



Figure 2 – Screen file illustrating a game session to assess the situation in Donbass

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INNOVATION - METHODOLOGICAL INTEGRITY OF REQUIREMENTS FROM THE ARCHITECTONICS OF THE SOCIOTECHNICAL FUTURE

1. Innovation - a crisis of perception and terminology

Innovation is one of the first topics to come to the attention of both aspiring researchers and academics with degrees in economics and technology. In addition, innovations are included in the zone of interests of corporations and states, which are obliged to operate with this term in their policies. But paradoxically, the essential awareness of innovation is still extremely vague and far from perfect - the number of publications does not translate into an increase in the quality of understanding of the phenomenon in question.

«Guidelines for Collecting and Interpreting Innovation Data» (The Oslo Manual) for more than 30 leading countries of the world (except China) since 1992 defines the content of the term innovation. In the latest edition (fourth edition, 2018), innovation is «new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and has been made available to potential users (product) or brought into use by the unit (process)».

The criterion of novelty as “improvement” is simplified to a primitive one - a minor change (for example, painting) of a minor subsystem can already formally be

considered an innovation, which does not correspond to the essence. In the public space there is already a rapid devaluation of the term to the level of media clichés - "innovative face cream", etc. At the same time, technological innovations, with which the era of Schumpeter's innovations began, were excluded from use on dubious grounds - "to expand" innovation to the service sector, which is supposedly not characterized by manufacturability, which is an inadequate substitution of meanings. This finally emasculates the essence of innovation as objectively measurable productive innovations that can form the basis of scientific and technological progress.

Despite the methodological errors, the national copies the term "innovation" in the interpretation of Oslo (as Russia did). Despite this, some countries do without an officially approved interpretation altogether, but achieve significant innovative results (as China did).

1.1 Failure of innovation

The description of innovative processes in Russian legislation began in 1996 and ended with the borrowing of the textual formula "innovations" according to Oslo (2010). For Russia, this path can be considered unsuccessful - the vagueness of the term, the lack of precise interpretations gave a prohibitive effect for the state as the main investor and stakeholder in innovations. This can be considered one of the reasons for the failure to implement the legally approved National Development Concept of Russia "Strategy 2020" (2008-20).

Globally, there is also no single well-established understanding of the term innovation. Moreover, the nationally determined interpretation of innovations in China is conceptually and legally incompatible with Anglo-Saxon law on legitimate technology borrowing and patent law, which already leads to international friction and economic sanctions between China and a number of countries (USA, South Korea).

For the same reason, it is impossible to implement the UN «Sustainable Development» Program, which in the program documents classifies innovation as a tool for achieving a socio-economic balance of development. Since the UN Sustainable Development Goals (SDGs) 2000-15 were actually thwarted by failing to achieve many parameters, it is difficult to expect a different result in the current period of SDGs 2015-30. The predicted failure is largely due to a methodological gap - the lack of a uniform and effective term innovation in national economies, distinguishable from conventional supply systems with standard indicators that cannot provide quantitative and qualitative multiple growth in productivity.

The essentially anti-scientific theory of Malthus, which is the essence of the political regimes of the "Western democracies", the Club of Rome, the UN SDGs, which supposedly justifies the containment of population growth by anti-human means (war, pandemic), is refuted not only economically and biologically, but also by the super-efficiency of real innovations. Breakthrough innovations increase both production output tenfold (up to 1000% in some industries) and multiply the share of effective product use (up to 200%), as well as the share of reuse (the level of recycling is growing tenfold - from 5 to 99% of the initial issue). Thus, real innovations are capable of providing a cumulative increase in productivity by a factor of hundreds and leveling imbalances in socio-economic development. Meanwhile, it was precisely the food shortage that was the cause of the two world wars in the form of attempts at aggressive territorial expansion of Germany.

Even at the current level of development with a non-systemic spread of innovations, the problem of hunger and poverty does not lie in the production and economic systems themselves, which in total produce a sufficient amount of food for humanity. The essence of the problems is due to the historically formed macrosystem of socio-economic relations with a huge disproportion of social unevenness in the distribution of production volumes. Instead of a systemic transition to a new level of socio-economic development, an unproductive discourse with imitation of innovations is slipped into the world, unable to solve world problems (UN SDGs), but taking away attention, resources and time.

In addition, time itself requires a rethinking of innovation not as something extraordinary, rare and risky, but as an ongoing ongoing process within organizations. Mass digitalization has come to the personal and microeconomic level, the informational connectivity of humanity reaches prohibitive values. The period of transformation of processes and change of generations of IT technologies occurs with an acceleration of a pre-singular nature: from 5 to 1.5-2 years and further downward. This requires a clear and understandable regulation of the term both for the sectoral scientific and engineering communities and for non-core social groups (related business units, state apparatus at all levels, foreign investors, teenagers studying, society as a whole, etc.)

2. The proposed scientific and objective definition of the mechanisms of progress

Innovation requires a serious description in scientific methodology, therefore, this requires the allocation of a number of approaches and qualifying features.

2.1 Scientifically objective definition of innovation

It is proposed to identify improvements (modernization) that operate within the existing principles of activity and bring only small improvements (an increase in efficiency of less than 100% within the existing principles). It is advisable to refer to innovations as a class of technologies of a wide range with significant characteristics in the following generic features:

- "advanced technologies" - operate using new principles (physical, technological, economic, social, organizational, business processes) on the main production processes that are ahead of the previous generation (4G is the fourth generation of the cellular and mobile internet standard between less efficient 3G and more efficient 5G);

- multiple increase in efficiency (output, productivity, reduction of material consumption and costs) by more than 100% (multiple, more than 2 times) in the main production processes (5G peak speed reaches 20 Gbps, which is 20 times more than 4G – 1 Gbps);

- synergy (emergence) - the appearance of beneficial effects in related areas (additional side resource or social impact) without creating a significant negative impact (4G broadband mobile internet launched the development of the «Internet of things» and unmanned systems).

Based on the degree of efficiency, it is possible to distinguish between "improving innovations" (the total increase in efficiency in the life cycle increases in the range of 100-300%) and "breakthrough innovations" (an increase in efficiency over 500%). Breakthrough innovations have an important defining quality of "closing technologies" – due to a sharp increase in their efficiency by orders of magnitude, they "remove" the need for technologies of the previous level, making their modernization

and existence beyond their planned operation senseless ("disruptive innovations", Christensen). The emphasis on "breakthrough as development" better corresponds to the essence of innovations, which do not have the target function of "undermining" in the negative connotation of destroying the existing technical and economic order - this is only a possible inevitable consequence.

Formulating innovation in this way programs the scientific, technical and social process along a trajectory of sustainable growth. A clear definition, quantifiable closes the door to quasi-new technology speculation. The simplicity of the innovation criteria suits both social and expert thinking. Relative and therefore universal criteria are applicable both at the international level and at the national level, taking into account any specifics of the existing levels of production and social systems.

The theory of technostructures (technostructure [техно-уклад] is a modern chronotope of the technosphere as a macrostructure of related technological packages, Glazyev), based on the "Kondratiev waves", is applicable to the scientific and objective scale of fixing technological progress. K-waves have proven their validity in a retrospective and prospective analysis of the development of macroeconomics, incl. confirmability and association with political crises. The founder of the economic theory of innovation, Schumpeter, used K-cycles, which formed the basis of the Austrian economic school. K-cycles are orthogonally complementary (consistent and mutually reinforcing) with other cycles of Zhuglyar, Kuznets, Kitchin, which have an appropriate scientific basis.

The popular approach of the «4th Industrial Revolution (Industry 4.0)» is more of a populist name, primitivized for replication in the media and the media, but does not have a scientific background and does not contain scientific discoveries.

Using the example of microchip topology, it is convenient to demonstrate the terms introduced. The current level of technology development in 2021 - in the civil sector of the economy, the production of chips with a dimension of 2 nanometers (10–9 m) has been mastered. This chip differs from the previous development in 7 nm by a 45% increase in performance with the same level of energy consumption, but the architecture of computers operating in the modern paradigm of science and technology (i.e. modernization) does not fundamentally change. The "leading technology" will be the expected release of chips in a new dimension - picometers (10–12 m). New physical principles in this case are manifested in optical quantum phenomena. Chips for quantum computers operate in a new architecture and outperform conventional computers by billions of times, incl. in an unattainable "quantum superiority". Breakthrough technology creates a synergistic effect of transforming the entire technosphere into new principles of functioning.

Alternative renewable energy at the current level of development is not considered innovation in the full sense with this approach. Although "green energy" creates decentralization and autonomy of use in mass use, it generates negative consequences – a paradoxical increase in the "carbon footprint" throughout the entire life cycle (for example, electric vehicles), in the absence of the main thing - a multiple increase in energy generation per unit area.

2.2 Sociotechnical approach as a general innovative approach.

The opposition of the traditional current operating activities of the organization and "high-risk" innovations, which is relevant in the 2010s, requires a modern revi-

sion. Against the background of mass digitalization of business and life in general, innovation in a radically changing world is becoming the daily essence of business as a search and implementation of new ideas.

The technologies that gave birth to innovation include more than just material equipment (not only exclusively materially defined technical systems – “hammer”), but also methods of production (organizational, social, labor, methodological and other components – “the ability to use”). The sociotechnical (ST) approach deepens this interface, assuming that labor activity consists of both the technosphere and the social environment (labor skills, people themselves, social infrastructure, etc.), forming a single space of activity.

Further development of the ST-approach from the applied socio-labor plane leads to the mutual adaptation of technical, information, economic systems and a person in different guises - this is an expanding space of opportunities for the constant generation of innovations and synergistic development. Its reduction and primitivization to the separation of technologies does not allow deep and effective organization of innovation processes.

In addition, the ST-approach is the key to the design of Artificial Intelligence (AI). NBIC-theory (nano-bio-IT-cognitive convergence) turns into reality - the cognitive science of a person's psycho-structure of thinking can be moved and multiplied by the power of computational capabilities, achieving harmony and a certain unity. Underestimating the role of the ST- approach does not allow us to implement a real AI-as long as it is mistakenly identified with neural networks that operate with data sets of nested statistical information of the past and are not able to formulate meaningful judgments at a new level of logic.

Thus, against the background of a new round of total informatization, the ST-approach is background and organic for the implementation of innovations based on penetrating technologies (end-to-end) IT as a constantly presented component of activities. This requires a revision of corporate strategies - corporate innovation systems from narrowly experimental ones must grow to the level of organizations and modify them in search of the optimum.

3. Forecasts of the development of innovations.

The proposed scientific-objective approach to innovations based on technological structures and Kondratyev waves has a predictive effect in the development of not only key technologies, industries and the technosphere as a whole, but also other structures (social, economic, etc.). Based on the scientific-objective approach, it is possible to make a forecast of the development of technologies (to the extent that it is possible at all).

The technical arms race of the 20th century significantly outpaced social progress. Social relations formed on the basis of the informational connectivity of the unity of mankind are in sharp contrast to the institutional picture of the historically formed macrosystem of capitalist relations. Planet Earth is artificially divided into divided zones of social well-being and social disaster, which does not correspond to the level of production capacity and public sentiment. Therefore, the growth of social innovations to equalize the disproportion is extremely likely and is due to the entire history of the social evolution of mankind, moreover, it is supported by the achievements of scientific and technological progress. Thus, ST-harmony can be acquired as macro-socialization on a planetary scale. Thanks to the covid pandemic, the world has realized that everyone's herd immunity is important to everyone. As the experience of in-

fecting more than 200 million people around the world has shown, there should be no socially vulnerable segments of the population - this is dangerous for everyone else.

Nuclear energy in modern implementation has not become the basis of the modern technological structure - the place of the energy carrier of the 21st century is still vacant. The criterion of truth is whether the new energy carrier is suitable for the exploration of near space - whether it will be able to create an energy intensity that is several times greater than the current generation of energy systems. It is highly probable that safe hydrogen is suitable for the new energy carrier in processes similar to cold nuclear fusion. Transport systems must move vertically upward - the physical limit of land transport in large cities has been exhausted.

The 7th techno-structure (22nd century) should become the agenda-setting presence in space as the defining criterion of the energy source, since it is necessary to interface with the inevitable exploration of "deep" space and continuity with the 6th techno-structure.

A significant event should be "endless technologies" - not dependent on the extraction of the final material raw materials, but giving productivity in the required, incl. colossal scales (the energy of the sun for all its size and conditional "infinity" does not allow space flights). Despite the seeming impossibility of such a formulation of the question, the modern atom, with all the technical costs of radiation, has already created the first stage of "infinite energy" - a closed nuclear cycle, when the problem of extracting new and utilizing old hazardous raw materials has been removed and overcome.

The second key milestone should be the "absolute safety" of human life in the world of the technosphere - the number of deaths from road accidents, accidents, infrastructure impacts should be reduced to vanishingly minimal.

Conclusions

Innovations in the modern interpretation, suffering from the weakness of essential terminology, have completely lost their content and, with their imitative discourse, actually restrain technical progress, i.e. transition to truly disruptive technologies. New approaches in a socio-technical key, objective criteria for innovation can intensify scientific, technical and social progress, on which the stability and sustainability of the development of the world-system and national socio-economic spheres depend.

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ИНВЕСТИЦИОННО-ИННОВАЦИОННОЙ СТРАТЕГИИ В КОНТЕКСТЕ РЕАЛИЗАЦИИ ИННОВАЦИОННЫЕ И ИНВЕСТИЦИОННОЙ ДЕЯТЕЛЬНОСТИ ПРЕДПРИЯТИЙ ПРОМЫШЛЕННОСТИ

В современных условиях экономического развития инвестиции и инновации являются важнейшими факторами повышения эффективности экономической