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THE NEW ROLE OF SCIENCE IN THE AGE OF TRANSFORMATIONS: FROM THE DRIVER OF PROGRESS TO THE GENERATOR OF RESOURCE RESERVES

The modern stage of human development is accompanied by the increasing complexity of social, economic and technological processes. Under the conditions of polycrisis, geopolitical turbulence and accelerating digital transformation, there is a need for fundamentally rethinking the role of science in society. Science is less and less perceived solely as a source of innovation and technological progress. Its new function – formation, release and redistribution of resources – is emerging as being central. Science turns into the system of adaptive management of society's sustainability capacities.

Traditionally, science has developed by generating new knowledge and technologies, but today it is turning into a multifunctional institution capable of accumulating, transforming and quickly redirecting resources. Digitalization, the development of artificial intelligence systems and automation make it possible not only to accelerate the creation of new ones, but also to free up previously occupied human, time and financial resources. This makes science not only an engine of progress, but also an internal regulator of complex systems.

Historically, the science development can be viewed along two main trajectories. The first is linear, in which knowledge and technology are consistently accumulated and improved. This model is well illustrated by the evolution of transport, communications, and construction technologies. The second is spasmodic, based on breakthrough discoveries: from quantum mechanics to the Internet. Such discoveries are difficult to predict, but they drastically change the paradigm. However, both models had one common feature:

they required growing investments and created pressure on the economy, not always providing immediate return.

The modern conditions actualize the third trajectory – the mobilization one. In this model, science focuses not only on creating newness, but also looks for freeing up resources from the existing systems. It is about the redistribution of human, time and financial potential, which is especially important in the context of transformation, when efficiency, flexibility and sustainability are required.

The main advantage of resource-saving solutions is their high predictability. For example, the research by the Federal Reserve Bank of St. Louis (2025) showed that, when using generative AI, the average time saving is 5.4%, and productivity per hour of interacting with AI is higher by 33%[1]. In turn, the study by Noy & Zhang (MIT, 2023) revealed decreasing the time required to complete professional written tasks by 0.8 of standard deviations while improving the quality of the result[2].

Similar effects can be observed in education. Introducing machine translation systems and adaptive content allows freeing up to 1,200 academic hours per student within the cycle, previously spent on learning foreign languages. These resources can be used to master fundamental sciences, digital competencies, or prepare for participating in research projects. This demonstrates technologies' ability not just to complement, but to replace individual parts of the system, freeing up its resource potential.

Against the background of such examples, the need for a new model of resource thinking becomes obvious. Traditional approaches to resource management assume their stability and limitation. However, modern science allows for the formation of dynamic reserves – resources mobilizable as needed.

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[1] Bick A., Blandin A., Deming D. J. The rapid adoption of generative AI [Electronic resource] // National Bureau of Economic Research. – 2024. – Sep. – (Working Paper No. 32966). – Access mode: http://www.nber.org/papers/w32966, free. – Date of access: 23.04.2025.

[2] Noy S., Zhang W. Experimental evidence on the productivity effects of generative artificial intelligence [Electronic resource] // SSRN Electronic Journal. – 2023. – DOI: 10.2139/ssrn.4375283. – Access mode: https://doi.org/10.2139/ssrn.4375283, free. – Date of access: 23.04.2025.

This requires a different view on the structure of the available potential of the system.

In this regard, we propose the principle of adaptive resource triad as a new conception of interacting between science, society, and transformational processes. According to this principle, a sustainable system in the age of transformations should be based on the three-component resource-distribution model:

- 60% of the basic resources is the supporting layer: fundamental functions of the state, supporting education, healthcare, infrastructure, and basic science. These resources are necessary for maintaining the system resilience;

- 20% of the released resources is the potential mobilizable due to technology. It is this reserve that creates the opportunity for fast adaptation, rapid response to external and internal challenges, compensation for losses, or investment in short-term priorities;

- 20% of innovative resources are funds aimed at financing breakthrough, high-risk areas. This is the area of long-term leadership and the formation of new technology platforms.

The advantage of this model is that the released resource forms the system flexibility and reduces risks. The loss of a part of the innovation resource can be compensated by the rapid mobilization of the released one. This, in turn, creates for the system the right to mistake, making it more sustainable.

For example, in conditions of the pandemic, it was the released resources, including human and organizational ones, that made it possible to switch education to the distance-learning format, compensate for logistical disruptions, and scale digital platforms. The same applies to healthcare, where retraining the personnel and redistributing premises for COVID hospitals has become possible precisely because of using flexible reserves.

The comparative analysis of the efficiency of the resource use, depending on their type, shows:

Resource type	Response rate	Predictability	Return period	Risk
Basic	Low	High	Long	Low
Released	High	Very high	Short	Low
Innovative	Medium	Low	Long	High

Thus, the system devoid of the layer of released resources becomes inflexible and vulnerable. On the other hand, excessively reducing basic functions for the sake of short-term efficiency may result in destructing the sustainability system.

Cultural and anthropological risks should neither be ignored. Replacing linguistic education with AI translators may lead to the loss of cultural contexts. The solution is not the abandonment of technology, but their humanitarian support: integrating cultural and linguistic models into AI systems, adjusting educational programs to new realities, without loss of identity.

Ethical and economic challenges are associated with the large-scale restructuring of the labor market. As the International Labor Organization (ILO) notes, “the growing number of technologies and automation being introduced raises concerns about workplace safety, economic inequality, and ethical issues”[3]. According to McKinsey, by 2030, “between 400 and 800 million individuals could be displaced by automation and need to find new jobs”, and “according to our estimates, 75 to 375 million may need to switch occupational categories and learn new skills”[4]. This confirms the need for developing buffer retraining programs aimed at adapting employees to new conditions.

International practices show that “countries, such as Singapore, actively invest in professional development initiatives, which helps mitigate the effects of

[3] International Labor Organization. Programme and Budget for 2024–25 [Electronic resource]. – Geneva: ILO, 2023. – Access mode: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_mas/@program/documents/genericdocument/wcms_905532.pdf, free. – Date of access: 22.04.2025.

[4] McKinsey Global Institute. Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages [Electronic resource]. – 2017. – 28 Nov. – Access mode: https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages, free. – Date of access: 22.04.2025.

structural changes in the labor market"[5]. The ILO report highlights that "a significant amount of resources is allocated to skills development and lifelong learning, for the purpose of meeting large-scale changes to be faced by the labor market in the coming years". Herewith, it is noted that, "for supporting employment and retraining programs, it is advisable to use the released resources, which makes it possible to implement these measures without significant additional external expenses"[6].

Thereby, the new role of science is not only generating knowledge and technological breakthroughs, but also applying the ability to manage the structure of resources. Science turns into a tool for forming sustainable, adaptive systems capable of self-regulation, which is especially important in the conditions of the large-scale transformation of the labor market.

Conclusion

Under global transformations, the society's sustainability depends not only on innovations, but also on the ability to flexibly manage its own resources. The new role of science is not only generating knowledge and technology, but also configuring the structure of available resources.

[5] Wautier N. AI and Automation: Societal Impact on the Workforce [Electronic resource]. – 2025. – 29 Jan. – Access mode: https://wautier.co.uk/ai-and-automation/, free. – Date of access: 22.04.2025.

[6] International Labour Organization. Programme and Budget for 2024–25. – Geneva: International Labour Office, 2023. – Access mode: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_mas/@program/documents/genericdocument/wcms_905532.pdf.

In this regard, the principle of the adaptive resource triad is formulated, according to which:

- 60% of resources ensure the resilience and sustainability of the basic systems;

- 20% of resources are released due to technology and become the flexible response reserve;

- 20% of resources are allocated to finance breakthrough and strategic developments.

This model ensures sustainability without abandoning development, flexibility – without destroying the foundations, and strategic potential – without excessive risk. Science in the 21st century is not just a Swiss army knife that combines many functions. It is an intelligent architecture generating the opportunity for civilizational balance in the unstable world.