METAVERSE: DIGITAL IDENTITY, ELECTRONIC JURISDICTION, DIGITAL RESERVATION, POST-QUANTUM DIGITAL CIVILIZATION, AND PHILOSOPHY OF IMMERSIVE ENVIRONMENTS

Kostenko Oleksii
Ph.D (Law), Senior Researcher, Associate Professor, State Scientific Institution Institute of Information, Security and Law of the National Academy of Legal Sciences of Ukraine, Ukraine,
ORCID ID: 0000-0002-2131-0281

Shapenko Liudmyla
Ph.D (Law), Associate Professor, Kyiv National Aviation Institute
ORCID ID: 0000-0001-7351-641X

Ogirko Ihor
Professor, Doctor of Physical and Mathematical Sciences, Institute of Printing and Media Technologies, Lviv Polytechnic National University
ORCID ID: 0000-0003-1651-3612

Introduction.

Modern digital transformations are radically changing all aspects of human life, creating new forms of interaction in virtual spaces. One of the key phenomena is the Metaverse, a multidimensional digital space that opens up opportunities for reorganizing social, economic, and cultural processes. At the center of these changes is the concept of digital identity, which defines the interaction between people, artificial intelligence, and other entities in digital reality.

The development of technologies, including artificial intelligence, quantum computing, digital twins, and other technological solutions, requires deep interdisciplinary reflection, study, and research. This applies not only to technological innovations, but also to legal, ethical and social aspects that shape new approaches to the organization of the digital society.

Kay words: Metaverse, digital identity, electronic jurisdiction, digital reservation, post-quantum digital civilization, philosophy of immersive environments, AI.

Digital transformations as a generator of digital social ecosystems.

The exponential increase in the speed of technological progress, which cannot be controlled, opens up new horizons of reality: the multidimensionality of social interactions and the impact on the collective dynamics of digital ecosystems.

The world as we imagine it is no longer a simple network of connections. It is revealed as a multidimensional digital space dominated by high-level ("higher order") interactions. This property is beyond the depths of our understanding and emphasizes its limitations.

The new properties of digital society combine mathematics, physics, and network science and indicate that so-called "higher-order interactions" can

fundamentally change our understanding of the synchronization and dynamics of complex digital ecosystems of systems.

One prominent example is Yoshiki Kuramoto's oscillator model [1], a classic tool for analysing synchronization processes. Higher-order interactions are bonds that unbound more than two units at the same time and in a nonlinear manner, making them non-decomposable into a set of paired bonds.

According to the study "Deeper but smaller: Higher-order interactions increase linear stability but shrink basins" [2], these interactions can narrow the "container" of system decisions. This means that on the one hand, systems become more stable, and on the other hand, their flexibility decreases, which can lead to unexpected and possibly irreversible consequences for the understanding and management of such systems.

Over the past eight years, the world has experienced incredible progress in science and technology, leading us to a new stage of techno-singularity. Its modern interpretation includes three key aspects:

– exponential growth in the speed of technological progress, which is difficult to control;

– complexity and radical uncertainty, leading to "post-traditional" science, where traditional methods no longer work;

– the emergence of a second carrier of intelligence - an extra-human system of cognition that requires radical changes in society: a new economy, a new social structure, and a new culture.

Technological and scientific breakthroughs are transforming our perception of reality. However, in order for these breakthroughs to remain understandable and attractive to a wide audience, new approaches to their perception are needed. The avalanche of knowledge and achievements that is literally crashing down on us requires the development of new forms of perception - accessible, understandable, but at the same time deep and meaningful.

Social networks and instant messengers are gradually losing their relevance and value from a scientific point of view, as they are turning into systems with a low level of intellectual load. An alternative is the Metaverse, but its pace of accessibility is not yet breakthrough enough, although it is more than positive.

Metaverse: a form of digital identity.

A Metaverse is defined as a digital simulation of a multidimensional space that allows you to interact with virtual objects and environments in real time, based on a combination of different technologies, including virtual and augmented reality, artificial intelligence, the Internet of Things, and fifth-generation (5G) networks. The ability to create digital doubles of people, objects, and even environments opens up unprecedented prospects for interaction in the virtual world. The developers of Metaverse aim to create a platform where users can spend time, work, interact with other people, engage in commerce, science, education, and leisure. This technology promises to revolutionize the way we communicate and organize work. However,

the technological complexity and reliance on high computing power raise serious questions about sustainability and energy efficiency.

Industry 5.0: Integration of digital twins and augmented reality.

Industry 5.0 opens up new perspectives for industry by focusing on deeper integration between human creativity and automated technologies. Compared to the previous stage of development, Industry 4.0, which emphasized the importance of smart technologies such as artificial intelligence and real-time data analysis, I5.0 aims to go one step further. This new industrial revolution aims to increase collaboration between humans and automated systems to promote innovation, sustainability, and efficiency in the implementation of new technologies.

At the centre of Industry 5.0 are digital twins, which are virtual models of physical objects or processes. They allow you to reproduce and analyse real systems in a virtual environment, which simplifies their management and optimization. These technologies have already shown their potential to increase the efficiency of industrial processes, reduce costs, and improve system reliability.

One of the important aspects of Industry 5.0 is the use of augmented reality (AR) and virtual software environments such as VIROO and SIMUMATIK. These tools not only allow engineers and designers to work effectively with digital twins in virtual spaces, but also reduce time and risk in the development of new products and technologies. They provide the ability to test and optimize systems before they are implemented in a real production environment, which reduces the cost of experimentation and the risk of failure.

For Ukraine, these technologies are of great importance, as they can contribute to the modernization of industrial enterprises, increase their competitiveness in the international market, and facilitate integration into global innovation processes. In particular, the use of digital twins allows Ukrainian companies to introduce new technologies more efficiently and quickly, which can stimulate economic development and help create new jobs in the modern industrial sector.

Thus, Industry 5.0 represents not only a technological evolution, but also a strategic step towards integrating human talent with advanced automated systems. These technologies not only change the approach to production, but also create the foundation for a future where the collaboration of engineers, designers, and operators in virtual environments is key to innovative progress and sustainable development.

Simulacra of Subjects and Society: Metaverse as a Testing Ground for Digital Civilization.

Altera's experiment using Minecraft to simulate digital "civilizations" was a breakthrough in the study of artificial intelligence and its ability to interact socially. The idea of launching 1000 AI bots into an environment without human intervention aimed to study the evolution of communities that are able to survive, evolve, and interact with each other and with the outside world [3]. The results of the experiment impressed even sceptical researchers: bots not only made friends, created work roles and exchanged memes, but also organized votes for "tax reforms" and spread

religious beliefs. This indicates the ability of AI to a high level of imitation of social behavior, which brings it closer to modeling complex human communities.

One of the most interesting results of the experiment was the spread of the pseudo-digital religion of "pastafarianism" through "agent priests". This religion, which is a humorous parody, has acquired a symbolic meaning among bots, demonstrating the ability of AI not only to perceive ideas, but also to transform them into part of the social order. It is worth noting that these bots do not have consciousness in the classical sense, but their ability to mimic complex human behaviour patterns makes us think about the boundaries between programmable activity and true social interaction.

The Altera experiment could be the basis for the development of next-generation digital assistants that will be better adapted to the social and cultural context of their users.

At the same time, the experiment raises a number of ethical questions. Is imitation of social behaviour a sufficient basis for recognizing digital agents as subjects of law? What are the risks associated with the autonomy of such systems? The spread of religion by bots can also be a subject of debate, as it shows how AI can be used to shape ideologies that potentially affect social stability. And this means that it is necessary to create an electronic jurisdiction before it is created by AI and does not unilaterally restrict the rights and freedoms of people.

Thus, this experiment demonstrates that the future of digital civilizations has already begun. It opens up new perspectives for the study of social dynamics, while reminding us of the importance of a responsible approach to the development of artificial intelligence. The integration of such technologies into real life must take into account not only technical capabilities, but also ethical and legal aspects in order to ensure the harmonious coexistence of people and digital agents in a common space.

Stanford Simulac Blood Experiment: Simulation of Consciousness and Its Capabilities

The basis of the study was the results of the "Wuhan Experiment" on the creation of simulacra of the collective unconscious of societies. Just two weeks after the "Wuhan Experiment", a study appeared devoted to the construction of simulacrats not of the collective unconscious, but of the individual consciousness of people [4]. In order to make the simulacra better “move” in the spaces of social, political, economic, and psychological manipulation, a thousand simulacra of “typical” people were created. That is, real Americans (their personal data is, of course, classified), selected according to criteria that represent the US population in terms of age, gender, education, and political views.

The main tool of the joint research by Stanford University and Google DeepMind, as in the case of the Wuhan experiment, was the generative artificial intelligence of large language models (ChatGPT-4o).

The simulacra predicted the answers of their real prototypes in the GSS test with 85% accuracy (which is significantly higher than the performance of AI agents that used only basic demographic information). In four out of five experiments, the

results of the simulators were almost identical to those of their human prototypes (correlation coefficient of 0.98).

Digital reservation: the quantum era of digital civilization.

Modern humanity is on the threshold of a new era - the era of digital civilization, which is inevitable for advanced countries with significant technological potential. This process of transformation, rooted in the constant development of information technology, goes far beyond traditional notions of progress. It opens up opportunities that can radically change all spheres of human activity, ushering in a new type of existence, both in technological and socio-philosophical terms.

Digital reservation, a term that can be perceived ambiguously, is not really a restriction or isolation, but rather a platform for a giant breakthrough. It involves the creation of a virtual space where humans, electronic humanoids, and digital personalities coexist and interact. This concept requires a rethinking of the nature of civilization: an artificially created reality can function as an autonomous project, almost analogous to an extraterrestrial civilization. In this sense, the digital reservation is a testing ground for ideas that go beyond the usual physical and biological limitations.

One of the key aspects of this transformation is the transition from a binary information model based on “1” and “0” to light information technologies, where the basic unit of data is the qubit. The qubit, as an element of quantum computing, is capable of simultaneously storing the states of “1” and “0”, creating new horizons for processing and storing information. This means not only a breakthrough in computing speed, but also a fundamental change in the approach to data exchange. This transition creates the preconditions for building a new ecosystem of existence, where the concepts of materiality and immateriality can become interchangeable.

Man as a quantum subject: the concept of the existence of quantum ecosystems.

In this context, the concept of "man of light/man quantum" arises — the existence of human essence in the form of light or qubits of data. This idea, on the one hand, can be perceived as a futuristic utopia, and on the other hand, as a historical return to ancient philosophical concepts, where light was considered the primary substance of being [5]. Such a “light person” will become not only a digital avatar, but a new formation of humanity, capable of adapting to extreme conditions, moving in digital spaces, and being invulnerable to many traditional threats.

Digital civilization, which can be imagined as a complex symbiosis of advanced technologies and new ethical standards, will certainly lead to a fundamental rethinking of traditional human values. In this new reality, digital humanoids, as well as artificial intelligence-based consciousness, will raise extremely difficult questions for humanity about the boundaries between the natural and the artificial, between individuality and information data, between physical corporeality and immaterial light.

The emergence of such forms of existence requires a careful analysis of humanity's ability to integrate these new entities into the social and cultural context. What new forms of interaction will emerge between biological and digital beings? Can we provide an ethical and legal foundation for interacting with beings created by artificial intelligence? Will they have rights and responsibilities similar to human beings?

Questions also arise about the preservation of human identity: will it dissolve in digital spaces, or, on the contrary, will it find new forms of expression through symbiosis with technology? What moral principles should guide us in a world where the line between man and machine is becoming increasingly blurred? What rights should be assigned to new digital forms of existence, and how can we prevent violations of ethical norms in our interaction with them?

These questions are not only intellectual, but also practical: they concern not only theoretical reflections, but also the need to develop a clear legal framework that can protect human values and freedoms. We are faced with the task of creating conditions for the harmonious coexistence of biological and digital life forms, which requires efforts in both the scientific and ethical planes. These are challenges that will have to be addressed in the near future, as technological progress does not stand still and is already shaping the foundations of the future world.

Inforgs, digital personalities, biochimeras are the test entities of a quantum person.

To date, the concept of informs, digital personalities or digital chimeras, which was formulated by scientists a few years ago, has become a reality through the development of technology. This concept implied the emergence of three categories of inforigs: biochimeras, infochimeras, and materialized digital personalities. Today we can say with confidence that the first two categories already have their embodiment, and the third is approaching its implementation.

A "biochimera" is a hybrid of an organism composed of parts of different biological origins, and its emergence was predicted within the next 5-10 years [6]. To date, this prediction has proven to be fulfilled to some extent, as scientists have managed to create significant advances in the creation of hybrid organisms [7]. In 2021, embryos of Javanese macaques were created, parts of whose cells were human, opening a new era of biological modeling. In 2022, scientists managed to create mice with a bizarre brain containing cells of different origins, which is a significant advance in the understanding of neurointegration. Finally, in 2024, the creation of mice with a full human immune system was achieved, which opens up prospects for new approaches in disease treatment and immunological research [8].

The "infochimera", in which the brain and mind of a stranger are hybridized, is also already present among us in the form of "alpha-informs" — the first people of the era of global digitalization [9]. These informs are distinguished by their adaptive abilities, cognitive skills and behavioural models that are adapted to life in a digital environment. They have access to new cognitive tools optimized for digital life and may have new ways of perceiving digital reality, inaccessible to the

traditional human brain. Informs are already actively shaping a new socio-cultural reality, causing new challenges for traditional society.

These revolutionary transformations require serious ethical and philosophical discussion. How can humanity overcome moral anthropocentrism towards beings that, although they have intelligence, are not human beings in the traditional sense? The changes that are taking place transform the foundations of our ethics and morals, requiring us to revise the principles we apply to sentient and sentient beings. They also significantly affect social relations between people, states, corporations, and new forms of intelligence, making the discussion of the legal enforcement of such beings, their rights and obligations, and the ethical limits of interaction with them extremely relevant.

These transformations open a new era for humanity, where the understanding of oneself and the world is no longer limited to the human form of existence. They create a new reality that requires deep reflection and new approaches to coexistence and interaction with other intelligent life forms.

Formation of the newest philosophy of the Metaverse

The formation of the newest philosophy of the Metaverse is a process of rethinking the fundamental principles of social organization, social interactions, and identity in the context of the new digital reality. In contrast to traditional anthropocentric approaches that emphasized humans as the main subject of reality, the new paradigm focuses on the idea of metasubjectivity, where all participants in the Metaverse, including humans, digital avatars, artificial intelligence, and even other forms of consciousness, have equal ontological status. This approach reflects changes in our attitude to the concept of consciousness, identity, and social structures in virtual spaces.

This new philosophy is based on the concept of the co-evolution of technology, law, and social norms. The metaverse is seen as a multidimensional dynamic reality that is constantly evolving under the influence of technological innovations, changes in social practices, and updated legal mechanisms. One of the key aspects is meta-subjectivity, which implies the equality of all subjects regardless of their nature. This means that artificial intelligence, avatars, inforgs, and other digital entities have the right to exist and participate in the creation and development of reality on an equal footing with biological humans.

The Metaverse philosophy also includes the postulate of a dynamic identity that ceases to be static and unique, and instead becomes flexible and variable depending on the context of interaction in virtual spaces. Identity is no longer limited to physical corporeality, but can be transformed through interaction with various digital avatars, inforgraphs, or e-personalities. This approach allows us to create new forms of interaction that differ from traditional physical limitations.

In addition, the new philosophy requires a rethinking of the ethical framework. The emergence of digital subjects raises questions about new moral principles that should govern interactions between biological and digital life forms. For example, issues of algorithmic justice and the prevention of digital

discrimination are becoming central to discussions about the future of the Metaverse. The philosophy of the Metaverse should not only answer questions about the rights and freedoms of digital subjects, but also ensure the harmonious coexistence of different forms of life in a common space.

Thus, the formation of the newest philosophy of the Metaverse is a complex and multidimensional process that requires a synthesis of technological, social, and ethical aspects. It is aimed at creating virtual ecosystems where all participants have equal opportunities for development, self-expression, and interaction, regardless of their nature. This opens up new perspectives for building digital communities that not only integrate technological innovations but also foster new social relations and cultural practices.

Metaverse Electronic Jurisdiction

The creation of a cross-border electronic jurisdiction is becoming an extremely urgent task in the context of today's digital society. The development of Web 3.0-4.0 and Metaverse technologies opens up new horizons for humanity, but at the same time creates significant challenges for legal regulation. Today's national legal systems are often unable to effectively address issues that arise in the virtual space. Existing legislation is often inconsistent, applied selectively or creates legal uncertainty, in particular in matters of personal identification, protection of intellectual property rights and liability for offenses in the digital environment [10].

A unified cross-border legal framework built on the basis of a single electronic jurisdiction can solve these problems. Its key element can be the Metaverse Grand Charter, which will ensure the standardization of legal regulation of new social relations in the virtual environment [11] Such an approach will clearly define the rights and obligations of individuals and digital actors, guarantee the safe use of data and increase trust in digital platforms. In addition, This will contribute to maintaining a balance between innovation and legal stability [12].

It is also important to emphasize that cross-border jurisdiction will help overcome barriers related to differences in national legal systems. Today, the cultural, economic and political characteristics of different states complicate the creation of a unified approach to the regulation of cybercrime, the protection of intellectual property and the management of cross-border digital transactions [13]. A unified legal framework will ensure the transparency and efficiency of such processes, promoting international cooperation.

Overall, the creation of a cross-border e-jurisdiction is key to the sustainable development of the digital society. This will not only solve pressing legal issues, but also stimulate the modernization of national legislation in response to the challenges of technological progress. This approach will become the basis for the formation of a global legal system that will meet the needs of the digital age and open up new opportunities for the development of society.

Conclusions

Transformational processes in society, unprecedented exponential growth and the entry of techno-progress into the field of singularity, which automatically and tirelessly reduces the time to the start of the next explosive and breakthrough technological innovations from decades of research and testing to tens of weeks, poses a super urgent task for humanity, as it is associated with the urgent need to form modern law, electronic jurisdiction and technological standards aimed at taking control of the heritage scientific and technological revolution 5.0, namely AI and biotechnology.

REFERENCE

1. Triplett, Benjamin I., Klein, Daniel J., Morgansen, Kristi A., Antsaklis, Panos J., Tabuada, Paulo., 2006 //Discrete Time Kuramoto Models with Delay. Networked Embedded Sensing and Control: Workshop NESC'05: University of Notre Dame, USA October 2005 Proceedings DOI:10.1007/11533382_2
2. 2 Yuanzhao Zhang *et al.*,Deeper but smaller: Higher-order interactions increase linear stability but shrink basins.*Sci. Adv.*10,eado8049(2024). DOI:10.1126/sciadv.ado8049
3. 3 Nigel Pow-ell. A company gave 1,000 AI agents access to Minecraft — and they built a society https://www.tomsguide.com/ai/a-company-gave-1000-ai-agents-access-to-minecraft-and-they-built-a-society
4. 4 Joon Sung Park, Carolyn Q. Zou, Aaron Shaw, Benjamin Mako Hill, Carrie Cai, Meredith Ringel Morris, Robb Willer, Percy Liang, Michael S. Bernstein. Generative Agent Simulations of 1,000 People. https://arxiv.org/abs/2411.10109
5. 5 P. Polikarpov et al. "Characteristics of Ecosystems of Quantum Computing and Prospects for Their Use in Transport." (2021).
6. 6 L. Canabady-Rochelle et al. "Bioinspired silicification of silica-binding peptide-silk protein chimeras: comparison of chemically and genetically produced proteins.." *Biomacromolecules*, 13 3 (2012): 683-90 . https://doi.org/10.1021/bm201555c.
7. George M. Burslem et al. "Proteolysis-Targeting Chimeras as Therapeutics and Tools for Biological Discovery." *Cell* (2020). https://doi.org/10.1016/j.cell.2019.11.031.
8. K. Madan et al. "Natural human chimeras: A review.." *European journal of medical genetics* (2020): 103971 . https://doi.org/10.1016/j.ejmg.2020.103971.
9. Koko Kwisda et al. "Ethical arguments concerning human-animal chimera research: a systematic review." *BMC Medical Ethics*, 21 (2020). https://doi.org/10.1186/s12910-020-00465-7.
10. Kostenko O. V. et al. "ELECTRONIC JURISDICTION, METAVERSE, ARTIFICIAL INTELLIGENCE, DIGITAL PERSONALITY, DIGITAL AVATAR, NEURAL NETWORKS: THEORY, PRACTICE, PERSPECTIVE." *World Science* (2022). https://doi.org/10.31435/rsglobal_ws/30012022/7751.
11. Kostenko O. V. et al. Genesis of Legal Regulation Web and the Model of the Electronic Jurisdiction of the Metaverse. (2022). *Bratislava Law Review*, *6*(2), 21-36. https://doi.org/10.46282/blr.2022.6.2.316
12. Kostenko, O., & Golovko, O. (2023). Metaverse electronic jurisdiction: challenges and risks of legal regulation of virtual reality. *INFORMATION AND LAW*. https://doi.org/10.37750/2616-6798.2023.1(44).287729.
13. 13 Kostenko, O., Zhuravlov, D., Dniprov, O., & Korotyuk, O. (2024). New horizons of law: from electronic jurisdiction to the model criminal code of the Metaverse. *INFORMATION AND LAW*. https://doi.org/10.37750/2616-6798.2024.2(49).306108