projects. Good luck in learning C++!

Artificial intelligence can be asked to develop a task on the topic studied and then evaluate it.

*I have studied the topic of multidimensional arrays in c++, develop a task for me on this topic.*

Of course, here is a task for you to work with multidimensional arrays in C++:

Assignment: Create a program that uses a multidimensional array to represent a matrix. Implement the following functions:

Write a function that fills a matrix of integers with random values in a given range. Write a function that displays a matrix on the screen. Implement a function that calculates and prints the sum of the elements of each row of a matrix. Write a

function that finds and prints the maximum element in a matrix, and also prints its location (row and column indices). Implement a function that transposes a matrix (swaps rows and columns). Write a function that takes a value and returns the position (row and column indices) of the first element found in the matrix with that value. If the element is not found, return a message. Set the matrix dimension and the range of random values as you wish.

Note:

Use dynamic memory allocation for a multidimensional array or C++ features to declare a multidimensional array.

In general, artificial intelligence is very popular nowadays in such technical areas as programming, for example, artificial intelligence can be a useful advisor and tool that can quickly do routine tasks, but we should not forget that artificial intelligence is a robot that obeys certain algorithms, so it is very important to test the code after receiving it.

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**Kudinov Y. O.**

### **PROBLEMS OF CONNECTING PRIVATE NETWORKS TO EACH OTHER**

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The task of building reliable connections between remote network segments via the Internet has always been relevant for both individuals and organizations. Such segments can be scattered around the world. It doesn't matter how and where they

were organized, whether locally in an office or on the equipment of some cloud provider, they need to be connected by a reliable secure tunnel.

To solve this problem, there are a huge number of routers with support for virtual private network (VPN) server and client. Such routers can be software or hardware. Many companies, for example, Cisco, Mikrotik, Juniper and others, manufacture hardware routers. Software routers can be installed on an existing operating system. For example, “Kerio Control” for Windows. However, minimal built-in traffic tunneling tools are available in every popular operating system, for example, Windows, Linux and BSD systems.

The router should be selected based on what protocols we will use to create the tunnel, as well as the required performance.

One of the common ways to organize a tunnel is IPsec. IPsec (short for IP Security) is a set of protocols for providing security for data transmitted over the Internet Protocol (IP). It allows authentication, integrity checking, and/or encryption of IP packets. IPsec also includes protocols for secure key exchange on the Internet. Because IPsec is located at the network layer of the OSI model, it is very flexible and can protect any IP-based protocols, such as TCP and UDP (Frankel et al., 2005).

However, its advantages also come with disadvantages. For IPsec to work, UDP ports 500, 4500 must be available, as well as, at a minimum, the ESP protocol (it can perform AH functions). End and intermediate Internet providers may block any of these ports and protocols, either accidentally or intentionally. In my practice, this most often happened when replacing backbone routers from intermediate providers. IPsec is also sensitive to packet routing. If packets from one router to another go along one route and return along another route, then the IPsec tunnel will not be established. It requires a white IP address on each side of the connection.

However, IPsec is a fairly fast and secure communication option that is supported in almost any hardware or software router, as well as in all popular operating systems.

Another tunneling protocol, L2TP, provides only tunneling, that is, grouping data into packets for confidential transmission over public networks. To provide encryption and privacy, it uses IPsec, which “negotiates” the use of certain data security and encryption tools. Then, with the help of ESP, devices at both ends of the communication channel recognize each other. And after that, L2TP establishes a tunnel. As a result, packets are double encapsulated, causing speed to suffer (Patel et al., 2001). The pros and cons are similar to IPsec. L2TP uses UDP port 1701 to operate, but in combination with IPsec, it does not need to be additionally opened for external access on the router if the L2TP server is behind NAT, since it is used inside the encrypted communication channel.

There is also the PPTP protocol – a point-to-point tunnel protocol that allows a computer to establish a secure connection with a server by creating a special tunnel in a standard, unsecured network (Hamzeh et al., 1999). However, now it is outdated and completely insecure, although most routers and operating systems support it.

SSTP (Secure Socket Tunneling Protocol) – application layer VPN protocol based on SSL that ensures the data encryption. Authentication is carried out using PPP and SSL. The connection is usually made using HTTPS on TCP port 443, but the port can be changed. All data encryption is carried out using the SSL protocol. All SSTP, PPP and higher protocol packets are transmitted only in encrypted form (Rajamohan, 2014).

Considering that Microsoft created this protocol, its operating systems have full support for SSTP starting with Windows Vista SP1 and Windows Server 2008. It was primarily designed to work on Windows, but today it has support for Linux, RouterOS. An SSTP client exists for a larger list of operating systems. SSTP shows good performance and is not affected by NAT settings. ISPs usually don't block HTTPS traffic, so you can connect to the VPN server without any problems. The security level is quite high. Of the minuses, from the point of view of selecting a router, for good speed it requires powerful hardware.

OpenVPN is one of the implementations of SSL VPN. To ensure the security of the control channel and data flow, OpenVPN uses the OpenSSL library. This allows to use the entire set of encryption algorithms available in this library. Today, OpenVPN is supported in all popular operating systems, such as Solaris, OpenBSD, FreeBSD, NetBSD, GNU/Linux, macOS, QNX, Microsoft Windows, Android, iOS. OpenVPN can use both TCP and UDP protocols. The Internet Assigned Numbers Authority for the operation of this program (Crist & Keijser, 2015) allocates the used port 1194. Typically, UDP is preferred because the tunnel carries network-level and higher OSI traffic if a TUN connection is used, or link-level and higher traffic if a TAP is used. TAP is used to carry Ethernet frames and for bridging, and TUN is used to carry IP packets (routing). OpenVPN is a fast and reliable solution, but in the case of a hardware router, the speed depends on the power of the hardware and the implementation of OpenVPN itself.

WireGuard is a communications protocol and free and open source software that implements encrypted VPNs. It was designed for easy VPN use, high performance and low vulnerabilities. It has better performance than OpenVPN and much faster than IPsec. WireGuard also uses strong encryption keys - Curve25519, ChaCha20, Poly1305, BLAKE2, SipHash24 and HKDF (Donenfeld, 2017). Currently, support for this VPN protocol is implemented in Microsoft Windows, Linux, Android, IOS, RouterOS, pfSense, OpenBSD, FreeBSD, NetBSD and others. Unfortunately, if your ISP blocks UDP traffic, WireGuard will not work, as it only works over the UDP protocol. It also supports only the third layer of the OSI network model (routing).

Thus, after reviewing the most popular VPN protocols, we can say that there is no ideal way to communicate between private networks. You always have to start from the circumstances: the presence or absence of blocking of ports and protocols by the Internet provider, the price of routers and the set of protocols they support. I will give a final comparative table of VPN speed and encryption without considering external factors (Table 1).



Table 1. – VPN speed and encryption without considering external factors

	IPsec	L2TP/IPsec	PPTP	SSTP	OpenVPN	Wireguard
Speed	Fast	Average	Fast	Average	Fast	Very fast
Encryption	Reliable	Reliable	Not reliable	Reliable	Very reliable	Very reliable

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**INTELLIGENT SYSTEMS OF A MODERN CAR**

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The volume and level of "saturation" of cars with automation components depends on their purpose and the required level of control of the car's movement and management of work processes.

Modern cars have sensor modules for satellite navigation, built-in on-board diagnostic systems for almost all technical systems, adapted control of work

processes, recognition and adjustment of the fuel mixture, regulation of fuel consumption in the internal combustion engine. The high technical level of car production makes it possible to increase the resource, technical and environmental safety, reliability, control the actions of the driver, adjust the periodicity and standards of maintenance compared to traditional car designs.

The types, quantity and quality of means of automation of vehicle control depends on the required level.

- The first – the system helps the driver in driving (adaptive cruise control, lane departure warning system);
- The second - partial automation (driving a car: acceleration, braking, etc.);
- The third – a high level of automation (confident driving outside the city: highway, autobahn);
- Fourth - full automation (confident driving in the city and outside the city);
- The fifth - without human participation.

An unmanned vehicle navigates thanks to cameras and sensors.

1. Sensors are installed around the entire perimeter. They determine the quality of the road and the conditions (for example, how much the conditions have deteriorated due to rain). They can also warn about a collision (like parking sensors).

2. Cameras are located on the roof, in the cabin (behind the windshield), on the front bumper and on the sides. The location may vary depending on the modification. Cameras monitor the road.



*Figure 1. – Google self-driving car*

The LIDAR sensor (Light Identification Detection and Ranging) is installed on the roof of the car for greater efficiency. It rotates and scans the space within a radius of 60 m. The car has four radars installed in the front and rear bumpers, with the help of which the car can effectively detect obstacles. Radars transmit information about the distance, height, direction of movement and speed of the object, which allows the car to "see" far enough and quickly react to changes on the road. In turn, a special position meter sensor, which is connected to one of the rear wheels, determines the location on the map of the unmanned vehicle itself. Such geographical coordinates as latitude, longitude and altitude are fixed. When the geostationary satellites broadcast GPS offset corrections that are visible to the vehicle, the device switches to differential GPS mode (thus ensuring high GPS accuracy). When a correction signal is not available, the device uses a signal with standard GPS accuracy. The video camera, located next to the rearview mirror, recognizes traffic lights and moving objects.

The main element of the control system of the unmanned car is the LIDAR sensor produced by Velodyne. With the help of this device, you can generate a detailed three-dimensional map of the surrounding area.

The on-board computer connects the information received from the sensor with the map of the area located in the memory. Then the car's program with a special algorithm evaluates the situation in terms of how other road users may behave. The computer also calculates the trajectory along which the unmanned vehicle should move. It evaluates not only the type of object, but also such details as, for example, the gesture of a police officer, which is very important for the safe movement of an unmanned car.

An unmanned vehicle (UAV) called Adaptive und Kooperative Technologien für den Intelligenten Verkehr (AKTIV for short) is being developed by 28 well-known European companies. Among them are BMW, Siemens, Volkswagen, Bosch, Vodafone and 23 other companies.

At the HAVEit conference, the German concern Volkswagen held a demonstration of the Temporary AutoPilot technology based on the Volkswagen Passat. By analogy with airplanes, the driver of this car can turn on the function of automatic control of the car on uncongested sections of the road. Volkswagen's temporary autopilot works when driving on highways at a speed of up to 120 km/h. The main advantage of this control system is that it is already practically ready for implementation on production cars.

The autopilot of a Volkswagen car is able to stick to its lane and keep a stable distance behind the moving vehicle in front, braking if necessary. The system is also able to recognize road signs and react to them by changing the speed of traffic. In addition to highways, Volkswagen Autopilot can move in traffic jams, repeating the same start-stop cycle. The maneuvers of this self-driving car are currently limited, and it cannot drive along a given route without the help of a driver, unlike the movements of Google's cars. The main task of General Motors (USA) when developing a car with fully or partially automated control was to increase the level of safety. In the coming years, the use of autonomous vehicle control systems in combination with innovative safety systems will make it possible to almost completely eliminate accidents by means of control intervention even at the moment when the driver is not yet aware of a dangerous situation. In the future, the operation of such automatic car control systems should completely replace drivers.

Tesla Autopilot is one of the key features provided in Tesla cars. This feature uses advanced artificial intelligence and computer vision technologies to provide automatic control of the car in various traffic conditions.

The main features of the Tesla autopilot:

- Automatic lane keeping: The car can automatically move on the road, keeping in its lane. The system uses cameras and sensors to detect road marking lines and maintains a stable trajectory.

- Adaptive Cruise Control: The car can automatically adjust its speed based on the traffic in front of it. With the help of radars and cameras, the system detects other cars on the road and maintains a safe distance.
- Automatic Realignment: With Autopilot enabled, the Tesla can automatically perform lane-aligning maneuvers during overtaking and maneuvering on the freeway.
- Self-parking: Some Tesla models can self-park. The system uses sensors and cameras to detect a free parking space and perform parking maneuvers.

Tesla is constantly updating its Autopilot software, introducing new features and improving its performance and safety. It is important to update your vehicle software regularly to take advantage of the latest Autopilot features and enhancements.

With Autopilot, Tesla aims to create safe and convenient driving, as well as accelerate the transition to full autonomy in the future. The Tesla car is shown in the figure.



*Figure 2. – Automobile Tesla model S*

Prospects for the development of autonomous vehicles (AUVs) promise a significant impact on the transportation system and society as a whole. A few key areas of development include:

- 1 Road safety: Autonomous vehicles promise to improve road safety because they can be programmed to avoid conflict situations and have the potential to reduce human error.

2 Traffic efficiency: ATCs can optimize traffic, avoid traffic jams, increase fuel consumption and reduce emissions of harmful substances.

3 Mobility for all: The introduction of autonomous vehicles can provide greater access to transportation for people with disabilities, senior citizens, and other groups.

4 Economic benefits: Reduced accidents, improved transport efficiency and new business models (such as driverless taxis) can lead to economic benefits for various sectors.

5 Infrastructural changes: The implementation of ATZ may require changes in the road infrastructure, such as sensors, special lanes and other technical aspects.

However, it is important to consider the challenges such as legal, ethical, cybersecurity and social issues related to autonomous vehicles. Also, a complete mass transition to ATZ may take time and require significant investment.

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**Miroshnichenko D. V.**  
**SMART CITY: THE ROLE OF INFORMATION TECHNOLOGY**  
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The world is experiencing a rapid technological evolution that is transforming our interactions with the environment. With increasing urbanization, the concept of "smart cities" has emerged, leveraging information technology to improve urban life and optimize resource management. This paper will explore the benefits and challenges of implementing smart city solutions and their potential to provide more sustainable and efficient urban environments. This study investigates the development of intelligent urban areas, including their essential features, probable benefits and challenges, and practical case studies highlighting the revolutionary impact of technology within city environments.

In urban development, information technology has played a pivotal part in history. Early examples include the implementation of effective water and sanitation systems in ancient civilizations, as well as the introduction of printing and telegraphy, which allowed for communication and economic exchange. Advancements throughout the 20th century, such as the development of telephones, radio, computers, and automation, led to increased urban management capabilities and socio-economic transformations.

The essential elements of a Smart City are as follows:

- smart transportation;
- smart energy management;
- smart waste management;
- security systems.

A smart city employs numerous interconnected technologies to establish a productive and eco-friendly urban environment. The technologies comprise Internet of Things (IoT). Real-time data is collected by sensors embedded in various urban elements, enabling monitoring and optimization of diverse aspects such as traffic flow, energy consumption, and waste management.

Technologies such as e-ticketing, traffic management systems, and connected vehicles contribute to efficient public transportation and reduced traffic congestion. Smart grids and renewable energy sources optimize energy usage and minimize environmental impact. Sensor-equipped bins and efficient collection systems improve waste management and promote recycling and resource recovery. Video surveillance, facial recognition software, and emergency response systems improve public safety and security.

Here are some benefits and challenges of smart cities. Smart cities provide a plethora of advantages, such as increased efficiency, by optimizing resource utilization through data-driven decision-making and automation. Additionally, technology enhances public services, safety, and citizens' convenience, improving their quality of life.

Moreover, smart cities foster environmental sustainability. Smart technologies aid in the reduction of energy consumption, waste generation, and pollution.

Economic growth and innovation are spurred by smart cities, which attract investment and facilitate the growth of technology-driven businesses. Enhanced public safety is achieved through improved security systems and real-time data analysis, thereby improving emergency response capabilities.

Nevertheless, smart cities encounter challenges such as privacy concerns. Collecting and managing significant quantities of personal data raises concerns about the breach of privacy and the possibility of misuse.

The expense of implementing smart technologies, particularly for smaller communities, is a financial challenge to consider. Similarly, access to technology and infrastructure disparities can create inequalities between different groups.

Technical issues and cybercrime lead to various concerns. The increased reliance on technology has raised concerns regarding system failures and cyberattacks. Citizen participation is crucial in this case. Ensuring public trust and inclusivity in decision-making processes is paramount for successful implementation.



Let's consider some examples of smart city initiatives. Many cities across the globe are actively implementing smart technologies; for example, Singapore. Advanced traffic management systems, smart buildings, and efficient waste collection systems bolster Singapore's status as a leading smart city. In Barcelona, sensor-equipped bins and digital platforms designed for citizen engagement are among the city's smart initiatives aimed at promoting environmental sustainability and community development.

Meanwhile, Tokyo is also implementing its smart solutions to enhance the city's urban systems. An integrated transport card system, alongside extensive sensor networks to monitor air quality and noise, is a key aspect of Tokyo's smart city strategy.

In Copenhagen, an emphasis on cycling infrastructure, supported by sensor-based optimization and green technologies, has established the city as a pioneer in sustainable and healthy urban living. Toronto's Sidewalk Labs project aims to create a data-driven neighborhood using integrated technologies for managing resources and improving living standards.

In conclusion, smart cities offer a promising vision for urban development. By leveraging information technology, cities can optimize resource utilization, enhance the quality of life for residents, and achieve greater sustainability. Recognizing the benefits and challenges associated with smart cities is crucial.

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**Moiseienko R. S.**  
**HOW ARTIFICIAL INTELLIGENCE IS TRANSFORMING**  
**THE CREATION OF MODERN CARS**

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Modern technologies actively influence many aspects of human life, and the automotive industry is not exempt from this transformation. In recent decades, artificial intelligence (AI) has become an integral element in the development and production of cars, altering the ways in which we perceive, use, and interact with transportation. It has already demonstrated its capabilities in various aspects of car manufacturing, design, and functionality. However, the question arises: is this a revolution or a threat to the industry? In this article, we will explore key areas where artificial intelligence significantly impacts the creation and utilization of automobiles, and analyze its role and influence on humans.

*Design and Engineering:* Artificial intelligence transforms the processes of car design by integrating machine learning methods for data analysis and structure optimization. This accelerates development, allowing the creation of more efficient and innovative transportation vehicles. However, the development and implementation of artificial intelligence technologies require significant financial resources. This can be a barrier for small companies or countries with limited budgets. Additionally, it's important to note that AI technologies are complex, and their maintenance may require specialized skills and equipment. This could increase the cost of technical maintenance and repair of automobiles (Smith, 2020).

*Autonomous Vehicles.* AI plays a pivotal role in developing technologies for autonomous vehicles. Machine learning algorithms enable cars to analyze the

surrounding environment, make decisions, and safely navigate, paving the way for a driverless future. However, with increasing automation and dependence on AI, drivers may lose skills in manually controlling vehicles during emergency situations. This could pose challenges in the event of technology failure or unexpected road incidents (Chen & Wang, 2019).

*Safety Systems and Collision Prevention.* AI technologies are employed in creating systems that enhance road safety. Image recognition systems, collision warning, and automatic braking reduce the risks of traffic incidents. However, with the increasing use of AI in vehicles, concerns arise regarding the safety and confidentiality of data. Possible attacks on artificial intelligence systems and leaks of sensitive information are potential risks (Li et al., 2018).

*Software Updates and Connectivity.* Artificial intelligence simplifies the process of updating car software, making it more convenient and efficient. Connectivity systems ensure continuous interaction between vehicles and external data sources. AI transforms the interaction between drivers and vehicles through voice assistants, gesture controls, and personalized interfaces, enhancing driver comfort and safety. However, decisions made by artificial intelligence in cars may raise ethical dilemmas. For instance, questions about how the system should make decisions in critical situations can lead to disagreements and require extensive discussions (Wang & Zhang, 2021).

*Regulatory Challenges.* The lack of clear and comprehensive regulatory standards in the field of artificial intelligence can pose challenges in establishing rules and requirements for the use of this technology in the automotive industry. When a car makes decisions based on AI algorithms, it is crucial to determine who is responsible for the potential consequences of these decisions. This is a question that requires clear legislative and regulatory oversight.

So, based on the above, it can be concluded that artificial intelligence indeed plays a key role in transforming the automotive industry. It ensures not only the creation of vehicles that become safer and more efficient thanks to autonomous

features and safety systems but also imbues them with intelligent capabilities that enhance interaction with drivers and provide a more comfortable user experience.

However, it is worth acknowledging that these benefits come with challenges. From data privacy and ethical dilemmas to difficulties in ensuring security and regulation, there is a need for the development of clear norms and standards for the effective integration of artificial intelligence into the automotive industry.

Nevertheless, in the light of ongoing developments in artificial intelligence technologies and active efforts to address ethical and technical issues, the automotive industry stands on the brink of entering a new era where vehicles not only serve as means of transportation but also become intelligent companions in everyday life.

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**Orel D. I.**

### **ARTIFICIAL INTELLIGENCE: POSSIBILITIES AND CHALLENGES**

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Artificial Intelligence (AI) is a fundamental innovation that is revolutionizing the way we interact with technology, solve problems and develop modern society. At its core, AI involves creating simulated intelligence in computer systems that can

learn, adapt and solve tasks previously considered exclusively human. The variety of AI applications is absolutely fascinating. From autonomous systems in transport to genomics analysis in medicine, from face recognition to optimization of manufacturing processes, AI has already proven to be a key catalyst for innovation and improvement in various industries. This technology has become not only a tool for solving problems, but also a steering wheel for managing important aspects of modern life. However, with the growing influence of AI challenges and risks arise that require attention and caution. Ethical issues, employment impacts, data privacy, and systemic failures are just a few of the aspects that need to be considered and addressed. AI has unlimited potential. From autonomous systems and efficient algorithms to social interaction and environmental sustainability, the future of AI promises to transform various areas of life and provide opportunities for new technological revolutions. Artificial intelligence is becoming not only a tool for technological progress, but also a key factor in shaping the future society. Awareness of this fact is important for anyone interested in technology and its impact on our daily lives.

Artificial intelligence is deepening its integration into various fields, accelerating technological progress. AI is revolutionizing the medical industry by helping to diagnose and treat diseases. From scanning medical images and predicting pathologies to developing individual treatment regimens, this technology helps improve treatment outcomes and increase the efficiency of medical procedures. In the financial sector, AI is used to analyze big amount of data, predict market trends, automate trading strategies, and detect anomalies, helping to reduce risks and increase the efficiency of financial transactions. In the transport sector, AI is used to develop autonomous vehicles, optimize routes and manage traffic flows. This contributes to the creation of safe and efficient transport systems, reducing the likelihood of road accidents and traffic congestion. In education, AI is used for individualized learning, adapting programs to the needs of students, analyzing progress, and developing innovative teaching methods. This helps to increase access

to quality education and develop skills that meet labor market requirements. AI is also being used in agriculture to optimize growing and harvesting, in arts and entertainment to create personalized entertainment and creative works, and in the energy sector to manage energy production systems and reduce environmental impact. The diversity of AI applications opens up new opportunities to improve the quality of life and develop various industries.

The conducted research shows that the development of AI raises serious ethical issues. Algorithms can be stereotyped, leading to the incorrect treatment of certain groups of people. It is important to develop standards and ethical guidelines to prevent discrimination and shortcomings in the ethical aspects of AI. Automation through AI may lead to the automation of certain work processes, which may affect employment in some. It is important to anticipate this impact and develop programs to retrain and support people whose occupations are becoming less in demand. As the use of AI grows, the amount of information processed and stored increases. This raises the issue of data privacy, especially in the medical and financial sectors. Manufacturers and developers must actively work to ensure data security and protect user privacy. AI algorithms can lead to unforeseen situations and system errors. This is especially critical in areas where AI is used to make important decisions, such as medicine or finance. It is important to establish control and recovery mechanisms to minimize possible negative consequences. AI algorithms are mostly learned based on available information, and this can lead to asymmetries in access to resources. If the data on which they are trained contain features or limitations, this can lead to systemic exclusion or inequality in data processing. With the growing use of AI, addressing these challenges is imperative to creating a sustainable and ethical development of this technology.

The future of AI promises even more innovation and change. The development of autonomous systems, even more efficient algorithms, and consideration of security aspects will be key areas of the development. The future of AI is defined by the development of autonomous systems that can make decisions and perform tasks

without direct human intervention. This may include robotics, autonomous cars, drones, and other technologies. The future of AI involves the further development of efficient algorithms that will be able to process huge amounts of data quickly and accurately. This will improve the accuracy and speed of solving problems in various industries. As the use of AI deepens, it is important to focus on security. Developers need to improve methods of protection against cyberattacks and unauthorized interference, especially when AI systems are used in critical areas such as medicine and energy. The future of AI will bring the personalization of services and products to a new level. Systems will be able to more accurately predict individual needs and provide users with a more convenient and personalized experience. The future of AI will evolve in the direction of improving social interaction. Understanding emotions and context will be key to creating systems that not only perform tasks, but also effectively interact with users on an emotional level. The future of AI will also be focused on creating environmentally sustainable technologies. The use of AI to optimize production processes and manage resources can help reduce environmental impact. All in all, the future of AI promises to be a key component of technological progress, setting new standards in various industries and contributing to a smarter and more efficient world.

Taking into account the conducted research, it can be stated that artificial intelligence, as an essential component of technological progress, offers endless opportunities in various sectors of society. AI illustrates impressive achievements in the fields of medicine, finance, education and many others, identifying AI as a key tool for solving modern problems. However, artificial intelligence draws attention to the importance of being aware of ethical, security and privacy issues arising from the use of AI. The development of this technology requires consideration and caution. At the same time, AI offers exciting prospects. From autonomous systems to social interaction and environmental sustainability, AI promises to transform the modern world and provide new opportunities for innovation. The overall conclusion is that AI is not only a tool technology, but also a key factor that will determine the future

development of the society. With endless possibilities come challenges, but the intelligent and ethical use of AI will determine its impact on the future.

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**Pientsova N. A**

### **APPLICATION AND DEVELOPMENT OF MODERN 3D PRINTING TECHNOLOGY**

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3D printing is a technology used to create three-dimensional objects by layering materials. It has a broad range of applications, including manufacturing, medicine, architecture and art.

The history of 3D printing dates back to 1981, when Japanese inventor Hideo Kodama patented his "rapid prototyping device". This machine used a photopolymer that cured under ultraviolet light. It operated much like modern 3D printers, applying



the polymer layer by layer and allowing it to cure. Each layer was a cross-section of the future model.

"Kodama's invention laid the groundwork for stereolithography, a primary 3D printing technology. However, Kodama's patent never gained widespread use or further development. Due to insufficient funding, he couldn't complete the development in time, leading to the project's abandonment.

In 1984, American inventor Charles Gall invented stereolithography as we know it today. His stereolithography apparatus (SLA) made it possible to create three-dimensional objects from a computer-generated file.

Since then, 3D printing has continued to advance. New technologies and materials are emerging, enabling the creation of increasingly complex and functional objects.

In 1986, American inventor Charles Gall founded DTM Inc. to produce complex models using stereolithography. The technology involved curing a liquid polymer layer by layer under the influence of ultraviolet light. DTM Inc. was later acquired by another company, 3D Systems Corporation. Its name became the standard term for this printing method.

In 1988, Carl Descartes invented a new 3D printing technology that used powder instead of liquid polymer. In this technology, called Selective Laser Sintering (SLS), a laser passes selectively through the powder, sintering it into solid areas.

In that same year, Scott Crump patented Fused Deposition Modeling (FDM) technology, which uses molten plastic to produce objects layer by layer. Today, this technology is among the most widely used for both industrial and consumer applications. Scott Crump founded Stratasys, which has since emerged as a leader in the 3D printing industry. Crump received his patent in 1992 and began refining his technology. One notable application that thrust 3D printing into the spotlight was the fabrication of 'scaffolds' for future organs, subsequently filled with living cells. Within these structures, the cells matured, producing tissue suitable for transplantation

By 2010, 3D printing had already gained traction in medicine. Various prosthetic limbs, a miniature working model of a kidney crafted from living cells, and the first blood vessels created from human biomaterial had been printed.

One of the most notable examples of 3D printing's application in medicine was the transplantation of an artificial bladder in 2001. Luke Masela, a boy afflicted with a congenital urinary system defect, received a bladder grown from his own cells. The surgical team utilized a standard household 3D printer, for which specialized software had been developed.

Atala's lab subsequently developed specialized machines to "grow" up to 30 different types of cells and organs, including cartilage and bone tissues. These machines have been employed to create artificial organs for patients in need of transplants.

Today, scientists have already produced a sample of a printed cornea. They are actively working to develop artificial organs that the human body will not reject.

However, 3D printing truly became accessible with the involvement of the open-source movement. In 2005, Dr. Adrian Bowyer initiated an ambitious project to design a printer capable of self-replication. He named his endeavor The Replication Rapid-Prototyping Project, commonly abbreviated as RepRap.

Following the successful completion of the RepRap project, 3D printing became accessible to a broad spectrum of users. This advancement paved the way for the swift evolution of bioprinting, an independent industry that continues to expand.

Metal 3D printing is a relatively new and rapidly developing technology. It has a number of advantages over traditional methods of manufacturing metal products, such as casting, stamping and machining.

One of the key benefits of 3D metal printing is the ability to create products with complex shapes that cannot be produced using traditional methods. This opens up new opportunities for the use of metal products in various industries, including aerospace, medical and mechanical engineering.

It is worth noting that 3D metal printing is a promising technology with significant potential for growth. In the upcoming years, 3D metal printing is anticipated to become more affordable and prevalent, paving the way for novel applications of metal products produced using this technology. In 2008, the first such printer debuted - the RepRap Darwin, named after Charles Darwin. The technology became accessible to the masses, and numerous variations of the model started proliferating worldwide.

One promising area for metal 3D printing is the fabrication of intricate components for the aerospace and medical industries.

An example of 3D printing contributing to green technologies is the utilization of recycled plastic as a printing material. Various plastics, including bottle caps, can be transformed into pellets for 3D printing purposes. This approach diminishes the volume of waste directed to landfills and curtails the consumption of raw materials required for producing new plastic.

The Ukrainian startup, Kwambio, has inaugurated the first 3D printing production facility in Ukraine, encompassing all stages of product creation from design to the finished product. The company specializes in producing ceramic and metal items using industrial 3D printers.

3D printing enables the creation of bridges with intricate designs, optimizing material usage and reducing construction time. Such advantages position 3D printing as a promising technology for bridge construction, particularly in isolated regions. In 2018, the Netherlands witnessed the inaugural printing of a pedestrian bridge. Using the MX3D robotic manipulator equipped with a welding apparatus, the bridge was essentially 'fabricated' from steel wire. Although the project spanned about three years, the 12-meter bridge was successfully constructed and passed all requisite tests. Since then, numerous 3D-printed structures have emerged globally.

Last year, COBOD constructed a two-story building in Europe using the BOD2 cement printer. The structure is intended to be rented out as office space or potentially as residential accommodation.

Ukraine's first 3D-printed school has been unveiled in Lviv. The initiative for the school's construction came from the charity Team4UA in collaboration with COBOD International, renowned as a developer and manufacturer of 3D printers for the construction sector. The school was completed in just 15 days. A 3D-printed school offers several advantages over conventional structures. Such buildings exhibit greater resilience to natural disasters and enhanced energy efficiency. Moreover, 3D printing enables the creation of structures with intricate designs unattainable through traditional means. Given its potential to address numerous challenges in the construction industry, this technology is anticipated to gain broader adoption in the coming years.

In summary, the evolution of 3D printing is characterized by a trend towards reduced costs, enhanced quality, and broader utilization of the technology. 3D printing is currently employed across various industries, encompassing manufacturing, medicine, design, and education. As time progresses, the technology is poised to find even broader applications, further benefiting humanity.

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**Siryi D. O.**  
**FUTURE EDUCATION: ARTIFICIAL INTELLIGENCE AND  
LARGE LANGUAGE MODELS IN EDUCATIONAL PROCESS**

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In today's rapidly evolving technological landscape, Artificial Intelligence (AI) and language models have emerged as transformative forces, reshaping numerous aspects of our daily lives. The influence of these technologies extends far beyond the realms of industry and commerce, profoundly impacting the sphere of education. This integration marks a paradigm shift in how education is delivered and experienced, signaling a new era of personalized, efficient, and interactive learning.

The continuous surge in scientific advancements and data accumulation poses a significant challenge: an overwhelming 'burden' of knowledge that makes it difficult for researchers to stay abreast of the ever-expanding scientific literature. In contrast, this proliferation of knowledge and data is a boon for the development of machine intelligence. The rapid advancements in generative AI, particularly in large language models (LLMs), represent a transformative shift. They are aptly positioned to ease the knowledge overload and have the capability to significantly transform scientific research. To harness this new technology effectively, it's essential to encourage the adoption of these methods and stimulate discussions and empirical studies on how scientific research is evolving in the age of generative AI.

The role of AI in the modern world cannot be overstated. AI systems, powered by advanced algorithms and vast data sets, are capable of performing complex tasks that were once thought to be the exclusive domain of human intelligence. From natural language processing to machine learning, AI technologies are pushing the boundaries of what machines can do, offering unprecedented capabilities in analyzing, predicting, and even making decisions.

Language models, a subset of AI, are particularly revolutionary. These models, trained on extensive text data, have the ability to understand, interpret, and generate human language in a way that is both meaningful and contextually relevant. The implications of this are vast, especially in the field of education. Language models

can facilitate communication, automate administrative tasks, and offer personalized learning experiences to students across the globe.

The integration of AI in education is not merely a technological upgrade, it is a necessary evolution to meet the changing needs of a digital society. Traditional educational models, often criticized for their one-size-fits-all approach, are being reimagined with the aid of AI. These intelligent systems offer personalized learning pathways, adapting to each student's unique learning style, pace, and preferences. This individualized approach ensures that education is not only more engaging but also more effective, catering to the specific educational needs of each learner.

Moreover, AI-driven tools in education extend the reach of learning opportunities, breaking down geographical and language barriers. Students from different parts of the world can access quality education, tailored to their linguistic and cultural contexts. This democratization of education is pivotal in creating a more inclusive and equitable learning environment.

However, the integration of AI in education also poses new challenges and ethical considerations. Issues related to data privacy, bias in AI algorithms, and the digital divide need to be addressed to ensure that the benefits of AI in education are accessible to all. As we navigate this new terrain, it is crucial to strike a balance between leveraging the power of AI and safeguarding the interests of all stakeholders in the educational ecosystem.

Ronald Beghetto, an educational psychologist, engaged graduate students and teaching professionals in a unique discussion format, incorporating creativity-focused chatbots he developed, soon to be hosted by Arizona State University (ASU). These bots, built on AI technology similar to the renowned ChatGPT, were used to stimulate creativity by adopting various personas and challenging assumptions.

A student used these chatbots to explore dissertation topics, while lecturers discussed class design strategies. Participants reported a very positive experience, noting that these chatbots were more helpful in supporting learning compared to their

previous experiences with ChatGPT. The bots were effective in expanding the range of possibilities considered by the participants.

Educators have concerns about ChatGPT facilitating cheating in academic assignments. However, Beghetto and others are investigating the use of large language models (LLMs) like ChatGPT to enhance educational practices. These models could aid in reading and summarizing extensive texts, allowing students and teachers to concentrate more on discussion and learning. ChatGPT's ability to coherently discuss almost any subject opens up possibilities for personalized, conversational educational experiences. Some educators view them as 'thought partners' that could be more affordable and consistently available compared to human tutors.

Theodore Gray, co-founder of Wolfram Research, highlights the potential of LLM-based tutors in education, acknowledging the limitations of previous software attempts in this domain. Wolfram Research is currently developing an LLM-based tutor, though specific details are limited.

AI partners like these could guide students through problems, encourage critical thinking, or enhance creativity, as demonstrated in Beghetto's experiment. Jules White, from Vanderbilt University, describes ChatGPT as "an exoskeleton for the mind."

Since its launch by OpenAI in November 2022, ChatGPT has mostly garnered negative attention in educational contexts. LLMs function by learning word and phrase relationships from extensive training data, enabling them to generate responses to prompts, including answers to assignment questions or entire essays.

ChatGPT stands out from previous AI systems due to its well-composed and seemingly thorough responses. However, this leads to worries that students might rely on it too heavily for homework assistance, potentially undermining their understanding of the subject matter.

Despite its proficiency in various exams across business, legal, and academic fields, ChatGPT has its flaws. It can provide incorrect answers if a question is slightly

altered and sometimes fabricates information, a phenomenon known as "hallucination."

Wei Wang, from the University of California, Los Angeles, discovered that GPT-3.5 and GPT-4 often err in answering university-level questions in fields like physics, chemistry, computer science, and mathematics. In their tests, GPT-4 managed to correctly answer only about a third of textbook questions, although it achieved an 80% score in one particular exam.

Despite these drawbacks, many in the educational sector see great promise in ChatGPT and LLMs. Researchers, educators, and companies are exploring the best ways to harness LLMs for educational purposes. This includes seeking alternatives to ChatGPT, reducing inaccuracies and hallucinations, and enhancing subject-specific knowledge within these models.

Collin Lynch, a North Carolina State University computer scientist specializing in educational systems, acknowledges both the potential benefits and significant risks of LLMs. He emphasizes the need for strategies to mitigate these risks.

Sobhi Tawil from UNESCO urges the educational community to comprehend and inform students about the strengths and limitations of LLMs, rather than outright banning their use. In line with this, UNESCO released a report recommending that educational institutions thoroughly evaluate tools like ChatGPT before integrating them into learning processes.

Several organizations are using AI to directly support students. One prominent example is Khanmigo, an AI tutor and teaching assistant born from a collaboration between OpenAI and Khan Academy, a non-profit educational organization based in Mountain View, California. Utilizing GPT-4, Khanmigo provides students with guidance while they complete exercises, thereby saving teachers' time.

Khanmigo operates differently from ChatGPT. It functions as a chatbot pop-up on a student's screen, where students can discuss their current problems with it. The tool is programmed to avoid giving direct answers and instead focuses on asking



questions, a process Khan Academy's Chief Learning Officer Kristen DiCerbo describes as a "productive struggle". While still in its pilot phase, Khanmigo aims to balance challenge and support in its questions.

However, the efficacy of Khanmigo in revolutionizing education remains uncertain. LLMs, trained to predict the next word in a sentence rather than fact-check, can sometimes provide incorrect information. Khanmigo's prompts to GPT-4 include correct answers to improve accuracy, but the system still makes mistakes, and feedback from users is encouraged for improvement.

Khanmigo, designed to respond uniquely to each student in different situations, aims to be more engaging than previous systems. Khan Academy plans to publish research on Khanmigo's effectiveness in late 2024 or early 2025.

Other tutoring firms are also exploring LLMs. For instance, Chegg in Santa Clara, California, launched a GPT-4 based assistant in April, and TAL Education Group in Beijing developed MathGPT, an LLM specializing in math.

An alternative approach to AI learning partners involves integrating the LLM with verified external knowledge sources, like textbooks or scientific papers, using the retrieval-augmented generation (RAG) method. This aims to overcome the challenge of verifying the vast text sources that empower LLMs. Merlyn Mind in New York City uses RAG in its Corpus-qa LLM, designed for education. This LLM, while initially trained on extensive general text, refers to specific, verified information sources when responding to queries, thus reducing errors and "hallucinations". Merlyn Mind also trains its LLMs to acknowledge when they don't have a high-quality response, further minimizing errors.

Arizona State University (ASU), identified by Claire Zau of GSV Ventures as a leading institution in adopting large language models (LLMs), is utilizing the retrieval-augmented generation (RAG) method in its educational programs. ASU, after a limited initial testing phase, rolled out a toolbox in October that allows its faculty to explore LLMs in education via a web interface. This toolbox offers access

to various LLMs including GPT-3.5, GPT-4, and Google's Bard, along with RAG capabilities.

These tools enable more researchers, like Ronald Beghetto, to create chatbots for student interaction. Following his initial workshop, Beghetto intends to incorporate these bots into a new course he's developing. ASU ensures student privacy by hosting these LLMs on its own secure cloud.

The positive educational impacts already observed at ASU. For instance, a bot developed for an introductory chemistry course at ASU employs RAG to integrate GPT-3.5 with course materials like PDFs and PowerPoint presentations. She cites an instance where the bot effectively explained dipole-dipole interactions in molecules using a baseball analogy, making the concept more relatable to a baseball enthusiast.

ASU's approach, which combines a general LLM with RAG, differs from previous AI methods that aimed to simulate a science expert. These older tools lacked the versatility to integrate diverse concepts, such as combining sports with chemical principles, says Danielle McNamara, who heads ASU's learning engineering institute. McNamara and her team are now evaluating the effectiveness of these chatbots and LLM tools at ASU.

Other educational institutions are also embracing LLMs. Vanderbilt University, for example, has provided students in certain courses with access to a premium version of ChatGPT, which includes specialized plugin tools. Meanwhile, researchers at East China Normal University in Shanghai have developed EduChat, an educational-focused LLM that integrates essay assessment, dialogue-based tutoring, and emotional support in a single chatbot. This tool, shared as open-source code, stands out for being an education-specific LLM rather than a modification of a general-purpose model like ChatGPT or Bard. While still in its early stages, EduChat's dedicated educational focus makes it a notable development in the field.

The integration of AI in education raises critical questions about accessibility and equity, particularly with fee-based services like Khanmigo. To address potential disparities, Khan Academy, under the guidance of Kristen DiCerbo, is seeking

philanthropic support and grants. This funding aims to subsidize computing costs and extend access to schools with limited resources, continuing the focus on these schools from the pilot phase. DiCerbo emphasizes their commitment to preventing a digital divide in education.

Another significant issue is ensuring that LLMs do not perpetuate biases and adequately represent diverse perspectives and knowledge, often missing from the texts used for training LLMs. Sean Dudley at ASU notes that their RAG-enabled LLM platform aims to enhance transparency by showing the sources of its information. While this doesn't eliminate bias, it provides an opportunity for critical examination of the information's origins.

Thus, the incorporation of AI and language models in education represents more than a passing trend; it signifies a significant shift towards a learning system that is more personalized, accessible, and efficient. As this AI-enhanced educational environment evolves, continuous evaluation and improvement of these technologies are crucial to ensure they fulfill their primary purpose of enriching and advancing global educational experiences.

Large language models are poised to revolutionize education in ways never seen before. They promise to bring about personalized learning experiences and foster worldwide collaboration, painting a picture of a future in which education is more accessible, inclusive, and efficient. The research study shows that the development of new user interfaces is key to resolving potential issues. While the possibilities are exciting, it's essential to carefully consider the ethical implications of these developments to ensure responsible use of LLMs.

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**Sukhonos V. O.**  
**YOUTUBE: HOW THE VIDEO-SHARING WEBSITE**  
**HAS CHANGED THE WORLD**

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YouTube is an American online video-sharing and social media platform. It is currently the second most visited website with more than 2.5 billion monthly users worldwide, who collectively watch more than 1 billion hours of videos every day. This article examines how YouTube has become a unique repository of popular culture, how it has changed the way we consume, create and share content, and how it has influenced different parts of life.

YouTube was registered on February 14, 2005, by Steve Chen, Chad Hurley and Jawed Karim, who were all former employees of PayPal. The founders had the idea of a video-sharing website after they had experienced difficulties in finding and sharing videos online. The first-ever video, titled “Me at the zoo,” was uploaded to YouTube on April 23, 2005. It was a 19-second long clip posted by Jawed Karim.

In May 2005, YouTube launched its beta version to the public, and in December 2005, when the website was launched officially, the platform was already getting 8 million views a day. In October 2006, YouTube, called “the next step in the evolution of the Internet,” was bought by Google for \$1.65 billion, and since that time, the platform has continued to grow exponentially.

YouTube’s success lies in its user-friendly interface and its ability to empower both creators and viewers.

People from all walks of life can become content creators, even without expensive equipment, and easily upload videos to the platform, sharing their passion, experience or creativity with the world and building dedicated fan bases. They can use YouTube Studio for managing their channel and analysing audience engagement in order to improve their content. Furthermore, thanks to YouTube's Partner Program, introduced in December 2007, and Google's AdSense, many content creators, also known as YouTubers, can turn their hobby into a full-time career, making money from pre-video and in-video advertisements. Additionally, creators often increase their revenue by YouTube sponsorships, brand deals, merchandise sales and crowdfunding.

In general, it can be said that YouTube has blurred the distinction between professional and user-generated content. As a result, a large number of traditional media outlets (for example, BBC News, The New York Times), corporations (for instance, Disney, Paramount, NBCUniversal, Warner Bros. Discovery) and celebrities have established their presence on the platform to reach new audiences.

Nowadays, YouTube viewers can find videos covering nearly every topic imaginable. Common genres of YouTube videos include tutorials, educational videos, DIY (Do It Yourself) videos, gaming videos (Let's Plays), music videos, unboxing videos and product reviews, comedy sketches, challenges, Q&A (Question and Answer) videos, video blogs (vlogs), news, documentaries, movie trailers and so on. Moreover, YouTube offers live streams (of concerts, sports games, the royal wedding, the Olympics, etc.) and paid content such as movies. YouTube's recommendation system, based on clicks, watchtime, viewing history and reactions, helps people to find the videos they may be most interested in. It connects viewers to high-quality information and minimises the chances they will see problematic content.

Viewers are provided with the opportunity to not only consume videos passively, but also actively engage with creators and other viewers through

comments, likes, subscriptions and shares. Therefore, YouTube plays a significant role in bringing like-minded people together and building virtual communities.

It is undeniable that the platform has a considerable impact on different fields of our lives.

YouTube has grown into a driving force for shaping trends and creating new icons in pop culture. Lots of popular memes, songs and dance moves (e.g. “Gangnam Style” by Psy, “Baby Shark Dance” by Pinkfong, etc.) have gone viral on YouTube and spread rapidly across the internet, breaking down geographical barriers and enabling cultural exchange on an unprecedented scale.

Beyond entertainment, YouTube has transformed education. As it was said, people can access tutorials and lectures on almost any subject, which allows self-paced and personalised learning for everyone. Educational content became extremely important during the coronavirus pandemic, when most of the world was under stay-at-home orders. At that time, many teachers worldwide created their own YouTube channels and regularly uploaded educational videos for their students to make online learning more productive.

YouTube has become a platform for political and social movements too. Politicians announce their campaigns via YouTube to reach voters and shape public opinion in their favor. Activists and organisations use the platform to raise awareness about various issues, sharing stories of injustice and discrimination, information about humanitarian or environmental crises. YouTube has given a voice to individuals who may not have had access to mainstream media as well. The visual and emotional impact of videos can call to action millions of people globally, causing a ripple effect for a positive change.

In addition, YouTube is a very powerful promoting tool. It has created new ways for businesses to reach customers: through targeted advertising and influencer marketing. YouTube influencers are relatable and often seen as friends rather than distant personalities, and thus this form of communication between brands and consumers is effective. According to Search Engine Journal, viewers say they are

twice as likely to buy something they saw on YouTube, and four times more likely to use the platform to find information about a brand, product or service versus other social networks.

Despite its growth and success, YouTube has faced serious challenges related to content moderation, copyright infringement and algorithmic biases. The platform has been widely criticised for the spreading of misinformation, hate speech and inappropriate content, which especially endangers child safety and wellbeing. In response, YouTube has implemented stricter policies, improved content filtering algorithms and launched a “family-friendly” version of the platform called YouTube Kids to ensure a safer and more responsible environment. There is also YouTube’s Content Verification Program which was introduced in October 2007 to help copyright owners easily identify infringing videos and get them removed from the platform.

All things considered, YouTube has evolved from a simple video-sharing website to an influential global platform that has revolutionised human interactions. Its influence on popular culture, commerce, education, politics, social changes and other fields of life cannot be overestimated. Most likely, YouTube will continue to be a thriving ecosystem for creators and viewers, developing new features and services and supporting our digital transformation.

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**DIGITAL TECHNOLOGIES IN INDUSTRY**  
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Numerous manufacturing firms employ contemporary digital technologies within their production operations, consistently updating their assembly lines across various phases. Initially, this entails the installation of state-of-the-art equipment, often computer-linked and equipped with software to streamline production. Another digitization factor involves reducing human involvement, which can lead to increased production speed and, consequently, improved product quality.

In a recent analysis of research publications related to this field, materials were examined regarding available technologies for implementing a software and hardware system designed to monitor moving objects in real-time. A key focus among the reviewed studies was comparing machine vision with human vision using neural networks. Several studies explored the technology of capturing images of moving objects, especially human movement, and detailed methods for real-time video information reading, processing, and computation.

Drawing upon scientific research and existing implementations, a strategy was formulated to enhance existing surveillance system operations. The article outlines methods such as segmentation, image processing, and the extraction of factors affecting image processing accuracy, like shadows, micro-motion, and variable illumination. The analysis also scrutinized the OpenCV library, a convenient tool for



machine vision problem-solving, highlighting its advantages, drawbacks, and prospects for system enhancement through collaboration with neural networks

The review of existing publications revealed criteria that impact software performance and technical implementation. This finding directed attention towards improving image reading accuracy and reliability. The primary objective remains the enhancement of software system attributes to ensure seamless integration across various industries' production processes.

OpenCV, short for OpenSource Computer Vision Library, is an open-source software library primarily focused on computer vision and machine learning. Developed to provide a unified framework for computer vision applications, OpenCV enables the adaptive use of machine perception in commercial products. It includes a comprehensive collection of both classical and contemporary computer vision and machine learning algorithms, boasting over 2,500 highly optimized variants.

The library offers a broad range of functionalities, facilitating tasks such as face detection and recognition, object identification, human action classification in videos, camera movement tracking, object motion tracking, 3D object model extraction, generation of stereo camera-derived 3D point clouds, high-resolution image stitching, image database similarity searches, red-eye correction in flash images, eye movement tracking, landscape recognition, and much more..

OpenCV finds extensive application across numerous industries and corporations, including Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda, and Toyota. Its advanced features power various implementations globally, detecting intrusions in Israel's video surveillance, ensuring runway cleanliness in Turkey, and conducting facial recognition in China and Japan. Additionally, it contributes to the art industry in Spain and the United States.

Notably, OpenCV provides interfaces compatible with multiple programming languages (including C++) and supports various operating systems. Its core functionality revolves around real-time video streams, leveraging MMX and SSE

instructions for optimal performance. Being primarily coded in C++, OpenCV offers seamless integration possibilities with software implementations across different programming languages.

TensorFlow stands out as a freely accessible, open-source software library designed for data flow and differential programming across diverse tasks. Its capabilities encompass training and deploying deep neural networks for tasks such as numerical analysis, word embeddings, image recognition, and natural language processing. Initially developed by Google to address their necessity for systems capable of constructing and training neural networks, TensorFlow maintains a strong association with neural networks and their machine learning applications.

Neural networks, inspired by the human brain, serve as a type of machine learning model. They leverage algorithms enabling computers to learn and assimilate new data. TensorFlow boasts versatility, being capable of operating on multiple CPUs and GPUs. Furthermore, it is compatible with 64-bit computing platforms, including mobile devices.

Notably, the utilization of TensorFlow's machine learning neural networks contributed to the discovery of Kepler-90i, a planet orbiting the Kepler-90 system. This discovery marked the Kepler-90 system as the only known one with eight planets orbiting a single star. The technology's adeptness in leveraging neural networks showcases its profound impact on astronomical discoveries and highlights its potential in groundbreaking scientific explorations.

Absolutely, neural networks have indeed revolutionized computer vision implementation by enabling machines to learn sequences of actions necessary for object recognition in videos. The inception of computer vision technology traces back to the 1980s, but a pivotal breakthrough occurred in 2012 during an object recognition competition. Jeff Heaton and Alex Krizhevsky made significant strides by presenting a neural network with a groundbreaking recognition accuracy of 84%, setting a record at the time.

Their innovation focuses on a convolutional neural network that closely emulates the model of living nerve cells, or neurons, in human vision. These neurons do not receive signals from all receptors but rather from specific areas, enhancing accuracy. For instance, certain neurons activate upon detecting vertical stripes, while others activate for horizontal stripes, enabling comprehensive object coverage. The CNN operates on a similar principle but substitutes living neurons with mathematical functions. The "convolutional" in its name draws from a mathematical function that combines two functions to create a third one at their intersection.

Based on the conducted research, it can be concluded that the neural network efficiently analyzes and processes images, effectively identifying desired objects within them based on this principle. This approach has paved the way for numerous modern technologies and algorithms in computer vision, significantly enhancing accuracy levels, reaching close to 100% in certain cases.

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# NATURAL SCIENCES

**Hrevtsov A. V.**

## **ENVIRONMENTAL CHANGES DURING ROAD CONSTRUCTION**

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The development of automobile infrastructure has an undeniable impact on the environment. This is due to the use of various materials in the construction of roads, the characteristics of their locations and the functioning of vehicles (Литвиненко, 2013). Of course, when designing and constructing roadways, it is necessary to minimize the negative impact of various factors on the environment. Thus, the road infrastructure has different directions of impact on humans, nature, and the fauna (Ihuoma, Chimere, & Bridget, 2021).

Humans are affected by noise, harmful substances produced by vehicles, as well as vibration and radiation. In addition, there is a fact, which is not too noticeable at first glance, that roads take away from us every year more and more space for existence (Литвиненко, 2013). Also, roads can often pose a direct physical danger to a living being – these are accidents.

Natural conditions are also certainly influenced, namely changes in the geographical landscape, contact with physical and chemical components of building materials, emissions from specialized vehicles, anti-dust and anti-icing agents, repair materials (dust, soot, exhaust gases, oils, heavy metal oxides, etc.). etc.), and vehicle vibration is of great importance here. Changes in the flora are also possible, this is the loss of the area of green spaces and even individual species of plants, animals are sometimes forced to change their migration routes, or become the cause of traffic accidents (Yaroshchuk, Kharytonova, & Lozova, 2020), flight navigation becomes more difficult for birds, and the inhabitants of water bodies are no exception.

Taking into account all of the above, when designing and constructing roads, it is desirable to assess as accurately as possible the risk of the negative impact of

toxic substances on agriculture, and to help reduce the road network in this regard. It is necessary to take into account existing environmental standards and requirements with maximum safety of eco-parks (Kharytonova, & Yaroshchuk, 2022), terrain and soil features (Li, Zhang, & Philbin, 2022). The most optimal solution is the use of modern building materials, environmentally friendly and as safe as possible for the environment (Кондратенко, 2021). It is also advisable to use means for absorption, reduction of vibration and noise, and the emission of toxic substances from machines (Литвиненко, 2013), take care of crossings and fences for animals in places of their migration, indicating these data on specially designed maps (Yaroshchuk, Kharytonova, & Lozova, 2020).

Thus, there is a need to consider the factors of negative impact of road construction on the environment and possible ways to reduce it.

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**Shypa T. V.**

**IMPACT OF AIR POLLUTION ON THE HEALTH OF  
THE POPULATION**

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Air pollution is the pollution of the internal or external environment by any chemical, physical or biological agent that changes the natural characteristics of the atmosphere. Household combustion devices, vehicles, industrial facilities and forest fires are the most common sources of air pollution. Pollutants of serious concern include particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulfur dioxide. Outdoor and indoor air pollution causes respiratory and other diseases and is an important source of morbidity and mortality.

Data from the World Health Organization (WHO) show that almost the entire world population (99%) breathes air that exceeds the regulatory standards and contains high levels of pollutants.

Air pollution is becoming a growing problem in the modern world, especially in urban areas. Continuous emission of harmful substances into the air due to industrial activity, transport and other sources causes serious consequences for human health. According to the WHO, air pollution is the cause of death for more

than 7 million people every year. This includes 4.2 million premature deaths from cardiovascular diseases, 1.8 million premature deaths from respiratory diseases and 1.4 million premature deaths from other diseases such as cancer and diabetes. In this regard, it is necessary to conduct systematic studies of the impact of air pollution on the health of the population.

Research shows that even small elevated levels of air pollution can have serious impact on health, especially in vulnerable populations such as children, the elderly and people with chronic diseases. To reduce the negative impact of air pollution on health of the population, it is necessary to take effective measures to protect the environment and reduce emissions of harmful substances. This can be achieved by using more environmentally friendly technologies and switching to alternative energy sources. It is also necessary to maintain the air clean by reducing waste and using more environmentally friendly methods of waste disposal.

It is necessary to provide additional measures that can help reduce the impact of air pollution on health of the population, these are:

1. Support of environmental awareness among the population and education regarding the impact of air pollution on health.
2. Implementation of legislation on limiting the amount of emissions of toxic substances into the air and ensuring its compliance.
3. Support for the development of energy-efficient technologies and alternative energy sources.
4. Reducing the use of road transport by supporting alternative modes of transport such as bicycles, electric mopeds and public transport.
5. Support for programs to reduce emissions of toxic substances into the air for industrial enterprises and the household sector.
6. Increasing green spaces in cities and reducing concretization to improve air quality.
7. Providing access to clean drinking water and reducing pollution of water resources, which can also have a positive effect on the health of the population.

In general, reducing the impact of air pollution on health of the population requires a comprehensive approach and joint efforts of industrial enterprises, the public and the scientific community.

Therefore, ensuring clean air is critically important to maintaining the health of the population. Achieving this goal requires joint efforts by governments, public organizations and the private sector.

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### **RESOURCE CONSERVATION IN UKRAINE: PROBLEMS AND PROSPECTS**

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The formation of a scientific basis for creating a resource conservation policy and mechanisms for its implementation today is a fairly obvious need, which is due to the needs for reforming the resource conservation policy in the national economy.



Regulation of resource conservation on the territory of the country coincides with issues of management at the national level, and these conditions give relevance to the development of a scientific basis for the formation of tools for the implementation of resource conservation policy. Despite this, it should be noted that the definition of an effective model of resource conservation management is impossible without an idea that covers the entire process (Андреева & Барун, 2014).

Many scientific concepts of economic development claim that it is necessary to move to resource conservation economic development. This approach will ensure an increase in the social level of the population, a decrease in anthropogenic impact on the environment, and a decrease in the rate of use of natural sources with almost no damage to the economic system.

In the highly developed countries of the world, the processes of formation of a resource conservation way of conducting business and offering competitive products and services on the world market took place.

The foundations of resource conservation policy should be based on scientific knowledge, which is based on existing laws, trends and regularities (Мусіна & Кваша 2014).

Summarizing modern ideas on resource conservation, several models of resource conservation in economic practice can be given:

- models based on the traditional basis of reducing material intensity or reducing waste generation and increasing the use of renewable resources;
- models based on a new basis for reducing the use and self-sufficiency of resources based on the transition to industrial recovery of raw materials.

The main difference between these models is that they are used as a general concept. In addition, all these conservation models have a common basis – the organization of resource consumption. Resource conservation currently does not have an official concept, but is a rather important issue that will require detailed improvement (Принципи та практики ресурсоефективного виробництва, 2016).

The main methodological principles underlying the idea of resource conservation include:

- implementation of a policy aimed at resource conservation within the framework of social and economic state policy;
- to explore the main ideas of resource conservation at the theoretical level to gain more understanding of its development;
- to choose a conceptual approach based on a combination of two complexes: resource provision and resource conservation;
- to adopt an alternative form of state resource conservation policy and at least partially stop the model of formation of raw materials markets.

In order for the resource conservation policy to be fully implemented at the state level, it is necessary to make changes to the basic principles of resource management, which should be based on the following:

- warning about self-sufficiency of resources;
- creation of an effective resource conservation management system;
- guarantee a competitive resource conservation policy;
- the ratio of the interests of the country and various property subjects;
- scientific supervision of resource conservation policy;
- implementation of strategies.

Considering that the resource conservation procedure is aimed at achieving a long-term effect of economic growth, it is necessary to create an effective methodical mechanism based on an economic and management approach to implement the resource conservation mechanism in real sectors of the national economy (Лютьчак & Гречанюк, 2013).

Due to the management principles and directions of resource conservation, such as technological, scientific, commercial and informational, the management system of the resource conservation process at each level of the economy should work well and efficiently.

Summing up, it should be noted that resource conservation is a breakthrough force for advancing towards the newest industrial form of development in the far-reaching perspective. This will lead to the expansion of the legislative framework in Ukraine, the creation of effective investment and economic market mechanisms for implementation and support from the state.

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# SOCIAL SCIENCES

**Bielikova D. S.**

## **KEY ASPECTS AND THREATS TO MODERN EDUCATION**

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Modern education is a system of learning and knowledge acquisition that meets the requirements of modern society and the labor market. Education in the modern sense includes the following key aspects:

1. **Up-to-date knowledge and skills:** Modern education provides students with relevant knowledge and skills that meet the needs of the modern world, including digital literacy, critical thinking, communication skills and many others.
2. **Flexibility and individualization:** Modern education provides learners with the opportunity to choose their learning paths, tailor their learning to their interests and needs, and enables lifelong learning.
3. **Use of technology:** Modern education uses modern technology to enhance learning and access to information.
4. **Development of critical thinking:** Education emphasizes the development of critical thinking rather than just memorization of facts.
5. **Intercultural and civic education:** Education promotes understanding of different cultures and values, and develops civic awareness and responsibility.
6. **Supporting the development of skills for the future:** Modern education prepares learners for the labor market of the future, where lifelong learning and adaptation to change are important.
7. **Supporting students' psychological well-being:** Ensuring psychological support and development of social skills among students (Шкарлета, 2022).

Modern education is focused on preparing citizens who can function effectively in the modern world, make their own choices and develop as professionals and individuals. So it has been changing a lot in recent years, first with Covid-19, then with the war in Ukraine, being critical for Ukrainian citizens including both

teachers and students. Many schools and universities have switched to distance learning, more and more people are switching to online learning as it saves our time and allows people to continue their studies from different places . But it is also less effective when you look at young children who will not be able to learn and fulfill the requirements of teachers, unlike older children.

Still, in my opinion, modern education faces many threats and challenges, including the following:

1. Technological transformation
2. Globalization
3. Changing role of the teacher
4. Accessibility of education
5. Consumer income
6. Environmental awareness

I suggest considering all of these threats and challenges at a time.

1. *Technological transformation.* Rapid development of technologies, outdated approaches to education. In today's world, technology is moving rapidly upwards, so some professions do not have time to adapt to this. Some regions still use the methods of the past centuries, as disrespect for students and bullying by school staff teachers. Such teaching methods are outdated and discourage children from learning.

2. *Globalization* is a process of worldwide economic, political and cultural integration and unification. In a broader sense, it is the transformation of a certain phenomenon into a planetary one, one that affects the entire Earth. That is, the education system should be ready to integrate into, for example, the European standard or even a completely new standard.

3. *Changing the role of the teacher.* Teachers need to rethink their role. In my opinion, they should become mentors and help students develop critical thinking and independent learning skills. Perhaps this will prepare children for university and a more adult and conscious life.

4. *Accessibility of education for all people.* Access to quality education must be ensured, which is a challenge in some regions, although it should be mandatory. But excessive commercialization and limited access to funding can limit access to quality education (Шкарлета, 2022).

After analyzing the challenges, the following question should be raised: “What should be done to reduce these challenges and threats to modern education?”

1 *Acquiring new technologies.* Rapid changes in technology and the introduction of artificial intelligence may change the requirements for learning and the skills of students. So both students and teachers have to keep up with state-of-the-art technologies.

2 *Adaptation to the needs of the labor market.* The labor market is changing and education needs to adapt to these changes by teaching skills that are suitable for future jobs.

3 *Eliminating inequalities in education.* Ensuring access to quality education for all groups of the population and combating social inequalities is a pressing challenge.

4 *Ensuring digital security and privacy.* The growing use of technology in education raises questions about personal data protection and information security.

5 *Changing approaches to learning.* There is a need to rethink traditional teaching methods in favor of more interactive and innovative approaches.

6 *Psychological health and well-being support of students.* Increasing levels of stress and psychological problems among students require attention and support.

7 *Providing socio-cultural diversity.* There is a growing role for understanding and taking into account different cultural, linguistic and identity contexts in learning.

8 *Additional financing of education.* Excessive commercialization and limited access to finance can limit access to quality education.

So, there are many threats and challenges to education today, as described in my paper. They need to be dealt with, but by overcoming them, it can turn into something enjoyable and interesting.

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**Brazhnyk M. A.**  
**EDUCATION TODAY: THE BIGGEST THREATS AND CHALLENGES**

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In the rapidly developing field of education, the emergence of contemporary issues, especially in distance learning, requires careful consideration. This material aims to understand the intricacies of these issues, shedding light on the changing dynamics of the educational system. The focus is on elucidating the difficulties inherent in distance learning in a university context, thereby providing a basis for a comprehensive examination of the subject.

In the field of modern education, technological development of universities plays a key role, forming a platform for distance learning. We will consider the most common problems and nuances below:

- insufficient technological infrastructure;
- limited access to high-speed Internet;
- compatibility issues between platforms and programs;
- overcoming organizational obstacles;
- coordination problems due to different time zones;
- limited opportunities for discussion and exchange of ideas;
- psychological measurements;

- reduced motivation and responsibility due to lack of direct feedback;
- a profound shift in student life;
- the need for adaptation in the context of changing educational norms;
- increased stress and depression, especially among students displaced by war.

The current technological infrastructure of university systems often fails to cope with its tasks, creating a serious barrier to the implementation of distance learning initiatives. These shortcomings hinder the flexibility and responsiveness needed for optimal online learning. One of the biggest shortcomings is the servers of the learning platforms that the university chooses, in particular their inability to handle a large number of users during rush hour during classes, which can result in lateness and absence of students from classes.

Also, an important problem is the limitation of slow Internet, which poses a serious problem for both students and teachers. The consequence of this is a decrease in the quality of online educational resources, which prevents comfortable distribution of knowledge.

Navigating through various platforms and programs presents a number of obstacles. The lack of compatibility between these tools disrupts the holistic integration of technology into the educational process. This incompatibility can impede the seamless flow of information, affecting the overall learning experience.

There are also other organizational issues that have a profound impact on the dynamics of distance learning, such as lack of real-time interaction between student and teacher.

One of the huge organizational problems arises from the lack of direct, personal interaction between students and teachers. Communication is possible only at online meetings, on forums, if they exist on the learning platform and in instant messengers, but as such, personal interaction between students or teachers is extremely difficult to achieve



The geographical dispersion caused by migration due to military conflict creates a complex level of organizational difficulties. Synchronizing activities across different time zones becomes a challenging task that requires careful planning to accommodate different schedules. This issue can have a major impact on learning activities, placing additional stress on both students and teachers.

The shift to distance learning means fewer opportunities for meaningful discussion and exchange of ideas. The lack of physical interaction limits both spontaneous dialogue and collaborative exploration of concepts, affecting the level of intellectual interaction. By the way, there is a solution to this problem: for example, interested students can separately make an online meeting on any convenient platform, without being tied to the one chosen by the university, and discuss ideas, various problems, as well as their solutions, or simply spend time together, which can be very useful for students who entered an educational institution during the period of distance learning.

Delving deeper into the psychological aspects of modern education, we will consider other nuances that significantly affect the mental state of people participating in distance learning.

The feeling of isolation in learning arises from the lack of social dynamics in the educational field. Despite the attempts of various organizations, both official and local, created by the students themselves, to diversify the monotonous everyday life of online learning, this poorly motivates students to interact with each other both in class and outside of class time, breaking the already traditional student life.

Amid academic activities, a noticeable spike in stress and depression is evident, especially among students forced to leave their home countries due to war. The psychological impact of displacement is intertwined with academic challenges, requiring a sensitive and holistic approach to support the mental health of affected people.

The lack of personal experience of communication between students and teachers contributes to a decrease in student motivation and a sense of responsibility.

Without timely guidance and reinforcement provided by face-to-face interaction, students may find it difficult to maintain their enthusiasm and also may not fully understand the seriousness of learning, resulting in irresponsibility that causes students to attend classes poorly, thinking that it is just online meeting and they have nothing to do with it.

This major shift toward distance learning is resulting in a completely different student life, one devoid of traditional aspects such as co-living in residence halls and the rich variety of personal interactions between students and faculty in physical spaces that we discussed earlier.

Among the psychological difficulties lies the urgent need to adapt to new forms of learning. This adaptation extends beyond the academic sphere, requiring students to acclimate to different educational structures devoid of familiar elements, forcing them to reconsider their understanding of student life, while simultaneously using innovative methods of acquiring knowledge.

Through this paper, it is clear that aspects of distance learning are multifaceted and require a holistic approach to support quality education and the adaptability of people in such a rapidly changing educational landscape.

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**Chevychelova A. O.**  
**ADAPTING EDUCATION: NAVIGATING CHALLENGES  
IN THE ERA OF ONLINE LEARNING AND AI TOOLS**

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The education system faces a variety of challenges in today's world. One of the biggest challenges we're grappling with is the rapid shift towards online learning. While it's fantastic that technology has enabled remote education, it's not without its hurdles.

What are the most challenging aspects of an online education? There are a number of advantages, but there are several major downsides as well:

First, the learner has to be self-motivated. The advantage that you can school any time you want becomes a disadvantage if that time is always tomorrow.

Second, have very few programs for earning accredited degrees online yet. Every state college and university should be required to have all courses available online. As it stands now, courses and programs are quite limited.

There are a lot of technical glitches, sometimes there's a power-cut, a network problem, slow internet connection. The lecturers seem to struggle with technology or some audio disturbance. Many students do not have a compatible mic to use while attending classes on PC and it takes a lot of time for a PPT (Power-point presentation) to load on phone.

It is also possible to use different tools as a source of cheating in online education.

For example, in Google Workspace for Education, there are so many features that are misused by students.

1. Students can cheat via the chat feature in Google Docs,
2. Students bully other students with bad stickers in Google Chat.

3. They can add or remove people in Google Meet. This creates a mess for teachers.
4. They can submit empty assignments in Google Classroom. This is also a headache for teachers.
5. Link preview in Google Docs.
6. Explore feature in Google Docs allows searching the internet.
7. Students use the dictionary features to find meaning and definitions.

Recently, the opportunity to use ChatGPT has appeared. While ChatGPT has potential benefits, their effect on students cannot be ignored. It is important for educators to consider these concerns and develop guidelines and frameworks for responsible and ethical use of these models in education. A balanced approach that combines the strengths of such models with human interaction and critical thinking skills is essential to provide students with a comprehensive and effective learning experience.

If a student takes a homework assignment and plugs it into Chat GPT to find an answer, is this cheating? Should this program be banned in schools?

Let's begin to get into Chat GPT, and uncover what it is, how it works, and how you can use it, because the answer to the question as to whether or not this is considered cheating, is that it isn't – and we need to adapt to new ways to learn, so that this is so.

Those who prevent that growth, will stand to support the cheating side of this discussion.

Remember, without first hand experience, it's unfair to dismiss it outright. Just like when we first started using the internet, we had to adjust and learn how to navigate the vast online world.

The internet itself presented opportunities for cheating, and we eventually developed measures to combat plagiarism. As technology advanced, iPhones emerged, and social media was born.

We faced challenges in handling the vast amount of information and distinguishing between reliable and false content.

Fast forward to 2023, and we're now exploring the power of AI, specifically Chat GPT. It serves as a repository of knowledge from the internet, capable of generating responses and suggestions based on the available information. While it's not a search engine, students often utilize it to find answers to their homework questions.

Is it cheating? Yes, technically it is, as students are using someone "or something" else's ideas.

However, we should consider the bigger picture. If the answer is readily available on the internet, why are we still using such questions as the primary mode of instruction? We need to shift our focus towards fostering critical thinking, analysis, and deeper engagement with the subject matter.

Rather than asking for a straightforward answer, we can encourage students to explore themes independently. For instance, assigning a task to research and outline five examples of themes from a novel prompts students to process information and prepare arguments for class discussions. This approach encourages differentiation and active engagement with the text.

Moreover, Chat GPT can level the playing field in education. The availability of the free version ensures that everyone has equal access to this valuable resource. This democratization of knowledge contrasts with paid services, which leave students unable to afford such assistance behind.

We must acknowledge that technology, including AI, has become an integral part of our classrooms. Platforms like Google Classroom and Google Docs embedded AI into our daily educational practices. Embracing AI in education doesn't mean blindly relying on it, but rather leveraging its potential to enhance the learning process.

Of course, caution and regulation are necessary to address potential risks and ethical concerns. However, we shouldn't let fear hinder our progress and prevent

students from benefiting from AI's transformative power. It's essential to view AI as a tool that, when integrated thoughtfully, can enhance learning outcomes and empower students to become healthier, happier individuals.

In conclusion, instead of fixating on whether Chat GPT constitutes plagiarism, let's shift our focus to the larger context. Is the question or task worth answering, or does it serve as a stepping stone to something greater?

So, to sum up, the challenges posed by online education, technology, and AI tools like Chat GPT necessitate a shift in our perspective on learning and assessment. While online education offers flexibility, it demands self-motivation and faces technical glitches that disrupt the learning experience. The advent of AI tools like Chat GPT has raised concerns about cheating and academic integrity, but it also presents an opportunity to rethink our approach to education.

Rather than viewing Chat GPT as a threat, we should recognize it as a reflection of the evolving educational landscape. The real question lies not in whether using such tools constitutes cheating, but in reevaluating our methods of instruction. Outdated assessment methods that rely on easily searchable answers should give way to tasks that promote critical thinking, analysis, and independent exploration.

Educators and policymakers must establish guidelines to ensure responsible use of AI tools, addressing concerns about plagiarism while acknowledging the democratization of knowledge they offer. Embracing AI in education is not about abandoning traditional methods but integrating technology thoughtfully to enhance the learning experience. By encouraging students to delve deeper, question, and engage actively with the material, it is possible to transform education into a dynamic, interactive process that prepares students for the challenges of the future.

In this rapidly changing landscape, our focus should be on nurturing curious, adaptable, and innovative thinkers. Chat GPT and similar AI tools, when harnessed responsibly, can be invaluable assets in achieving this goal, fostering a generation of lifelong learners equipped to thrive in the digital age.

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**IMPACT OF INTERNET AND SOCIAL MEDIA ON MODERN SOCIETY**

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The internet and social media have revolutionized the way we live and interact in modern society. Once considered novel technologies, they are now integral parts of our daily lives, transforming various aspects of our world.

The advent of platforms such as TikTok, Twitter, Instagram, and others has fundamentally changed our communication. These platforms have introduced and popularized new styles and formats of communication that are distinct from traditional methods.

One of the most notable changes is the rise of short-form videos, particularly on platforms like TikTok and Instagram. These videos, often just a few seconds to a minute long, are designed to capture attention quickly and convey messages in an engaging, easily digestible format.

Similarly, memes have become a common form of communication on social media. They are a unique blend of humor, satire, and commentary, often encapsulating complex ideas or sentiments in a simple, relatable image or short video.

A viral content is another key aspect of modern social media. Content that goes "viral" can reach millions of people, significantly amplifying the message. This phenomenon has led to a culture where users are constantly seeking to create or share content that has the potential to become a viral.

However, these changes in communication styles have also raised questions about the depth and quality of communication. The emphasis on brief, eye-catching content can sometimes lead to oversimplification of complex issues. The rapid pace of information flow makes it challenging for users to engage deeply with topics, leading to a more surface-level understanding.

The impact of social media on mental health is a topic of increasing concern and interest among psychologists and mental health experts.

One of the primary issues associated with social media use is the potential for addiction. The design of these platforms often encourages habitual use, by notifications, likes, and infinite scrolling, which can trigger dopamine responses in the brain similar to those in other addictive behaviors. This can lead to excessive use, impacting daily life, productivity, and even sleep patterns.

Loneliness is another significant concern. While social media connects people, it can sometimes lead to a sense of isolation. This phenomenon is particularly pronounced among users who spend a lot of time passively scrolling through feeds without engaging in meaningful interactions.

For many teenagers, social media is not just a tool for communication, it's a vital part of their life. One of the critical issues in this context is the distinction between online personas and real-life identities. Young people often control their online presence, selectively sharing aspects of their lives that portray them in a certain light. This can lead to a disparity between who they are online and their true selves, which may impact their self-esteem and sense of identity. The pressure to maintain a certain image on social media can be heavy, often leading to anxiety and self-doubt.



However, it is important to recognize the positive aspects as well. Social media offers opportunities for connectivity and community building. Young people can connect with others who share similar interests, experiences, and challenges, regardless of geographical barriers. This connectivity can give a sense of belonging and support, especially for those who might feel isolated in their immediate physical environments.

Additionally, social media can be a platform for self-expression and creativity. It allows young people to explore their identities, share their talents, and voice their opinions. When used positively, it can be a tool for empowerment, learning, and personal growth.

Social media has become a pivotal arena for political activity. Firstly, social media platforms are increasingly used for political campaigning. Politicians and political parties utilize these platforms to reach a broader audience, particularly younger demographics, more effectively.

Activism has also found a powerful tool in social media. It provides a platform for activists to organize, mobilize, and spread their message to a global audience. Social media campaigns can rapidly gain momentum, rallying support for causes, influencing public opinion, and sometimes even leading to positive changes.

However, there are significant challenges associated with the role of social media in politics. The spread of misinformation and propaganda is a major concern. The same features that make social media effective for spreading legitimate information can be exploited to distribute false or misleading information. Moreover, the echo chamber effect, where users are exposed primarily to opinions that reinforce their own, can limit exposure to diverse perspectives, further entrenching divisions.

These issues highlight the need for users to engage in thoughtful critical thinking and to develop robust media literacy skills. As individuals navigate through vast amounts of information and diverse viewpoints, the ability to discern credible information from misleading content becomes paramount.

Social media also a powerful force in driving globalization and cultural exchange. It connects people across the globe, enabling interactions that were once limited by geographical and cultural boundaries. This interconnectedness has facilitated a remarkable exchange of ideas, traditions, and perspectives among diverse communities.

One of the most significant impacts of social media is its ability to bridge cultural gaps. Individuals from different parts of the world can interact, share experiences, and learn from each other in ways that were not possible before. This sharing often includes cultural aspects such as cuisine, music, art, and fashion which can contribute to understanding and appreciating cultural diversity.

All things considered, it seems reasonable to assume that the internet and social media have brought huge changes in our society. They have reshaped how we communicate, interact, and understand the world around us. From changing the way how we talk and share our lives on social platforms, to influencing the mental health and self-perception of people, these technologies have far-reaching impacts.

Social media has also become a crucial part of political campaigning, activism, and spreading awareness about various issues. However, with these advancements come challenges like misinformation and the echo chamber effect, which emphasize the importance of critical thinking and media literacy.

Moreover, social media has played a vital role in globalization and cultural exchange, bringing people from different corners of the world closer together.

As we move forward, it is important to recognize both the potential and the pitfalls of these digital tools. By using them responsibly and thoughtfully, we can harness their power to improve our lives and society. Social media and the internet are not just tools for communication; they are powerful forces that, if used wisely, can bring positive changes in our increasingly interconnected world.

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**THREATS TO EDUCATION:**  
**HOW TO ENSURE VALUES AND QUALITY**

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Education is essential to society, and there are several threats that can affect the values and quality of education. Of course, education is one of the most important sectors that determines the development of society and shapes the values of the nation. Educational centres remain an important point of contact between the citizen and the state, future professionals and professional institutions, creating opportunities for their communication and responding flexibly to the urgent needs of a particular area. However, quarantine restrictions related to the coronavirus epidemic in Ukraine, as well as the beginning of a large-scale invasion, have significantly affected the quality and efficiency of the educational process, adding new challenges to the current problems. In this report, we will examine the key

threats to education and propose measures aimed at safeguarding its core values and improving the quality of the learning process.

Thus, among the main negative factors affecting the education sector, we can single out the following: pollution of the information space. Attempts to distort or use information to support certain interests, which may occur through the media, have a direct impact on the educational information space. Contamination can lead to a loss of trust in educational institutions. In particular, students may doubt the reliability of the information they receive from teachers and curricula. To prevent such an impact, it is necessary to stimulate the development of critical thinking among all participants in the educational process, increase access to trusted sources, and maintain open and direct communication between students and teachers.

Threat to the safe organization of the educational process. Since the beginning of active hostilities in Ukraine, the education sector has been under particular threat. Teachers and students are under constant stress and are subjected to physical and mental violence against the backdrop of partial or complete destruction of the scientific and technical base. To mitigate the negative impact of the above-mentioned aspects, a number of measures need to be taken, such as protecting educational institutions and their infrastructure, ensuring continued access to education, and providing psychological support and assistance to all those in need. It is also important to take measures to restore the quality of education in the de-occupied territories and effectively integrate them into the educational network.

Irrelevance of educational programmes. In light of global challenges, such as the technological revolution, economic changes, and climate change, which affect the way we live and work, the quality of education is of particular importance. Today's students need to learn not only traditional subjects, but also to develop critical thinking, technical competence and complex problem-solving skills. Curricula and teaching methods must be constantly reviewed and reformed to ensure that they remain relevant and effective, and to ensure that future professionals are of high quality and qualified.

Commercialization of education. The first serious threat to education is the process of commercialization. Commercialization in the education sector can lead to educational institutions putting profits ahead of important achievements, such as the quality of education and accessibility of education. This can lead to higher tuition fees, making education unaffordable for many citizens. To prevent this threat, it is necessary to establish strict controls over commercialization in the education sector and promote a system that guarantees affordable and high-quality education services.

Technological challenges. Another challenge is rapid technological progress, which may lead to changes in traditional teaching methods and forms of education. The use of Internet technologies and mobile platforms may lead to the devaluation of classical approaches to learning and require a rethinking of educational methods. In order to ensure the quality of education in the context of rapid scientific progress, it is necessary to develop and implement innovative teaching methods and ensure access to modern technologies for all educational institutions.

Underfunding of education. The persistent underfunding of education is a worrying trend. Low teacher salaries and the lack of modern equipment in educational institutions can undermine the motivation of teaching staff and thus significantly reduce the quality of education. To address this need, it is necessary to prioritise education spending and ensure adequate funding for education.

Insufficient attention to teacher training. Teacher training is critical to ensuring the quality of education. Insufficient training and outdated teaching methods can negatively affect the entire learning process. To improve the situation, it is worth investing in teacher training and promoting continuous professional development (Д'юї, 2003).

Various measures can be implemented to promote core values and improve the quality of the learning process in education, such as: developing teachers' professional competence; creating flexible curricula; ensuring access to education; using modern technologies; assessment and reporting; developing critical thinking and self-education skills; involving parents and the community; training and

education of teachers; monitoring and evaluation of quality; and introducing ethical standards.

These measures can contribute to the promotion of values and quality of learning in education systems and contribute to the development of competent and dignified citizens.

Thus, to ensure the values and quality of education, it is important to consider these threats and take measures to address them. This may include developing effective control and regulation systems, increasing investment in education, supporting the autonomy of educational institutions, developing innovative pedagogical approaches and continuously improving the education system in line with the current needs of society.

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**DISTANCE LEARNING IN TIME OF WAR: CHALLENGES,  
OPPORTUNITIES AND EXPERIENCE OF ADAPTATION**  
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Russia's full-scale invasion of Ukraine, which began on 24 February 2022, has had dire consequences for secondary education in Ukraine. Schools have suffered human losses as teachers, students and parents have been killed in the fighting and Russian occupation. Hundreds of schools were destroyed or damaged. Millions of children and thousands of Ukrainian teachers have been forced to change their place of residence within the country or go abroad. Every day, all participants in the educational process have to overcome the challenges of war: forced breaks in school, switching to distance or blended learning, air raids and power outages. The full-scale war has worsened access to education, deepened existing educational inequalities,

negatively affected the quality of the educational process and academic performance, and affected the psycho-emotional state of students and teachers.

Due to Russia's aggression against our country, martial law was introduced on 24 February 2022, making it impossible to study in person.

Distance learning is not an alternative to face-to-face learning. Distance learning is a term that is often used synonymously with distance education, but is not identical to it, as distance education includes both self-study and learning. Distance education is a system and process that provides learning resources to students.

Distance learning in time of war can be important for ensuring the safety and continuity of education in a conflict zone. However, there are some aspects and benefits of distance learning in such circumstances. One example is security. Distance learning allows learners and teachers to avoid the risks associated with being in unsafe environments. They can leave their homes or other safe places only a limited number of times to access the internet and learning resources.

Preservation of education, as distance learning allows for the preservation of educational opportunities for children and adults in conflict zones. This is especially important for children who are unable to attend school due to insecurity or the destruction of educational facilities.

Global access to knowledge. Distance learning can provide access to learning resources and teaching from anywhere in the world, making it possible to receive quality education in times of war.

Reduced costs. Compared to traditional learning, distance learning can reduce the cost of transport, learning materials and infrastructure of educational institutions.

Flexibility, as distance learning allows learners to choose a flexible schedule and pace of learning, which can be particularly useful in dangerous environments (Алексюк, 1993).

However, it is important to bear in mind that distance learning can have its limitations, particularly in terms of internet access, necessary technical resources and support for students and teachers. In addition, it is important to consider distance

learning as a complement to traditional learning rather than a substitute for it, especially for younger learners who may require more face-to-face contact and interaction with teachers and classmates to complete their education.

Distance learning can take many different forms and is typically characterized by the following: 1) the separation in space and/or time of the student from the teacher, other students, and learning materials, and 2) interaction between the student and the teacher, other students, and learning materials using one or more technologies; it does not necessarily have to be electronic technology (Смульсон, Машбиць, & Жалдак, 2012). We know that pupils and students need to go to educational institutions to learn, socialize and develop. Minimizing visual communication with teachers and peers causes social and social delays, inhibits the acquisition of self-organisation experience and skills for further admission to other institutions, and makes it impossible to fully learn some subjects, such as physical education, practical and laboratory work, and the study of the nuances of some disciplines.

The war has made many negative adjustments to the educational process and the lives of today's pupils and students. A large number of people were forced to change their place of residence due to martial law and the state of emergency in Ukraine.

However, today, the development of computer hardware and various software under martial law provides great opportunities for distance learning, but sometimes the use of these technologies is complicated. Distance learning requires access to the Internet, as well as the ability to use the available technical equipment (computer, tablet, laptop, smartphone). The negative side of distance learning is that all participants in the educational process are isolated from each other, and there is a minimisation of visual communication.

Thus, distance learning in times of war faces numerous challenges and opportunities, and requires adaptation to ensure continuity of education in conflict. As for the challenges of distance learning in time of war, it is necessary to mention



access to the Internet and technical resources. In many conflict zones, access to a stable internet connection and the necessary technical infrastructure is limited or non-existent, making distance learning difficult.

Security and confidentiality are also a concern, as distance learning can be vulnerable to cyberattacks and breaches of confidentiality, especially in war zones where cybercriminals may try to gain access to education systems.

The social aspect should be taken into account. Lack of face-to-face contact with teachers and classmates can lead to social isolation and psychological problems for students, especially children.

As well as learning outcomes. Distance learning may be less effective than traditional learning, especially for younger learners who need more face-to-face contact and support.

When considering the possibilities, consider flexibility. Distance learning allows learners to work online and access learning materials at any time, which can be useful in military conflicts where schedules and learning environments can be unstable.

Global access, where learners can access global learning resources and teachers from anywhere in the world, expanding their learning and development opportunities.

As for the experience of adaptation, there are some ways of adapting distance learning during war, which include alternative communication means, where there is the use of different means of communication, such as radio, satellite Internet, mobile communication, to improve access to distance learning in hard-to-reach areas.

Information security - ensuring cybersecurity to protect learning systems and user data from cyber threats.

Supporting social development - providing opportunities for remote social interaction, such as online support groups and collaborative online projects.

Assessment and support for learning outcomes - developing effective methods of assessment and support for learners to ensure the best possible learning outcomes.

In summary, distance learning in time of war requires a creative and innovative approach to address the challenges and opportunities to ensure access to quality education in conflict.

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### **CHILDREN IN THE AGE OF DIGITAL EDUCATION: THREATS AND OPPORTUNITIES**

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Education today is facing a number of significant threats and challenges that need to be considered and addressed to improve the educational process and prepare students for the future.

Today, developed and not so developed countries are rapidly embracing the digital transformation of education and science. Digital learning is a form of education in which technology and digital resources are used to teach and improve learning effectiveness. This form of learning can take many forms and includes the use of computers, the Internet, software, multimedia materials and other technologies to deliver information and facilitate learning. Digitalisation in Ukraine is replacing conventional learning with electronic and digital devices, tools and the establishment of electronic communication exchange between people. No one would have thought a few years ago that stationary learning would almost completely give way to distance learning.

In response to these global changes, society has been divided into two categories. The first considers online learning an important step into the future, given the rapid development of technology and the popularity of modern professions. The other side is unwilling to accept the changes, believing that online learning will not be able to provide the necessary knowledge required for the full development of the student. And there is also the problem of social adaptation: how can a child be taught to get used to society if he or she spends all the time on the Internet?

Digital learning tools and technologies allow you to develop effective self-education skills, so the following advantages can be highlighted: the ability to learn anytime and anywhere. That is, the learner builds the algorithmisation of learning in a way that is convenient for him or her, with the possibility of being in other cities or countries. Distance learning allows you to study at your own pace and independently allocate time to study the material.

Digital learning is much more accessible. There is no longer a problem of a shortage of textbooks and teaching aids. All the necessary material can be found on the Internet or in the databases of universities and schools. Distance education is also cheaper for both students and teachers, who do not have to pay for travel and accommodation every day, and in the case of foreign universities, they do not need to spend money on a visa and passport. The above factor leads to another advantage: studying in a relaxed home environment, where the usual daily stress is reduced to a minimum.

Despite the many advantages, digital learning has its own set of disadvantages. One of them is mentioned above: the lack of communication skills. When studying remotely, students have minimal or no personal contact with teachers and peers, so later in life (especially for introverts) it is difficult to develop teamwork skills and feel confident in society. (And perhaps even a sense of fear when in the midst of people) (Гуревич, 2012). But if a person has contact outside of distance learning, for example, at work, then this drawback is easy to fix.

We should also add the problem of lack of practical skills. It is quite difficult to acquire practical skills, especially if the future profession is not related to digital technologies.

But the most important problem with digital learning is motivation. Students have to master almost all the learning material on their own, which is not for everyone. Some students need to be supervised and encouraged to learn, because not everyone may have the willpower and responsibility.

Nevertheless, digital education in the country has been gaining momentum since the start of the pandemic and then the full-scale invasion of Russia. At the beginning of 2020, during the coronavirus outbreak, when people had to stay at home, digital learning was developed for students who were not able to study at all. This happened very quickly and had a lot of drawbacks. People in general have a hard time accepting any changes, and at that time they were not ready for such a global leap in education and therefore had to adapt to be able to continue their studies. Currently, distance learning continues during the war in Ukraine. Teachers are trying to provide the necessary knowledge even in shelters under fire. Most students choose domestic universities, studying away from home.

Many platforms and courses have been created to make it easier to prepare for university or even to provide training in new professions for those who cannot enter. Among the global platforms: Coursera, Udemy and EDX, as well as the Ukrainian programme Diia: Education. Access to all these platforms is free, and upon completion, students receive a certificate that can be added to their CVs. The Diia: Education platform provides an opportunity to learn a new profession regardless of age or level. This is the largest project aimed at increasing digital literacy among Ukrainians. Although modern education in the country has been shaken, indomitable teachers and students are doing their best to keep the nation's bloom alive (Костельова, Ярмолович, 2017).

So, based on the above, we can conclude that digital education still has more advantages than disadvantages and will continue to gain momentum. If digital

technologies are developed to the European level, it is possible to completely replace the usual stationary education with distance learning. Digital learning is a big step forward. It is a breakthrough and the future.

To summarize the topic of children in the age of digital education: threats and opportunities, it should be said that children generally face both threats and opportunities. The main threats are screen addictions. Too much time spent in front of screens can lead to addiction to gadgets and social media. This can affect the physical and mental health of children.

Digital sharing. Children may face the risk of online harassment, cyberbullying and negative interactions online.

Loss of privacy. The use of digital technologies can lead to a violation of personal privacy and the collection of personal data without proper control.

Reduced activity. Spending too much time in front of screens can reduce children's physical activity, which can lead to health problems.

In terms of opportunities, this includes access to information. Digital technologies provide children with access to a wealth of information and learning resources.

Interactive learning. E-platforms and training programmes can make learning more interactive and engaging.

Developing digital skills. Children can learn to use digital technologies and develop digital skills that are important for future careers.

Connectivity and communication. The Internet allows children to connect with peers from other countries and gain new perspectives and experiences.

Flexible learning. Digital technologies make learning more flexible and allow children to learn at their own pace and according to their own programme.

It is important that parents and teachers promote the balanced use of digital technologies and provide children with appropriate supervision and guidance on how to use the Internet and gadgets safely and responsibly.

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### **SOCIAL AND PSYCHOLOGICAL CHALLENGES OF DISTANCE LEARNING FOR STUDENTS**

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Distance learning can pose a number of social and psychological challenges for students. The main ones include social isolation. The lack of physical contact with classmates and teachers can lead to feelings of loneliness and isolation. Children may experience a lack of social interaction and support from their classmates.

Decreased motivation. Distance learning can be less stimulating and less engaging than school. Lack of structure and motivation can lead to lower academic achievement.

Technical difficulties. Not all learners have access to the necessary technology and internet. This can lead to inequalities in learning opportunities and create difficulties for those without access to appropriate resources.

Stress and anxiety. Transitioning to a new form of learning, especially in times of crisis, can cause stress and anxiety among learners. They may feel anxious about the uncertainty of the future and changes to their schedules.

Lack of physical activity. Distance learning can lead to a decrease in physical activity for students as they spend more time in front of computers or screens.

Social inequalities. Distance learning can exacerbate social inequalities, as not all families are able to provide children with the necessary support and access to resources.

Decline in the quality of education. Distance learning may not always provide the same level of quality education as traditional schooling (КОСТЮКОВ, 1989).

To overcome these challenges, it is important to provide support and resources for students, teachers and their families. Distance learning systems also need to be flexible and adaptable to the needs of different learners. It is important to create opportunities for interaction, collaboration and support between students and teachers, even in an online environment.

Children are also unable to receive various services, such as speech therapy, health and wellness, due to the inability to attend preschools, which is extremely important in times of war. At the same time, migration processes and a decline in preschool education coverage leave the problem of a shortage of places in the relevant institutions.

Another problem is children who study at two schools at the same time or have many additional classes. Of course, such children have fewer educational losses, which is a plus. While abroad, they join Ukrainian classes at their schools. Mostly we are talking about those who are abroad but plan to return to Ukraine. There are many such children. However, the problem is that these students may become exhausted or even lose motivation to study due to overload.

As for the assessment of academic achievements, there is also a problem here, because, for example, children who temporarily study abroad write on social media that Ukrainian schools often do not recognize foreign grades. The problem with grades concerns students who went abroad and then returned. Schools must recalculate the academic achievements of children from other schools and countries. The Ministry of Education and Science explains that there are mechanisms for this, and the school can cope with this on its own. A child returning from abroad must provide a Ukrainian school with an extract from the programmes, topics and subjects

he or she has studied. The school should check the child's knowledge in accordance with the Ukrainian curriculum, re-calculate the grades or test and give their own.

Destroyed schools are a global problem in Ukraine today. In the city of Kharkiv, 3126 educational institutions have been affected by bombing and shelling, and 337 of them have been completely destroyed. Rebuilding schools is one of the priorities voiced, in particular, at the International Conference on the Reconstruction of Ukraine. In general, we rely on our foreign partners to help Ukraine.

So, combating the social and psychological challenges of distance learning for students requires a comprehensive approach that takes into account their needs and helps create a supportive learning environment. Such strategies include providing psychological support. Providing access to psychological support and counseling for students is important. Children should be able to discuss their emotions and stressful situations with professional psychologists or counselors.

Establish a regular schedule. Creating a structured schedule for distance learning that includes time for lessons, breaks, physical activity, and fun helps children feel more stable.

Interaction with classmates. Encourage interaction with classmates through virtual meetings, group projects, and cooperative games. Communicating with your peers can reduce feelings of social isolation.

Maintaining physical activity. It is important to encourage children to engage in regular physical activity, which contributes to psychological well-being. Playing sports or exercising can help reduce stress and improve mood.

Access to technology. To reduce inequalities in access to technology, consider providing equipment and internet connections for families who are unable to provide for themselves.

Parental support. Collaboration with parents is important for successful distance learning. Schools can provide parents with resources and support for learning at home.



Teacher support. Teachers play a key role in supporting children in distance learning. Schools should provide teachers with the necessary resources and support to teach in an online environment.

Social projects. Encourage children to participate in social projects or volunteer work, even online. This can contribute to their personal development and maintain social connections (Биков, 2009).

Therefore, providing psychological and social support for students during distance learning is an important task for parents, teachers and educational institutions alike.

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**MODERN EDUCATION:**  
**A PATH TO A STABLE FUTURE OR A BURDEN**  
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Modern education can be either a path to a stable future or a burden for young people, and much depends on context, education, and individual circumstances.

Education is an integral part of evolution, but in today's context, we can see how the issue of education is becoming more acute every day. The martial law in Ukraine prevents the traditional acquisition of knowledge in universities and schools, which is why most higher education institutions are forced to switch to distance learning. There are two sides to this coin: on the one hand, online learning helps to increase free time and allows you to study from anywhere in the world, allows you to choose the pace individually for each student, online learning is more effective

due to the use of various tools such as presentations, tests, videos, chats, the ability to modify classes, on the other hand, young people lose the opportunity to communicate live during their studies, and to take control and take responsibility for improving their knowledge, as well as to perceive information with a It's no secret that distance learning has worsened students' knowledge, isolation has increased stress levels and negatively affected the psychological state of many students (Cayx, 2012).

Education is a tool that provides people with knowledge, skills, information, and allows them to know their rights and responsibilities towards their family, society, and nation. Education enriches the worldview and empowers people to fight injustice, violence, corruption and many other unpleasant aspects of society. Education is the process of acquiring and improving knowledge, skills, values, beliefs and habits through various forms of cognitive activity, such as perception, attention, memory, imagination, thinking and various forms of learning, such as study, instruction, training, research and practical experience. Undoubtedly, the skills acquired during education will help on the way to implementing plans and achieving the goals in life that each of us sets for ourselves. We cannot but agree that if education does not provide a 100% guarantee, it at least increases the chances of stability and confidence in the future.

Higher education provides the information base without which it is impossible to develop professionally, but only a few people manage to do so. And during your years at university, you gain skills in communicating with people, with management, and temper your mind and intuition.

To get an education nowadays, you need to have willpower, endurance, responsibility, and be strong-willed. The likely root of the problems with education for young people today may be emotional instability due to the war, apathy, anxiety, fear, etc. The educational process can have an impact on the traumatised psyche of the younger generation, which will lead to failures in learning, it will be difficult for

a person to remember information, and this will cause even more stress, which will close this circle of chain reaction. As a result, we will only get a mental disorder.

Some young people believe that higher education is not necessary for a successful life, based on the examples of famous people who have achieved recognition without the help of education. Of course, such cases also occur, but they are less common than examples of people who became successful thanks to higher education.

Education often becomes a "burden" for young people because of emotional burnout. Emotional burnout is a condition that can also be described as emotional exhaustion. This is something that a student may not know about when they notice themselves: constantly tired, emotionally drained, devastated, indifferent to their studies and to the people around them, irritated, anxious, disappointed in their profession. Sometimes, in this state, young people may start blaming themselves for being lazy, doubt themselves more, and squeeze the most out of themselves. But such behaviour only increases emotional exhaustion. You need to learn to adapt to the learning environment in a way that does not harm your mental health or physical health. Adaptation is a very important and often painful period of familiarisation and getting used to new learning and living conditions, which should not be prolonged. The adaptation period lasts from three months to six months. The most difficult period of adaptation is the first 2 months. Of course, the sooner a person adapts to new conditions, the better, but it doesn't matter if someone needs a little more time for this process than others. Adaptation helps a person to endure significant changes around them, and it is also necessary in order to succeed in life through education.

Success is the result of long and hard work, it is an appropriate goal that a person sets for himself or herself to achieve in the future. A successful person sees meaning in all their actions and does not waste time in useless activities, they strive to develop, and they are able to assess their capabilities, see their weaknesses and look for ways to improve. They like to learn new things and spare no effort and time to study. Learning helps to pave the way to success, which means that you need to

be able to study, develop your abilities, work with your emotional state, and not forget about rest.

Thus, modern education can be both a path to a stable future and a burden for young people, and a lot of this depends on the quality of education, individual goals and circumstances. It is important that education is accessible, of high quality, and develops the skills needed in the modern world, as well as promotes self-realisation and enjoyment of learning.

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**Levenets Ye. V.**

**MARTIAL LAW AND DISTANCE LEARNING:  
ADAPTING EDUCATION TO CRISIS SITUATIONS**

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The introduction of martial law can significantly affect the educational process, including distance learning. Martial law basically means that the government has expanded powers to ensure security and order in the country, and this can include traffic restrictions, limited access to public places, and strict quarantines. Of course, it is important to have plans and strategies in place to ensure continuous learning during martial law, including distance learning opportunities and support for students and teachers.

The current situation puts us in a difficult position and requires rapid adaptation to the crisis. Since the beginning of the full-scale invasion of Ukraine on 24 February 2022, schools/institutes/colleges have been destroyed approximately every second day. Many children have not attended for a year and a half. Those who have been able to attend schools have been forced to hide in basements or bomb

shelters, sometimes for several hours and several times a day due to air raid alerts. This created enormous difficulties for students and teachers. Martial law certainly poses a danger to our society, but it can also be an incentive to improve teaching methods. In times of war, education becomes a fundamental component for the preservation and development of society. It is the key to preserving and disseminating knowledge that can contribute to peace and conflict resolution, as well as prepare the next generation to build a stable society.

Distance learning has proved to be a crucial tool to ensure the safety of students and teachers/educators. War, with its constant threat of bombs, shells and rocket attacks, makes access to education/training incredibly difficult for millions of children and young people. This makes the educational process unstable. However, one of the most important aspects in today's world is access to technology and the Internet. The technological limitations that arise from war can manifest themselves in limited access to modern means of communication, due to massive damage to infrastructure. Access to education and technology should be ensured even in conflict situations.

Martial law can also affect the psychological and social problems of students and teachers. They face stress, anxiety, and a sense of insecurity, which definitely affects their emotional and mental health. This can manifest itself in increased aggression, decreased interest in learning, lack of motivation and concentration. Teachers can also face similar problems.

Challenges faced by students during martial law include: insecurity, even during distance learning; social disorientation; and limited access to education.

There are factors that emphasize the need to rethink curricula and methodologies during wartime: flexibility and adaptability; support for emotional well-being; preservation of educational values.

Taking these factors into account will help to adapt teaching methods to the current conditions, ensuring quality and effective education, regardless of the difficulties faced by today's society.

It is only through joint efforts and the use of technological resources that the sustainability of the educational process in crisis situations can be ensured.

Therefore, distance learning is an important tool for adapting education to crisis phenomena such as natural disasters, pandemics, conflicts and other emergencies. The main aspect of adapting education to crisis situations through distance learning is increased flexibility. Distance learning allows schools, colleges and universities to be more flexible in responding to crisis situations. Learning can quickly move to an online format, allowing pupils and students to continue their educational growth even if their normal learning process has been suspended.

The use of technologies such as video conferencing, online learning platforms, specialized collaboration software and other tools allows for online learning during crisis situations.

Teacher retraining. Teachers and other educators need to be prepared to teach in an online environment. Training and preparation are important to ensure quality learning in a distance format.

Psychological support. It is important to provide psychological support to pupils and students, as crisis situations can be accompanied by stress and anxiety. Access to counseling and psychological support can be important in such circumstances.

Overcoming inequalities. It is also important to consider that distance learning can lead to deepening inequalities in education, as not all students and learners have equal access to technology and resources. Measures are needed to ensure equal opportunities for all.

Emergency plans. Educational institutions should have emergency plans, including plans for distance learning, to be prepared to respond quickly to crisis situations (Шуляра, 2020).

Distance learning can be an important part of a strategy for adapting education to crisis situations, but it is important to keep in mind that it must be well organized and provide quality learning for all students and learners.

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**Morkova V. O.**

### **INCLUSIVE EDUCATION IN THE MODERN WORLD: CHALLENGES AND PROSPECTS**

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Inclusive education is an important topic in today's world and is a method of implementing education that provides equal opportunities for all students, regardless of their physical, psychological, social or economic situation. Inclusive education is developing as a response to many of the challenges faced by modern society.

Inclusive education is a pedagogical approach aimed at creating a learning environment in which all students, regardless of their special educational needs, can receive a quality education and actively participate in the learning process.

The introduction of inclusive education has benefits for all participants in the educational process. When it comes to children with special educational needs, the following points can be noted: 1) targeted communication with peers improves children's cognitive, motor, language, social and emotional development; 2) peers play the role of models for children with special educational needs; 3) education is based on children's strengths, abilities and interests; 4) children have opportunities to establish friendly relationships with healthy peers and participate in public life (Софій, Сварник, & Троханіс, 2006).

As for other children, we include: 1) children learn to naturally accept and tolerate human differences; 2) children learn to establish and maintain friendships

with people who are different from them; 3) children learn to behave in a non-standard way, to be creative, and to have compassion for others.

When considering teachers and specialists, it should be noted that: 1) teachers of inclusive classes have a better understanding of the individual characteristics of students; 2) teachers master a variety of pedagogical methods, which enables them to effectively promote the development of children, taking into account their individuality; 3) specialists (doctors, special educators, other professionals) begin to perceive children more holistically and learn to look at life situations through the eyes of children (Колупаєва, 2008).

The real situation of inclusive education in Ukraine today is deplorable, primarily due to the lack of qualified staff and the unwillingness of schools to change or improve the qualifications of their employees. There are very few professionals with competencies in inclusive education. Mostly, these are representatives of education who have considerable experience and are ready to meet new challenges and needs of their time.

In order to overcome the shortcomings of the current state of inclusive education in general education institutions, researchers should focus primarily on the prospects that will open up for society in the case of successful implementation of an effective system of inclusive education, in particular: the prospect is that when the perception and attitude towards such children in society is changed, their successful adaptation and socialisation will take place; such people will have a chance for a full life, further education in educational institutions, and further training in the field of inclusive or special education (Сбруєва, 2004).

In general, it can be noted that at present such children are not eligible for higher education, as inclusive education according to the current legislation is valid from the 5th to the 9th grade of a general education institution. In the future, children from category 14 who have a sufficient level of knowledge can enter colleges, institutes and universities, but this is extremely rare, most of them stay at home under the supervision of their parents. Currently, the system of inclusive education in



Ukraine is in the process of development and implementation. The ideal construction of a truly effective system of such education still seems to have a long way to go. It also requires retraining or retraining of teachers and their adaptation to the inclusive education system. Curricula need to be modified or modernised to meet the needs of children with special educational needs. It is necessary to ensure that parents of children with special educational needs are aware of the possibility of this type of education, in order to generate their interest in the prospects for socialisation and adaptation of their children with their peers. It is necessary to equip the premises of educational institutions to meet the needs of special children. Inclusive education requires the creation of relaxation rooms where, if necessary, children with various psychophysical disabilities can rest during the learning process, because their education should be structured in such a way that such children have time to rest in order not to overload and overstrain them, but to work with them within their development and capabilities and with due regard for their peculiarities. These are the main reasons why inclusive education cannot be successfully implemented now and there are no promising opportunities for further development until they are addressed.

Thus, inclusive education is not only a fair and moral step, but also an investment in the future. It contributes to creating a society where every child has the opportunity to develop their potential and be part of a diverse and inclusive environment. Despite the challenges, inclusive education is a way to achieve a more just and harmonious world.

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**Oleinik A. O.**  
**RETROSPECTIVE REVIEW AND CURRENT TRENDS  
IN EDUCATION**

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Education is the process of acquiring the knowledge, skills, and abilities essential for life in society. The evolution of education is a lengthy and intricate journey shaped by various factors, including socio-economic conditions, political shifts, and cultural changes.

Educational practices have been present since ancient times. In early societies, education was informal, transmitted across generations through stories, songs, dances, and rituals. As agriculture and animal husbandry advanced, a more structured approach to education became necessary. In civilizations like ancient Egypt, Babylon, China, and India, the earliest schools emerged, focusing on instruction in reading, writing, arithmetic, and religion.

During the Middle Ages, the Church held significant influence over education. The primary educational institutions were monasteries, where subjects such as Latin, theology, history, and philosophy were taught. Additionally, universities began to emerge during this era, evolving into hubs for scientific research and advanced education.

The Renaissance witnessed notable advancements in education. The invention of the printing press increased access to books for a broader audience, facilitating the dissemination of knowledge to the general populace. Additionally, this era marked the rise of novel educational approaches, including vocational training and opportunities for women's education.

In the twentieth century, education was made mandatory for all children. This mandate resulted in the proliferation of schools and educators. Additionally, this era

witnessed substantial shifts in educational content, emphasizing the cultivation of students' personalities and fostering their creative abilities.

The history of education demonstrates its continual evolution and transformation. These changes are influenced by shifts in society, economic requirements, and technological advancements. In the twenty-first century, education further evolves under the impact of information technology (IT).

Information technologies have had a significant impact on the development of education, changing the forms and methods of teaching.

The initial efforts to integrate information technology into education began in the mid-twentieth century. During this era, the first computer-based learning programs were developed, and television and video recorders were utilized for distance learning.

Later, the impact of IT on education became even greater. This was due to the development of the Internet, which opened up access to a vast array of educational resources.

Today, IT is employed in education through various means:

- Online courses facilitate distance learning opportunities accessible over the Internet.
- Virtual laboratories provide digital representations of actual labs, enabling students to perform experiments without the need for a physical space.
- Mobile applications are educational apps designed for use on smartphones and tablets.
- Among the advantages of information technology compared to traditional teaching methods, some experts emphasize the following:
  - Individualization of learning - IT tailors learning to the unique needs of each child.
  - Flexibility of learning - IT provides students the opportunity to learn at any time and from any location.

– Effectiveness of learning - IT enhances learning outcomes by making the process more captivating and interactive.

Conversely, there is an abundance of information coupled with the swift obsolescence of knowledge. IT can contribute to this information overload, challenging students to discern pertinent information from the extraneous and concentrate on pivotal concepts. Given the rapid evolution of the information technology sector, technologies can become outdated in mere years. Consequently, the knowledge students acquire during their studies might be obsolete by the time they enter the workforce.

In the future, IT is poised to assume an even more pivotal role in education. Anticipations suggest that IT will foster innovative learning modalities that are adaptive, flexible, and efficient. Certain experts envision virtual environments where students can engage with educational resources and one another. Such platforms hold the potential to cultivate a more interactive and immersive learning experience.

Another promising area of IT advancements in education is the integration of artificial intelligence. The incorporation of AI holds the potential to customize learning experiences, assist students, and evaluate mastery of knowledge.

Thus, the analysis of the historical evolution of education and its current trajectory in the context of information technologies shows a dynamic and transformational movement forward. Education, as a process of acquiring knowledge, skills and abilities necessary for participation in society, has undergone significant changes in the prevailing social and economic conditions, with certain cultural transformations and technological progress.

Throughout history, education has adapted to the needs of societies, transitioning from informal practices in primitive societies to the establishment of formal schools in ancient civilizations. The invention of the printing press and societal shifts in the twentieth century were pivotal moments that propelled compulsory education and emphasized the development of individual personality and creative skills.

The integration of information technology in the twentieth century heralded a paradigm shift, with the Internet at its core reshaping teaching modalities and methodologies. Online courses, virtual laboratories, and mobile applications exemplify the current applications of IT in education.

While information technologies offer advantages like individualized learning, flexibility, and enhanced efficiency, they also present challenges such as information overload and swift knowledge obsolescence. The future of education is anticipated to be significantly influenced by IT, fostering the development of adaptive, flexible, and efficient learning experiences within virtual environments.

Given the aforementioned points, it can be concluded that modern technologies in education foster the cultivation of creative thinking and the ability to independently acquire knowledge, enabling individuals to navigate the rapid influx of information.

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**Pelypenko O. I.**

**THREATS AND CHALLENGES OF EDUCATION:  
EDUCATION AND ADAPTATION OF TEMPORARILY  
INTERNALLY DISPLACED PERSONS ABROAD**

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The education and adaptation of temporarily internally displaced persons abroad creates numerous threats and challenges for modern education.

In the Ukrainian language, the words "light", "dawn" and "education" are the same root and are very symbolically related. Just as dawn dispels physical darkness in the morning, so does education dispel spiritual darkness. And just as the future day begins with the dawn and experiences all the challenges of modern, turbulent life, so does education reflect all the challenges of society. Of course, for every person, especially today, in times of war, physiological needs are of paramount importance, because this is the natural essence of man. But what will happen to people if they stop caring about the spiritual, namely education?

When considering this topic, it should be noted that the education and adaptation of temporarily displaced persons abroad poses a significant challenge for educational systems and governments in host countries. Threats and challenges include the most important points such as: language barriers, as many displaced persons do not speak the language of the country they arrived in. This makes learning and adaptation more difficult, as they may have problems understanding and expressing themselves. The basis for this is the language barrier to mastering the educational programme in the host country. This is noted by most parents whose children are abroad. Children who do not know the language of the country of residence cannot receive education. That is, they have a double educational loss; secondly, children who study simultaneously in foreign schools and Ukrainian online schools, or have many additional classes, also face many problems. These children have fewer educational losses and this is a plus. While abroad, they join Ukrainian classes at their schools. But even the family form of education in a Ukrainian school creates an additional burden when it is already difficult for the child. Many are afraid of losing their place at their home school because their families dream of returning to Ukraine in a peaceful future. Unfortunately, no one knows when or how it will end. You have to catch up on your own when your child should be resting. The simultaneity of teaching in schools in Ukraine and abroad makes it almost impossible to synchronise learning processes. All these challenges lead to the fact that students may become exhausted or even lose motivation to study due to overload; thirdly,

inaccessibility of education, as in many cases displaced persons may have limited access to education due to bureaucratic barriers, financial constraints or lack of appropriate educational infrastructure; traumatic experiences, we understand that many displaced persons have experienced traumatic events such as war, violence or natural disasters. These experiences can affect their ability to learn and adapt; psychological problems are equally important. Displaced people may face psychological problems such as depression, anxiety and post-traumatic stress. This can affect their ability to learn, and then there is the issue of socio-cultural adjustment, as culture shock and uncertainty in the new environment can make it difficult for displaced people to adjust. Education should take these aspects into account and facilitate their socio-cultural integration; the need for an individualised approach is essential. Displaced persons may have different educational needs depending on their age, level of previous education and other factors. Education systems should provide an individualised approach to learning. It should be added here that the difference between the programmes of Ukraine and any other country is striking, and the programmes are not synchronised. In addition, children returning from abroad have not studied the Ukrainian language, literature or history of Ukraine for some time. There is also a problem with the assessment of students who have gone abroad and then returned. Schools have to re-calculate the academic achievements of children from other schools and countries. The Ministry of Education and Science believes that there are mechanisms for this, and schools can handle this on their own, but it would be better to have general and uniform recommendations for everyone. Financial constraints are something that many people face. Many displaced people may have financial constraints that make it difficult to access quality education. The availability of affordable educational programmes can be important for their adaptation. Availability of teachers and professionals - Education systems need to have sufficient teachers and professionals who are able to work with displaced people and provide them with the necessary support. Beliefs and stereotypes - here we need to pay attention to social stereotypes

and beliefs that can lead to discrimination and exclusion of displaced people, which affects their education and adaptation. And, of course, political instability, as political instability in the country leads to misunderstanding and unwillingness to provide educational services to displaced persons (Ніколаєв, Рій, & Шемелинець, 2023).

Of course, this is a far from complete list of problems. Many people's lives have changed dramatically. Accordingly, education should prepare students to act in a changing world. When it is said that teachers should pass on a certain amount of knowledge and skills from generation to generation, a static picture emerges. As if a person's goal is a fixed house to which he or she must go, and education helps to find this path. However, modern education should prepare a person, to use a metaphor, to shoot at dynamic targets.

Therefore, to address these challenges, it is important to develop a comprehensive approach to the education of displaced people that takes into account their unique needs and helps them successfully adapt to their new environment. All of these aspects require cooperation between educational institutions, governments, non-profit organisations and civil society organisations to ensure the successful adaptation of displaced people abroad through education.

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**Plakhotniuk I. M.**

**LEGISLATING LAND REFORM IN UKRAINE**

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Following the collapse of the Soviet Union in the early 1990s, newly independent Ukraine carried out a land reform designed to abolish the collective farm system and distribute land among the peasants, laying the foundation for the



development of a private economy. But in 2001, fearing the possible consequences of launching a land market, the Ukrainian parliament introduced a moratorium on the sale and purchase of agricultural land. The moratorium has been extended ten times since then, as the majority of the population do not support lifting it and the authorities are afraid to take this step. Currently, the government plans to introduce an agricultural land market – but only for Ukrainian citizens. In 2018, the European Court of Human Rights ruled that the moratorium violated the rights of landowners. Additionally, the International Monetary Fund has long required the introduction of an agricultural land market as a precondition to obtaining new loans. The only question is thus when the moratorium will be lifted – and most importantly, what the new rules will be.

The Zelensky government's planned reform only grants the right to purchase and sell land to Ukrainian citizens. The government seems to be protecting national resources from being captured by foreign corporations. Currently, companies with foreign capital cultivate only four percent of all agricultural land in Ukraine. Some parts of large and small agribusiness support the reform, while other sections are involved in organizing protests against it. The lifting of the moratorium may be one of the least popular moves by the new government, and other political forces are trying to exploit it to improve their own standing.

The opposition parties All-Ukrainian Union *Batkivshchyna* and Opposition Platform – *Za Zhyttia* opposed the opening of the land market, while European Solidarity led by former president Petro Poroshenko and their ideological fellow-travellers *Holos* favour delaying the moratorium decision. All these parties have members involved in agribusiness, but lobbying for their interests is often side-lined when parties need to win over the electorate during renewed protest waves. Thus, at the end of 2018 President Poroshenko called to lift the moratorium as fast as possible, but after moving to the opposition he now calls for delaying the decision. The far-right parties *Svoboda* and *National Corps* also play a significant role in protests

against the reform. The radical militant wing of the National Corps was involved in clashes with police during land protests.

In general, political attitudes towards the lifting of the moratorium can be characterized as situational. Understanding the volatility of the issue among voters, parties in opposition tend to slow down lifting the moratorium, but when they come to power (not least because of pressure from creditors) advocate for opening the land market. The land issue has long been a trigger for voters, similar to the language issue or that of national remembrance culture. Its roots lie in Ukrainian history, dating back to when survival depended on land ownership. Taken together with the political trajectory of the last two decades, today, the words “land sale” provoke a storm of emotions among various sections of the electorate. The topic is actively exploited by Ukrainian nationalists, who interpret the sale of land as a betrayal of national interests – a transfer of “national wealth” to foreigners.

The moratorium aimed to prevent the concentration of land in the hands of large agricultural holdings, but failed to do so. Despite the formal ban on sale and purchase, over the past two decades a remarkable concentration of land has taken place in Ukraine. This is because millions of landowners are unable to cultivate their land on their own, and thus rent it out at low prices—mainly to large agricultural holdings. There are no legal mechanisms for land demonopolization. There are dozens of agricultural holdings in Ukraine with land banks containing tens if not hundreds of thousands of hectares that heavily influence public policy. The ten largest agricultural companies own about 10 percent of agricultural land, while the top 100 own nearly one quarter (the same amount of land is owned by about four million small landowners).

The average size of an agribusiness in Ukraine is 1,058 hectares, while the equivalent figure in the EU is only 16.6 hectares. Many Ukrainian agricultural holdings cultivate hundreds of thousands of hectares. One of the largest oligarchs in grain production, Ukraine’s specialization, is the infamous Oleh Bakhmatyuk. Owing billions of dollars to private depositors of his banks, the Ukrainian national

budget, and even foreign investors, he also owns companies with acreage that would be considered massive even in the monopolized agricultural market of Ukraine. His company, Ukrlandfarming, holds a total of 570,000 hectares of land.

The second-largest player in Ukraine's agrarian market is the company Kernel, with 600,000 hectares of land. Kernel is controlled by Ukrainian oligarch Andriy Verevskyi, whose wealth is estimated to exceed one billion US dollars. Interestingly enough, this oligarch – who owns one of the largest agribusinesses in Eastern Europe – has been a member of four parliamentary assemblies for four different parties, and even served on the Committee on Agrarian Policy and Land Relations. Today that committee is headed by Mykola Solsky, founder of Ukrainian Agrarian Holding (which cultivates over 50,000 hectares).

Large agribusiness controls 60 percent of Ukrainian agricultural land, food markets, supply chains, and receives 60 percent of the government's agricultural subsidies. All this leaves farmer households with little opportunity for successful development. There are no viable mechanisms to protect small farmers in Ukraine, and intermediary business is substantially monopolized and criminalized. Agroholdings are interested in export-oriented monocultural production (primarily wheat, barley, and maize), exported mainly through offshore schemes. Offshore exports of wheat and maize alone resulted in a 1.5 billion dollar tax exemption for 2015–2017. Agroholdings avoid time- and labour-consuming food products like potatoes, vegetables, fruits, meat, and dairy.

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**Shamelyov V. O.**  
**POTENTIAL FOR ADVANCING SOCIAL PARTNERSHIP**  
**IN UKRAINE**

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Social partnership is considered as an important component of the formation of civil society under the conditions of market transformation. In countries with transition economies, social partnership is still in the developmental stage. Many social problems remain unsolved not only due to the lack of financial resources but also because of the absence of initiative and coordination among public institutions, authorities, and businesses. At the same time, establishing a dialogue platform and exploring cooperation opportunities are crucial for the development of social partnership and the determination of its forms. Effective social partnership is an essential element of labor market and social policy at the national, regional, sectoral, and microeconomic levels. On one hand, its development depends on various factors; on the other hand, it contributes to improvements in the social and economic situation, salary growth, reductions in unemployment and poverty, and enhancements in social policy legislation. Through the lens of implementing the social partnership mechanism, one can study the role of social and human capital, the degree of integration, societal development, and the level of corporate governance.

It should be noted that, as of today, the system of social partnership in Ukraine is not fully formed. The traditional reasons for its low efficiency include the underdevelopment of various elements of the social partnership system (such as legislative, organizational, social, and economic aspects) at both the state and regional levels. Additionally, the trade unions, as primary entities responsible for protecting the interests of workers, exhibit low efficiency. Collective agreements are often imperfect, failing to address all crucial aspects of socio-labor relations. Furthermore, employees often struggle to influence the formation of socially responsible behavior among employers. To achieve the outlined goals, methods should include legislative regulation to implement principles of social responsibility into the practices of domestic enterprises, the adoption of measures to motivate

employers to embrace responsible partnership principles at the micro level, the establishment of joint programs to monitor the development level of social partnership, and continuous communication to inform society about the results of organizational and enterprise activities based on these indicators..

Improving social partnership at the micro level extends beyond its organization within individual enterprises. The development of micro-level partnership is closely tied to changes in the system of social partnership at regional and national levels. In the modern stage of socio-economic development, social responsibility cannot be viewed solely as the responsibility of business entities, the state, or trade unions and employees. These categories are interrelated and complement each other. Consensus, achieved in many ways, relies on the socially responsible behavior of all partners in labor relationships and contributes to the further development and improvement of social partnership mechanisms. The formation of socially responsible behavior in the business environment is possible only with the support of the state and its active participation in addressing social issues.

Ukraine is striving to advance in the realm of social partnership. The country has been refining its legal framework to better incorporate social partnership, which encompasses laws on collective bargaining, trade unions, and workers' rights. Furthermore, Ukraine is undergoing labor market reforms aimed at enhancing social dialogue and fostering cooperation among various stakeholders, including trade unions and employers. Ukraine possesses the potential to cultivate industry-specific partnerships, facilitating collaborations in sectors like agriculture, manufacturing, and technology. Collaboration among governments, employers, and educational institutions can play a crucial role in fostering skills development initiatives. Such collaboration ensures that the workforce possesses the necessary skills to meet the demands of a rapidly evolving labor market.

The prospects for the development of social partnership in Ukraine are promising, given the increasing recognition of the importance of collaboration

among the government, business, and civil society in addressing social and economic challenges. Some of the key factors contributing to the potential for the development of social partnership in Ukraine include:

1. *Legal framework:* Ukraine has made significant progress in developing a legal framework for social partnership in decision-making processes.

2. *Civil society engagement:* Ukraine boasts a robust and active civil society, marked by a growing number of scientific, industrial associations, and community-based organizations addressing a wide array of social issues. This foundation provides a solid basis for social partnership and collaboration with authorities and businesses.

3. *Government commitment:* The Ukrainian government has demonstrated its commitment to fostering social partnership as a strategy for addressing social and economic challenges. This commitment encompasses initiatives aimed at engaging civil society and businesses in policy development and implementation.

4. *Business engagement:* Many businesses in Ukraine are increasingly recognizing the importance of corporate social responsibility and are seeking opportunities to collaborate with civil society and the government to address social issues.

5. *International support:* Ukraine has received support from international organizations and donors to strengthen social partnership and promote collaboration among different sectors of society.

Overall, the prospects for developing social partnerships in Ukraine are promising, but there are still challenges to address. These include building trust among different stakeholders, improving transparency and accountability, and ensuring that the benefits of social partnership are equitably distributed across society. With the consistent commitment and efforts of all interested parties, social partnership can play a significant role in addressing social and economic challenges in Ukraine.

The prospects for the development of social partnership in Ukraine's information technology sector are promising, given the country's significant growth in this area in recent years. In this context, social partnership refers to collaboration among the government, industry, and civil society to support the growth of the IT sector and ensure its benefits are realized by society as a whole.

One of the key factors determining the prospects for social partnership in Ukraine's IT sector is the government's recognition of the industry's importance for the country's economic development. The Ukrainian government has been actively promoting policies to bolster the IT sector's growth, including offering tax incentives for IT companies and launching initiatives to enhance the quality of education in IT-related fields.

At the same time, the IT industry in Ukraine has actively collaborated with civil society and educational institutions to foster the development of digital skills and offer opportunities for young individuals to join the sector. This encompasses initiatives like coding schools, hackathons, and mentorship programs, all of which contribute to cultivating a more diverse and skilled workforce in the IT sector.

Furthermore, there is a growing recognition among IT companies in Ukraine regarding the importance of corporate social responsibility and sustainable business practices. Many of these companies are actively participating in social partnership initiatives, such as supporting local communities, promoting environmental sustainability, and investing in education and training programs.

Given the aforementioned points, it can be stated that in Ukraine, several industry associations and organizations actively work to promote social partnership within the IT sector. They serve as a platform for dialogue among the government, industry, and civil society and advocate for policies that bolster the IT sector's growth and its beneficial impact on society.

Thus, social partnership is an important mechanism for fostering cooperation and addressing the interests of different stakeholders in the country.

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**Тkachenko V. R.**  
**ENERGY EFFICIENCY AND THERMAL COMFORT**  
**OF BUILDINGS OF HIGHER EDUCATION INSTITUTIONS**  
**IN UKRAINE**

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According to official information, the Ministry of Education and Science of Ukraine manages more than 2,500 educational buildings and more than 1,000 dormitories, most of which were built in the late nineteenth and during the twentieth centuries, with a total area of about 13 million m<sup>2</sup>, using equipment and materials that do not meet current energy efficiency requirements. This is one of the reasons for their high energy consumption. The above creates a challenge to improve the level of energy efficiency of higher education buildings.

Given the fact that most heating systems operate in the mode of heat supply due to the critical state of the energy infrastructure caused by constant attacks by enemy drones and missiles, the task of developing a system of integrated energy supply the task of developing a system of integrated energy supply for higher education buildings with using the latest energy storage systems, which will allow to ensure the maintenance of comfortable conditions for people in during the period of heating system shutdowns.

Due to the low level of energy efficiency in the public sector, it is necessary to conduct a structural analysis and develop a holistic model of energy saving



management in public institutions. To do this, it is necessary to study the mechanisms for managing and organizing energy saving activities, develop energy efficiency indicators for budgetary institutions, and assess their economic and environmental attractiveness in the current economic situation in Ukraine. Optimal management of energy consumption and energy saving processes in individual institutions and in the entire sector requires the development and improvement of scientific, technical and managerial methods (Cotton, Shiel, & Paco, 2016).

The Ministry of Education and Science of Ukraine is responsible for educational institutions and establishments of state and private ownership. Educational institutions include: pre-schools, general education schools, higher education institutions of I-II accreditation levels (colleges, technical schools, vocational education institutions), higher education institutions of III-IV accreditation levels (universities, institutes, academies).

Currently, it is difficult to estimate the exact number of operating educational institutions due to the constant consolidation of existing ones, the creation of hub educational institutions, etc. In addition, the assessment is complicated by the fact that an unknown number of educational institutions, both secondary and higher, were destroyed or damaged by the Russian military during the full-scale invasion in 2022, and the state of educational institutions in the temporarily occupied territories is also unknown. As of the beginning of the 2019/2020 academic year, the following figures were reported: 281 universities, academies, institutes, and 338 colleges, technical schools, and vocational schools. At the same time, compared to the 2014/2015 academic year, the number of universities, institutes, academies increased by 1.4%, while the number of technical schools, colleges and vocational schools decreased by 12.7%. All educational institutions, without exception, are subordinated to the MES in the development of curricula, methodological plans, etc. The majority of higher education institutions of all accreditation levels are financially subordinated to the MES, while pre-school and general education institutions are subordinated to local or district administrations, which finance the activities of educational institutions.

An analysis of the facilities under the jurisdiction of the Ministry of Education and Science conducted by the authors of the article (Deshko & Shevchenko, 2011) showed that approximately 50 per cent were built before 1970, 20 per cent in 1970-1980, 25 per cent in 1980-1996, and 5 per cent were commissioned after 2007.

That is, the existing stock of buildings of higher education institutions was formed in the Soviet years, when the main task was to save initial costs, and operational energy costs were used as secondary indicators in calculating the final efficiency. Changes in the technological conditions of building heating caused by funding constraints and rising energy costs lead to uncomfortable conditions in buildings - low air temperatures and high humidity. Due to such circumstances and taking into account the peculiarities of higher education institutions, where people are supposed to stay indoors all the time, it is important to take into account two conditions simultaneously when striving to save energy resources: energy efficiency and comfortable living conditions (Fareniuk, 2009).

An analysis of monetary expenditures on energy resources in recent years reveals that costs are growing every year, and the share of expenditures on heating services is also increasing. This is due to two main factors. Firstly, the growth of tariffs, and secondly, given the similarity of climatic conditions during the period under review, this is influenced by the deterioration of the building stock of higher education institutions. This requires taking measures to thermally modernize buildings and improve their energy efficiency to meet the established regulatory requirements.

A comparison of heat consumption by universities in European countries and Ukraine, taking into account modern standards and research into the actual condition of buildings and the material and technical base of domestic educational institutions leads to the conclusion that most premises do not meet comfort requirements. The reasons for unsatisfactory comfort conditions include insufficient thermal insulation properties of the building envelope due to the age of the buildings and untimely heat supply by energy supply companies.

Most residential and public buildings, including those of higher education institutions, were constructed before the adoption of modern energy efficiency standards. At the time of their construction, energy standards were not as stringent because building materials were expensive and fossil hydrocarbon fuels were cheap and readily available. However, in today's context, these buildings require so much energy to provide comfortable indoor conditions that it puts a significant strain on the fuel and energy sector, and increases the requirements for improving the thermal resistance of the building envelope and the energy efficiency of buildings in general.

Building envelopes should be at a level not worse than those specified in Table 1.

*Table 1. – Thermal performance of residential and public building envelopes for the 1st and 2nd temperature zones of Ukraine*

№	Type of building envelope	Heat transfer resistance, m <sup>2</sup> ·grad/W		Heat transfer coefficient, W/m <sup>2</sup> ·grad	
		I	II	I	II
1	External walls	4.00	3.50	0.25	0.29
2	Combined floors	7.00	6.00	0.14	0.17
3	a) floors over a cold basement	5.00	4.00	0.20	0.25
	b) overlapping of heat-insulated unheated technical surfaces (attics)	6.00	5.50	0.17	0.18
4	Entrance doors	0.70	0.60	1.43	1.67
5	Windows, balcony doors, translucent facades	0.90	0.70	1.11	1.43

Obviously, for the reasons mentioned above, most buildings of higher education institutions do not meet these requirements. For example, the authors of the article (Panasiuk, Yeshchenko, & Shovkaliuk, 2020), while researching the educational and administrative building of one of the universities in Kyiv, found that the existing heat transfer resistance of walls and windows does not meet modern thermal protection requirements. In addition, they identified other problems such as the inefficiency of the existing heating system, the inadequacy of the microclimate conditions in the building, and the use of electricity for space heating. Given that the majority of universities were built around the same time using standard or similar

designs, a similar situation is observed in all educational institutions across the country.

Rising energy costs and increased heating costs necessitate the implementation of effective energy saving and thermal modernization measures. It is necessary to develop an integrated energy supply system, including the use of modern energy storage systems, to ensure comfortable conditions during periods of heating system shutdowns and power outages.

The buildings of higher education institutions need urgent thermal modernization, including improved insulation and the use of modern energy saving technologies and energy management systems.

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**Zhuha A. S.**  
**PANDEMIC AND EDUCATION:  
CHALLENGES AND NEW APPROACHES TO LEARNING**  
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Education is the process of acquiring knowledge, skills, values and developing intellectual and socio-cultural competences. It plays an important role in the development of individuals and society, enabling individuals to understand the world around them, make informed decisions, develop their potential and contribute to society. Education can take many forms, including formal education (studying at schools and universities), non-formal education (self-study, courses, seminars) and informal education (learning in the workplace, at home, etc.). Education contributes to personal and social development, improves the quality of life, and helps to preserve and transmit cultural values and knowledge to future generations.

The transition to distance learning due to the spread of the COVID-19 virus has had a negative impact on the quality and accessibility of education. At the beginning of the pandemic, approximately 90% of schools around the world were quarantined. In the spring of 2020, all Ukrainian educational institutions switched to distance learning. After some time, Ukraine introduced an "adaptive quarantine", which involved dividing the country into epidemiological security zones: "Green, Yellow, Orange, and Red. Accordingly, general secondary education institutions were constantly switching from distance to blended learning and vice versa, while higher education institutions mostly remained in distance learning.

The 2020-2021 academic year began under adaptive quarantine. Educational institutions located in the "red zones" studied remotely. Meanwhile, in the yellow and orange zones, individual schools and classes were quarantined. Higher education institutions were offered distance learning or blended learning. In addition, educational institutions were issued instructions on sanitary and epidemiological standards, including social distancing, monitoring of student learning, and the use of personal protective equipment such as masks and antiseptics. It is emphasized that the main means of hygiene is primarily handwashing, not the use of antiseptics.

According to the WHO recommendation, children from 6 to 11 years old should wear masks, taking into account factors such as the level of morbidity of the environment where they are, and awareness of how to wear them correctly should be the responsibility of parents and adults. From the age of 12, children can wear masks on an equal footing with adults.

UNICEF has stressed that teachers should be a priority group for vaccination due to the impact of the pandemic on the quality of education. Priority vaccination of teachers is needed to ensure that schools do not switch to distance learning during new outbreaks. Students could also be vaccinated, but only with parental permission.

In the context of the pandemic, pupils, students, teachers and lecturers may experience mental health problems: increased anxiety, depression, stress, fear. It can be said that due to the closure of schools and the transition to distance learning, children and adolescents spend more time in isolation, do not see their friends, spend less time outside, and experience a deterioration in their psychological state. For example, one of the most common problems with distance learning was the difficulty in focusing on learning. At the national level, recommendations have been made on how educational institutions can provide psychological support to pupils, students and teachers. UNICEF has also provided advice to parents on how to support their children during distance learning. The psychological state of teachers has also deteriorated during the pandemic due to stress and difficulty in adapting to online learning through various educational platforms.

Thus, the main problem often associated with distance learning is digital inequality. This means that not all schoolchildren and students have equal access to the technical capabilities that have become essential for distance learning. For example, villages are almost twice as likely to have an Internet connection as large cities. This means that students living in rural areas have less or no access to learning. The same problem affects students (Биков, 2008).

Another technical problem is the provision of technical equipment. According to the survey, most children used smartphones during distance learning, which also

had a negative impact on teachers' eyesight. That is why children had to share other technical devices with their parents - laptops, computers or tablets. The lack of previous experience in teaching also affected the students. The same problem affected students. Due to the lack of previous experience, some teachers assigned written work and independent study instead of distance learning.

Teachers and lecturers also had technical problems, both with the not always high-quality Internet and with the lack of technical means for teaching. However, an equally serious problem was the lack of experience in teaching remotely. It was unclear how to organize online learning, assign tasks and assess responses.

Thus, the COVID-19 pandemic has had a significant impact on the education system and has forced educational institutions and teachers to look for new approaches to learning. These changes include the following new approaches that have become relevant in the context of the pandemic and education:

**Distance learning:** One of the main responses to the pandemic has been the need to move quickly to distance learning. Teachers and students have learnt to use video conferencing, online platforms and other tools to deliver lessons and learn from a distance.

**Hybrid models:** Many educational institutions have combined distance and face-to-face learning to provide greater flexibility and security for students and teachers. Hybrid approaches may include alternating between classroom meetings and remote lessons.

**Online resources:** Online learning resources, such as video tutorials, interactive platforms and webinars, have become increasingly popular. This gives students access to a wide range of educational materials.

**Balanced curriculum:** Teachers have begun to consider ways to reduce the teaching load and improve the quality of learning. It is important to balance the amount of homework and learning effort to avoid excessive stress for students.

Communication tools: Teachers and students have learned to use a variety of communication tools to support collaboration and communication. This includes email, chat rooms, forums and social media.

Curriculum development: Teachers were forced to adapt their curricula for distance learning. This required creating digital versions of teaching materials and changing teaching methods.

Student support: It was important to provide psychological and social support for students as the pandemic led to stress and isolation. Schools and universities have begun to actively work on psychological assistance and counselling.

These new approaches to learning have been important in the response to the pandemic, and some of them may remain relevant in the future as a means of improving the educational process.

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**Zui V. A.**

### **GLOBAL CHALLENGES IN MODERN EDUCATION: HOW TO PREPARE FOR CHANGE**

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Global challenges in modern education include a number of trends and obstacles that require adaptation and innovation.

Education has always been an important tool for societal development and individual success. However, in today's world, where changes are occurring at an extraordinary rate, global challenges present education with new challenges and opportunities.



Outdated school models, approaches to students and traditional teaching methods are no longer in line with modern technologies. That is why we need to focus our efforts to meet the demands of a changing world. One of the most important global challenges in modern education is technological progress. The digital revolution and the widespread use of information technology have changed the way we learn and created a need for new skills. Knowledge of computer science and digital literacy has become essential for successful functioning in the modern world. To prepare for this challenge, educational institutions must provide students with opportunities to learn about technology and develop skills in working with it.

In today's environment, technology has become the dominant characteristic of human activity, meaning a transition to a qualitatively new level of efficiency and optimality. The educational policy of countries focuses on the development of the individual, his or her qualities, talents and abilities. The technological approach characterizes the focus of pedagogical research on optimizing and improving learning activities, increasing their effectiveness, instrumentality and intensity. The technology of pedagogical activity takes into account objective didactic laws and thus ensures that the result of activity meets the previously set goals in specific conditions.

Among the main ways of setting goals that take place in the practice of teaching are the following: setting goals through the analysis of the main components of the content of the educational material; setting goals through the teacher's activities; setting goals through the internal processes of personal, intellectual, emotional development of students; setting goals through the learning activities of students.

Another global challenge is globalization. The world is becoming more and more connected, and this requires education to prepare students for international communication and work in different cultural environments. Language skills, intercultural competence and understanding of global issues are becoming key elements of education in the context of globalization.

The political aspect of globalization's impact on the development of education is determined by the spread of neoliberalism ideas to the educational policy of a large number of states, which has such manifestations as the erosion of the sovereignty of the national state and the fullness of its powers in the field of educational policy, increased influence on the educational policy of international organizations; denationalization of the educational sphere, privatization of educational services; transformation of forms of control in the educational sphere: from political and administrative control to market and consumer control (Левітін, 2020).

Taken together, the political and cultural aspects of globalization's impact on the development of education allow us to speak about the emergence of the phenomenon of education globalization, which is the process of convergence of the fundamental principles of educational policy of national states in a number of parameters, primarily such as goals and strategies for the development of education, the content of education, methods and criteria for assessing the effectiveness of educational systems, etc.

Another important challenge is the changing nature of jobs and the labor market. Rapid changes in technology may lead to the automation of some jobs, so it is important to prepare students for the labor market of the future. Education should foster creativity, critical thinking, and skills that are difficult to automate, such as leadership and collaboration.

The need for the comprehensive development of the younger generation is driven by the social need for new types of thinking and new ways of transforming reality.

Pedagogical practice requires the creation of a relatively simple and at the same time maximally universal toolkit for the personal and professional development of students. This toolkit should reveal the structure of this development and its dynamics in innovative teaching technologies, in modeling the educational environment itself. In this context, the main components of education should be

reviewed: content, forms, methods, teaching technologies, methodological support (including textbooks), and teacher functions.

In addition, cooperation between educational institutions, industry organizations, and governments can help to adapt education to global challenges. Joint programmes, internships, and research projects can help students gain practical experience and connections in their chosen field.

In order to prepare for these global challenges, first and foremost, education systems need to be flexible and open to innovation. It is important to introduce relevant subjects into curricula and support lifelong learning. It is important for students to develop independent learning and critical thinking skills.

We need to be creative, especially during martial law in the country. In distance learning, you need to put in a lot of effort to obtain information that will help you become a professional in your field.

In general, global challenges in modern education require reforms and adaptation. Education needs to be more flexible, relevant and focused on developing skills that will help students withstand the complexities of the modern world.

Thus, global challenges in modern education create unique opportunities and demands for educational institutions, teachers, students and parents. To prepare for these changes and ensure quality education for the younger generation, it is necessary to take into account current global trends and develop strategies that promote adaptation and innovation.

This means abandoning static teaching and learning methods and instead focusing on developing the skills of the future, which include critical thinking, creativity, digital literacy and problem-solving. Educational institutions should be flexible, ready for change and provide access to modern technologies.

At the same time, it is important to take into account intercultural competence, develop skills for cross-sectoral partnerships and support lifelong learning. Global challenges can be addressed if educational institutions, teachers and parents work together to develop and implement new strategies and approaches to education.

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Наукове видання СТУДЕНТСТВО. НАУКА. ІНОЗЕМНА МОВА

Збірник наукових праць

Випуск 16

Частина 1

АРХІТЕКТУРА ТА БУДІВНИЦТВО  
ГУМАНІТАРНІ НАУКИ  
ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ  
ЕКОНОМІЧНІ НАУКИ  
ПРИРОДНИЧІ НАУКИ  
СУСПІЛЬНІ НАУКИ

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