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New Industrial Society of the Second Generation: Towards the Noospheric Civilisation[1]

The paper studies the development of the concept of the new industrial society of the second generation under the changes of the global civilisation. It elaborates on the principal propositions of the industrial society of the second generation and proves that instead of making a transition to postindustrial society the civilisation is moving towards transformation of material production. New material production features a decrease in unit consumption of materials and capital accompanied by an increase in knowledge intensity of a product. The author explains the reasons behind the reindustrialisation of the Russian economy, and investigates the problems of transition of the Russian production to the new type of industrial society. Finally, the author examines technologies that are going to underlie the economy of the second generation and justifies the impact of knowledge as the major factor in formation of the noospheric civilisation.

JEL classification: L00, L50

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Indroduction

The world economy and the global civilisation are on the verge of changes. Nowadays we are observing that the very nature of the global civilisation is changing.

In the new age globalisation is increasingly showing its dark side, and inherent collisions exacerbate global tensions, local and asymmetric wars, localisations and, simultaneously, boost imperial ambitions. Heightened antagonism between (a) the tendency towards using globalisation to establish the hegemony of transnational capital of select countries, and (b) the tendency towards safeguarding national economic, political, and ethnocultural interests, provides the background for the fight for economic superiority in the upcoming technological revolution. As the fighting intensifies, many experts start considering the most negative scenarios.

Indeed, we are observing processes that up until recently have appeared highly unlikely. Brexit, the American Tragedy (the term widely used in the USA to describe the new administration), the US decision to withdraw from the Trans-Pacific Partnership Agreement are just a few events which indicate that the foundation of the globalisation trend is crumbling.

Economic and political groups that used to promote globalisation (the European Union, NAFTA) are going through difficult times while new alternative economic unions are being formed. This situation can potentially lead to the world splitting into competing and possibly warring blocks.

[1] Based on the materials of the public lecture delivered at the University of Cambridge on May 11, 2017 [10].

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At the same time, the tendency towards the development of holistic economic cooperation between countries and nations, which is the reason behind modern globalisation trends, remains quite objective and progressive. That is why movement towards mutually beneficial economic cooperation should be used to counter tensions engendered by the modern hegemonic globalisation model that hampers the development of positive potential of global economic cooperation and jeopardises established economic relations. Such cooperation would enable all member countries to meet the challenges of the new technological revolution associated with radical changes not only in the technological mode, but also in social and economic orders.

Perhaps other similar projects targeting higher life expectancy, preservation of the environment, space exploration, etc. could also exert positive influence.

Clearly, all such projects would be efficient if they were based on specific development concepts for our civilisation that is currently undergoing major changes.

The concept of the new industrial society of the second generation

Several decades ago in an attempt to describe the direction of these changes, a number of experts [5; 6; 8; 12; 14] formulated the concept of the transition to the *postindustrial* society. Yet at the moment it is becoming increasingly obvious that we need to develop new approaches that would explain the essence of the new technological revolution and new stage of societal development.

It is important to remember that half a century ago J. K. Galbraith published *The New Industrial State* [13]. Now we can validate a few of the ideas that he introduced long before postindustrial concepts became popular. As for postindustrial society theories, even though they provided a number of sharp observations and forecasts (e.g. dramatic increase in the share of services in GDP of developed countries, increase in the share of highly qualified professionals and expansion of higher education), most of them were not confirmed. ***The world is not transitioning to the postindustrial society*** (even though it would be wrong to ignore the emergence of some postindustrial tendencies). Au contraire, we are witnessing the formation of a new quality of industrial production which paves the way for the coming of a new societal type – the new industrial society of the second generation (NIS.2) [3; 9].

Postindustrial concepts relied on the seemingly correct observation that in most developed countries the share of material production (and its industrial core) in GDP was decreasing. But the authors of postindustrial theories failed to take into account the constant and even growing role of modern industrial technologies in the entire system of public reproduction. Moreover, the conclusion about the reduction of the industry share in GDP rested on a statistical illusion.

In particular, London-based *The Economist* magazine pointed out that "the slide in manufacturing's share of GDP largely reflects a fall in the prices of goods relative to services. Measured in constant prices, the share of manufacturing in GDP has been broadly unchanged in America, and in developed countries as a whole, since 1980"[1].

Incidentally, the data on a decrease in the industry role reflected geographic migration of production from developed to new industrial countries while the global economy in general saw no drop in industrial workforce, and even in developed countries industrial workforce numbers have remained the same (see Table 1).

Whereas they were correct in capturing an increase in the share of knowledge and information in production, the adepts of postindustrial society theories mistakenly concluded that knowledge and information per se could replace material production by superseding or reducing it to minimal levels. Instead, the current *transition to a new social order does not stem*

[1] Industrial metamorphosis. The Economist, Sept. 29th, 2005. Available at: http://www.economist.com/node/4462685.

Table 1

Sectoral share in employment, world and regions, %

Region	1998	2003	2004	2005	2006	2007	2008	1998	2003	2004	2005	2006	2007	2008	1998	2003	2004	2005	2006	2007	2008
	Industry							Services							Agriculture						
World	21.1	20.7	21.1	21.5	22.1	22.7	23.2	38.1	40.7	41.5	41.9	42.4	42.9	43.3	40.8	38.7	37.5	36.5	35.5	34.4	33.5
Developed Economies and the European Union	27.9	25.6	25.3	25.0	25.0	25.0	25.1	66.3	69.8	70.4	70.8	70.9	71.1	71.2	5.8	4.6	4.3	4.2	4.0	3.9	3.7
Central and South-Eastern Europe (non-EU countries) & CIS	27.7	25.6	25.3	25.5	25.5	25.4	25.3	45.5	51.7	52.6	53.2	54.2	55.1	56.0	26.8	22.7	22.1	21.2	20.4	19.5	18.7
South Asia	15.4	18.7	19.4	20.1	21.0	21.8	22.6	25.1	27.9	28.5	29.0	29.5	30.0	30.4	59.5	53.4	52.1	50.8	49.5	48.2	46.9
Latin America and the Caribbean	21.8	21.6	21.8	22.2	22.4	22.6	22.9	56.8	59.0	58.9	58.9	59.6	60.3	60.9	21.4	19.4	19.3	18.9	18.0	17.1	16.2
North Africa	20.0	19.2	19.7	20.8	21.7	22.7	23.6	44.1	46.1	45.1	44.8	44.5	44.2	43.9	35.9	34.7	35.3	34.5	33.8	33.1	32.4
Sub-Saharan Africa	9.5	9.5	9.7	9.7	9.9	10.1	10.3	22.9	25.1	25.9	26.3	26.7	27.4	28.0	67.6	65.4	64.4	64.0	63.4	62.5	61.7

Source: Global Employment Trends. January 2009. International Labour Organisation. Geneva: ILO, 2009. P. 36.

from the decline in the role of material production. The latter is irreplaceable because people need material goods to support their lifestyle and common activities. What we are currently observing is quite different: *material production itself is acquiring a new quality* by converting into ***knowledge intensive*** *production*.

The classical industrial system (characterised by absolute domination of industrial production) and service society (where service sectors supersede material production) are being replaced by ***the new industrial economy of the second generation (social order based on this new industrial economy constitutes the new industrial society of the second generation, or NIS.2, for short)***. Fundamental aspects of the NIS.2 concept were developed as part of research conducted by the Saint Petersburg Institute of New Industrial Development named after S. Yu. Vitte (INID) in the early 2000*s*, and after 10 years of further elaboration were first published in 2010. Since then, the concept has been discussed in a number of publications and presented by the author and his INID colleagues at economic forums in Russia, seminars and conferences held in Cambridge, Lisbon, Stockholm, Helsinki, Vienna, and other cities.

The difference between the NIS.2 and industrial production that came before it is easily visible on the graph which shows the reduction in unit consumption of materials and capital accompanied by the increase in knowledge intensity of a product of production (Fig. 1).

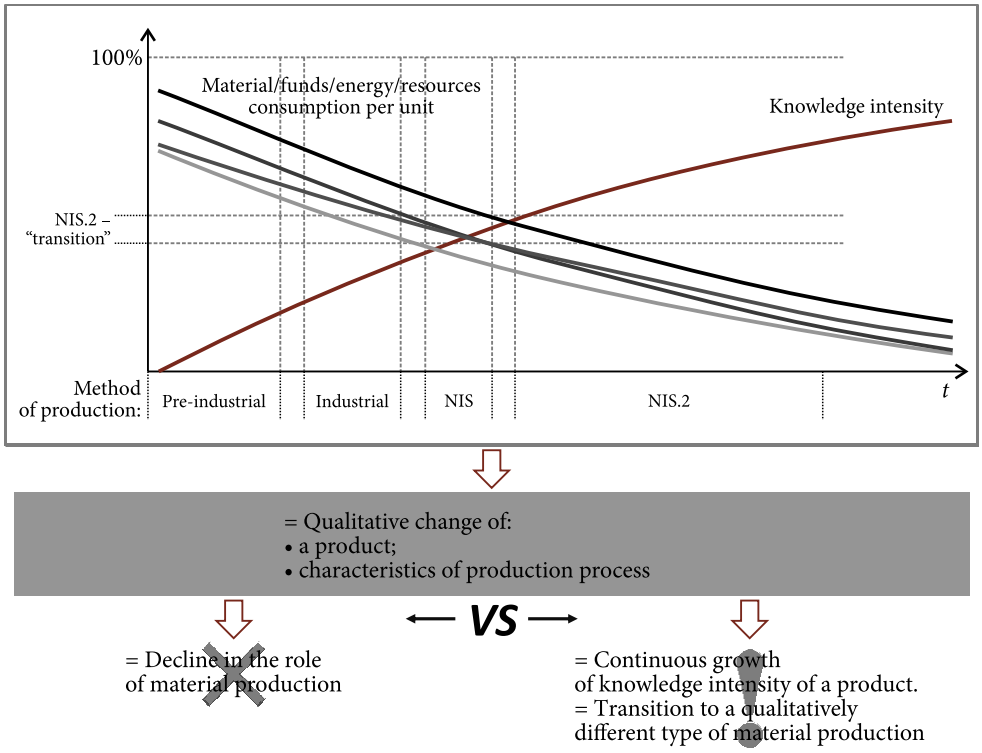

Fig. 1. Histrorical changes in the share of unit consumpsiton of components of a product

The interval where the lines cross signifies the shift towards the domination of knowledge over other components within a product of production and marks the starting point for the gradual transition to the second generation of the new industrial society.

The NIS.2 era will be dominated by segments that create knowledge intensive products, i.e. segments that (1) manufacture actual products, (2) generate knowledge, and (3) educate people capable of learning and applying the knowledge to material production (Table 2).

Table 2

Differences between various generations of the new industrial society

Main features	New industrial society	NIS.2
Main characteristics of industrial product	Mass industrial product	Knowledge-intensive industrial product
Main production cost components	Capital and labour costs exceed the cost of natural resources	R&D, education and wellness costs outweigh materials costs
Core economic areas	Mass production, financial, commercial and other corporate services, other service areas, healthcare, education, R&D	High technology industry reliant on continuous innovative process, R&D, education, healthcare
Dominating type of production organisation	Large corporation	Corporation, which integrates production, science and education
Means for demand satisfaction	Quantitative build-up of mass production and high-pressure sales in high volumes	Resource efficient production capable of satisfying various rational wants

However, in spite of its changing parametres, the technological foundation of material production remains industrial. All advanced technological modes of material production (including fifth and sixth) still predominantly rely on some iteration of industrial technology and machinery definitely accompanied by the change in machine technology type: cutting-edge equipment is no longer mechanical, for its functionality is based on controlled physical, chemical, biological, information and cognitive processes. For example, previously used subtractive technologies employ mechanical processes of cutting, trimming, grinding, etc. whereas modern additive technologies that involve layering of materials mostly rely on other physical processes, such as lining, sintering, coating, etc. along with modern information technologies (3D printing).

But the main qualitative leap pertains not to the subtleties of industrial technologies per se, but to large-scale and *continuously accelerating* technological application of new *knowledge* which enabled the incorporation of a wide range of various controlled natural processes into industrial production. This phenomenon will result in further reduction of the material component in a product. In some of the most advanced segments, it has already happened. Unit consumption of material, capital and labour in product production tends to decrease, and the applied knowledge component is growing steadily. As this process gains momentum, production is gradually switching to the mode of constant technological innovation, and innovations spread throughout the new generation of industrial production at the *"acceleration of acceleration"* pace.

Such prospects make us consider a number of topical and seminal issues.

Unfortunately, the Russian economy is much less prepared for such changes than it could have been. It is too early to speak of the development and implementation of the most advanced technologies at the vanguard of science and technology progress (the so-called "horizon of science and technology"), for Russia lacks the necessary industrial foundation. Many technologies have been lost. The situation is particularly dire in key sectors of the Russian economy: mechanical engineering, machine-tool building, equipment for the power industry and industrial transportation. Even if we do not consider the ongoing effects of anti-Russian sanctions, we have grown completely technologically dependent on import. For example, in 2000, we purchased 10 billion US dollars worth of machines, equipment and vehicles while in 2013 that number went up to 150 billion US dollars, which indicates a 15-fold increase (Fig. 2). Thus, in spite of the recent focus on import substitution programmes, the data reflect Russia's high dependence on import, even in segments that are a strategic priority for any country.

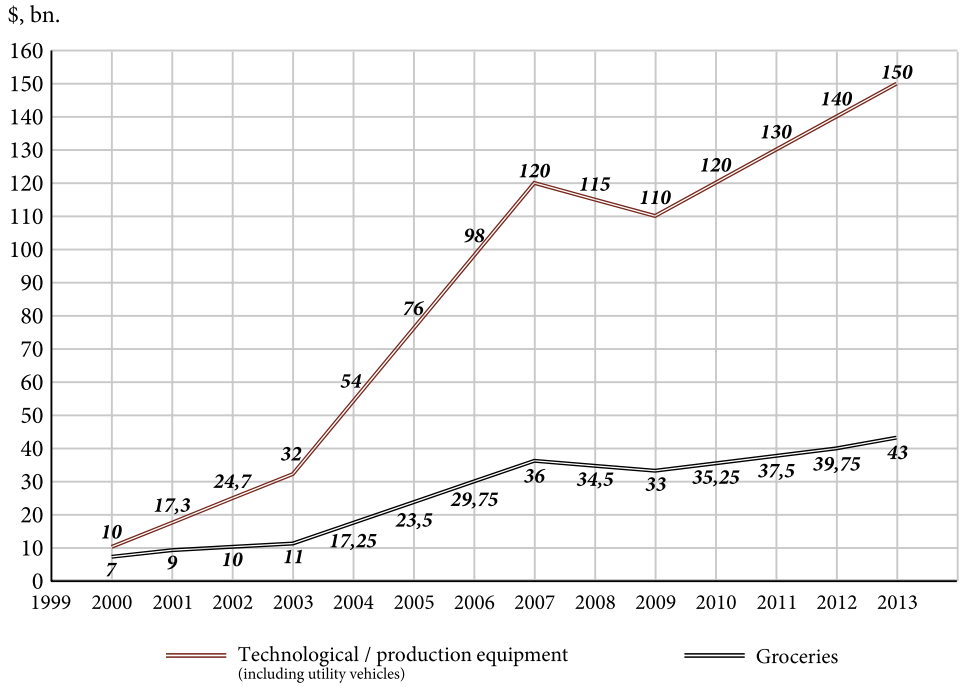

Fig. 2. Dynamics of Russia's imports, 1999–2013[1]

The issue here goes beyond the shortage of some convenient and common things and becomes a matter of national security in food processing, defence, information, energy and other industrial sectors. Once the country was hit with sanctions, the public and the authorities finally became aware of the problem.

Why did we find ourselves in this situation? How could this happen to the country that possesses the largest area of usable land, almost half of global natural resources (most of them are strategic resources of the 20th–21st centuries) and a large population with undeniably vast intellectual potential?

Naturally, many factors contributed to the situation, but the author is willing to postulate that the current recession resulted from *profound de-industrialisation* of the Russian economy.

Over the several past centuries, industry played a major part in the economy of all countries. It served as the economic stabiliser, progress catalyst, recipient of science and technology achievements and creator of actual material goods.

If we define ***industrialisation*** as the process of shifting the economic focus towards the industrial sector, the development of industrial production accompanied by the perfection of the means of production, enhancement of fixed assets, and technical systems mechanisation and automation, then ***de-industrialisation*** shall be its opposite. Under de-industrialisation, common labour gradually replaces inclusive labour, complex operations are substituted with simpler ones, *the share of knowledge in added value dwindles*, production facilities deteriorate and are not replaced, and common reproduction steadily edges out developing, innovative reproduction. De-industrialisation processes lead to the overall decline and loss of entire industrial areas and production sectors that often suffer irreparable damage past the point of return.

The phenomenon is by no means new and quite well known.

Famous British expert Alec Cairncross [11] defined de-industrialisation as the situation characterised by the reduction in production output and export of industrial products.

[1] Source: Federal State Statistics Service of the Russian Federation, INID.

The author's assessment of this phenomenon refutes Cairncross' definition to a certain extent. It is important to bear in mind that in various countries de-industrialisation, while having a few common characteristics, proceeded differently due to historical and national idiosyncrasies [1; 2]. To substantiate our disagreement with Cairncross, we would like to emphasise that the main characteristics of de-industrialisation as an economic phenomenon do not involve the reduction in production output, its share in the GDP and definitely not the decline in industrial export (it can even increase!), but many other 'de/dis' features which permeate ***all basic components of the production process*** (process *organisation*, production *means*, *labour quality/qualifications* and *product type/production output*) and include deStabilisation of financial and economic components of manufacturing companies, disIntegration of industrial structures and relations and many other negative effects.

Let us also remark that Cairncross' methodological extreme is mirrored by those postindustrialists who rely on purely volumetric indices in lieu of performing a profound qualitative assessment of the industrial segment of the economy.

So, has Russia had a chance to overcome the 1990*s* de-industrialisation caused by the disruption of economic ties after the rapid collapse of the Soviet Union?

It could have definitely been finished in the early 2000*s* when we still possessed many modern technologies passed on from the Soviet period and superhigh revenues from oil exports pouring into the national budget.

Unfortunately, the right decisions were never made, and that is our failed experience from the 2000*s*. In lieu of pursuing the possibility of transitioning to supply economics, we started developing demand economics based on the export of raw materials.

In the meantime, without the necessary updates, equipment grew outdated and depreciated, production facilities fell into disrepair, output and production potential declined, employees quit, and profits dropped. Investment and innovative interest in the industrial sector decreased accordingly, especially due to the short and quick money conditions.

Under these circumstances Russians spent more and more of their growing income on imported goods which quickly replaced local products and further exacerbated the situation in the industrial sector that lacked the funds for the renovation of production facilities and product upgrades. Thus, the vicious circle of de-industrialisation was complete. Concealed by rosy macroeconomic indicators (seen as a positive sign even by the IMF), it dragged the Russian economy down into the deep hole of future – current! – stagnation.

In light of this, one of the key issues that Russia faces nowadays is the need to overcome the difficult heritage of de-industrialisation that resulted not only from objective processes, but to a great extent was borne out of market fundamentalism and postindustrialism ideology, as well as the Shock therapy, implemented by the Russian Government in the 1990*s*.

Our main goal is to put an end to the crisis that has lasted over the past decades. In order to rise to the challenge, we should not revert to the old economic structure, but instead launch new industrialisation based on cutting-edge technologies. The urgency of the task is determined not only by the said modern trends in the evolution of material production, but also by the need to ensure true economic independence for Russia. Such independence is impossible without a solid science and technology core reliant on high technology industrial production.

The exigency of new industrialisation is obvious, but it cannot be accomplished if we persist in economic policy stereotypes and neoliberal anachronistic ideological clichés introduced in the1990s. The leap into the new industrial future of the second generation also necessitates changes in Russia's economic model. They imply an active industrial policy that would employ a wide range of regulation methods, including economic planning, lowering administrative barriers for entrepreneurial activity, elimination of corruption and the arbitrary interference of state officials seeking administrative rent, and actual as opposed to notional transition to a socially oriented economy.

We have no time to waste. Current leaders hasten to convert their economic advantage into a technological resource that would ensure their top positions under the NIS.2, but in the meantime the global economy is experiencing the gravest problems in recorded history.

What should be accomplished in order to pursue the strategic goal of moving towards the NIS.2? To what extent is the modern economy prepared to transition to this new stage?

We have to admit that the movement towards the second stage of the new industrial society is currently plagued with problems.

What many experts dubbed the New Normal several years ago looks more like an abnormality from the perspective of the traditional economic paradigm (Fig. 3). Former market control and regulation mechanisms and methods for adapting to market signals no longer deliver the desired effect. The volatility of all market parametres has increased so much that there is no way of telling whether the invisible hand of the market is pointing in the right direction. We are witnessing the change in economic leaders and development trends.

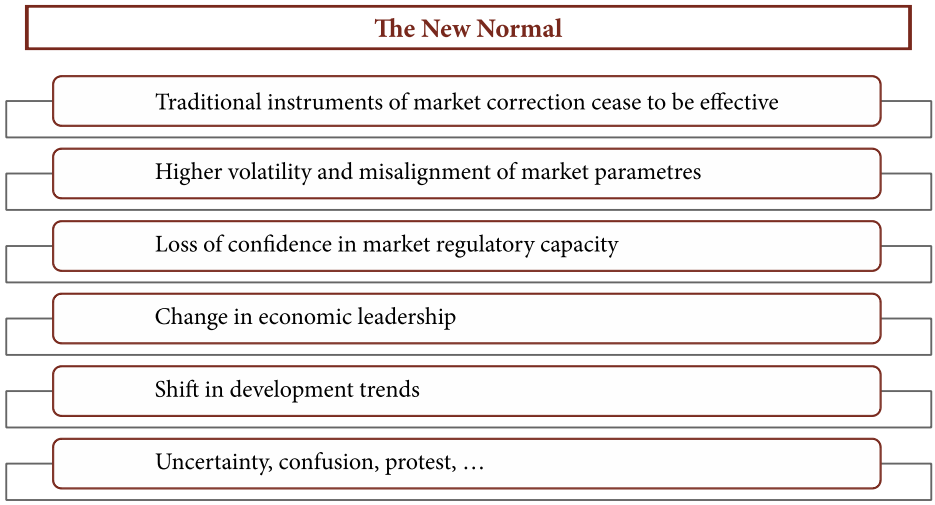

Fig. 3. Characteristics of the New Normal

The situation provokes many questions: what direction shall we choose? what should our priorities be? how can we achieve our goals if conventional instruments are no longer working?

So far we have not come up with good answers to these queries, and the international community seems to be a bit at a loss at the moment. Nevertheless, a careful assessment based on acknowledging the inevitability of the upcoming transition to the NIS.2 allows delineating pivotal directions that determine global civilisational development.

Currently, the main trend is the acceleration of science and technology progress. At the 2016 World Economic Forum in Davos, its participants announced the beginning of the fourth industrial revolution, thus officially acknowledging the global trend that experts of the Institute of New Industrial Development named after S. Yu. Vitte have been talking about since 2005–2010.

What will come of this trend? In my opinion, the outcome is ambiguous, because progress and industrial development possess enormous positive potential, but can also be a threat (based on the historic example of the French Revolution and paraphrasing Jacques Mallet du Pan's famous saying, "The future technological revolution may devour its fathers"). Either the technological progress will yield its fruit or inherent risks will be actualised? but at the moment we are getting it all in one and not necessarily in equal proportions. We need to perform preliminary analysis of what shall prevail in order to accelerate the positive aspect of the trend.

We can either increase technological capabilities to indiscriminately satisfy any wants, or shape new wants on an intelligent and truly human basis.

The new stage of industrial development creates new opportunities for the satisfaction of wants and personal development and thus potentially facilitates the resolution of collisions resulting from the fight for material goods.

The wide application of knowledge-intensive material production accompanied by a progressive decrease in material costs and explosive innovative growth will soon fully satisfy the demand in essential material goods. Moreover, modern knowledge intensive products are designed to meet such diverse wants that consumer demand often cannot keep up with new features.

Just one modern smartphone can satisfy the needs that used to require a phone, radio receiver and transmitter, TV, tape recorder, camera, watch, alarm clock, notebook, pen, postal service, various reference materials, etc. Moreover, material costs have decreased dramatically. An advanced and relatively inexpensive contemporary device can satisfy the needs that 30 years ago existed only in science fiction novels.

But will we be able to respond to the challenges of this new technotronic civilisation? Will it be a society guided by humanist ethics, characterised by widespread knowledge generation as the prevailing occupation, attuned to the environment and set on eradicating social conflict? Will it be a society that eliminates material limitations and diminishes the role of private appropriation of material goods through accessible satisfaction of essential materials wants? Or are we going to implement the opposite scenario?

We should not turn a blind eye to new threats that can compromise social development.

In developed countries, people can be swept off their feet by virtually limitless opportunities for increasing the degree of demand satisfaction and easily indulge in overconsumption. In less developed countries, due to the history of chronic underconsumption, the danger lies in using new technological capabilities to ensure unchecked quantitative growth of material goods production. Both trends can lead to the inflation of irrational, unrealistic, simulative wants. In the first case, the trend will manifest itself as the pursuit of prestigious consumption of increasingly more sophisticated and technologically advanced simulacra of goods meant to satisfy the simulative demand of consumers who will gradually lose their human characteristics. In the second case, the senseless increase in the output of traditional objects of consumption driven by the desire to imitate more developed countries will ultimately lead to the inclusion in their race for the satisfaction of simulative wants.

If we retain the current economic development paradigm that John Maynard Keynes labeled "biological" [7] to emphasize its predatory nature, simulative wants can acquire an intolerably exaggerated role. Many people worldwide are already dragged into the thoughtless pursuit of illusionary consumption growth that drains actual resources.

Clearly, if this development trend persists, it will result in resource deficit and an already discernible civilisational crisis.

The solution to this problem is potentially inherent in the very process of mastering of new knowledge.

The widely popular idea that modern production is based, first and foremost, on the production of new knowledge is, strictly speaking, inaccurate. Increasingly accelerated addition of knowledge does not engender new knowledge. Knowledge exists objectively, and, in this sense, it exists absolutely. People do not produce knowledge; they just discover things that are out there: Ohm did not create Ohm's law; he merely grasped and explained a law of nature. Our work is not the "creation", or "production" of knowledge, but the discovery of specific aspects and gradual expansion of the scope of knowledge available at any given moment to any individual and the humanity in general. But that is neither the invention of new knowledge nor its generation. People do not produce knowledge, but discover it in the world of things, extract the inherent knowledge through disobjectification.

New knowledge also brings about the understanding (discovery!) of new wants, some completely rational, others simulative, excessive or resulting from fantasies or deadend (from the perspective of progressive human potential) branches of the technological process. What is perceived as redundant nowadays can become rational tomorrow, and from this angle, simulative wants, just like regular ones, stimulate production growth.

Both real and simulative wants can be perceived as somewhat positive under different civilisational paradigms. The danger here is that the increase in demand satisfaction frequently leads to the increase in the satisfaction of simulative wants within the society which views them as such.

We are witnessing an important trend: the development of technologies responsible for the formation and satisfaction of simulative wants outpaces the development of real wants. Moreover, many simulative goods are not just relatively redundant. Some of them create only an illusion of a useful effect, e.g. many cosmetic and media products, while others go even further and have negative side effects. The aforementioned trend promotes a new consumer type engulfed in an eternal relentless quest for simulative goods which means that the pressure on the global ecosystem will keep growing in spite of the opportunities for a significant increase in production efficiency. Unchecked consumption can devour any number of natural resources, bury the planet under mountains of waste and engulf the humanity in wars over material goods and dwindling resources required for their production. Moreover, ensuing irrational use of resources can result in their depletion, loss of habitat and, furthermore, the demise of the very subject of wants, i.e. people as we know them today. Humans become increasingly *alienated*: from other people, society and ultimately themselves. They lose their human characteristics, turn into *shadows* of what they used to be, destroy the environment and jeopardise their own survival.

Nowadays both trends are clearly present: there are technologies which support simulative development, and technologies targeting personal development.

It is also important to bear in mind that current economic methods in the global economy and modern research mechanisms not known for quality analysis are unfortunately geared towards the pursuit of the first trend.

Many prominent sci-fi authors have been writing about external forces threatening the existence of our civilisation, but let us leave all these extraterrestrials, aliens, impostors, etc. to fiction writers. The world is a lot more complex than sci-fi conjectures. Aliens are already here, among us in the shape of technetic[1] types of civilisation substances that steadily supersede humans not only by changing their abilities and habitat, but also by covertly altering them to the point where they become the Aliens. In their development and formation of the so-called technocenosis, they will be able to replace people as the subject of basic social interest under the new society. Even though is sounds chimerical, sadly, it is the reality of the present situation. The scenario that involves keeping our civilisation as purely human, emphasising personal development and maintaining people as the core subject of public interest and space appears much less feasible at the moment.

There is, however, the opposite trend which is less pronounced, but equally important. In spite of existing threats, our civilisation has the opportunity to build a different future based on the opportunities created by ourselves in the process of industrial development and reliant on the technological application of knowledge. Humans are the only species capable

[1] Technetics is the term coined in the early 1980*s* in Russia and significantly expanded in the publications of INID. It is based on the ideas that can be traced back to Sergey Kapitsa. Technetics implies the study of technologies, their development patterns, interrelations with the economy and society, technical development philosophy, etc. akin to cybernetics as the approach for exploring regulatory systems and emphasises the capacity for self-replication and self-development of "substances" deriving, unlike genetics, from technology as opposed to biology.

of interacting with material surroundings in order to obtain immaterial knowledge. When learning about the world, people can barely tap the inherent absolute and endless knowledge, though in this process they also engage in self-knowledge and study other people and social ties that bind them together. Through the acquisition of new knowledge, humans establish and perfect certain criteria of their social existence by checking, updating and rationalising them. At the same time, they learn to see themselves as part (albeit special due to the capacity for self-knowledge) of this world by introducing culture as a social phenomenon and "glue" that binds the civilisation together.

Of course, up to a certain point the technological development of human civilisation noticeably conflicted with the progress of culture (even though they have always been interdependent). Still, the imminent crisis of human civilisation and the upcoming technological revolution make us reassess the correlation between technological progress and culture. ***Cultural development and technological progress are not necessarily mutually exclusive.*** They are intertwined to the point of being virtually inseparable.

Modern technological development requires and simultaneously provides the material foundation for cultural development in accordance with humane and intelligent evolution of technology. The latest technologies may cause changes in human knowledge and consciousness accompanied by cultural shifts.

Contradictions in technological and economic development can be resolved once people understand their real (non-simulative) needs and proceed to make the conscious decision to move in the positive direction which implies the limitation of simulative needs, efficient use of resources, transition to the technological development through rationalisation of human activity and its incentives, etc., including cognitive and personal development.

Only self-knowledge and rationalisation of self-evaluation criteria can put a stop to unchecked pursuit of simulative consumption and thus ensure movement towards noospheric civilisational development described by the great Russian scholar Vladimir Vernadsky [4] more than half a century ago.

Such self-knowledge will also facilitate cultural development, for only a person of both knowledge and culture is capable of a truly human attitude towards his/her needs, other people and the environment. If people responsible for the creation of a new quality of material production and industry, where the key role is attributed to materialised human knowledge, go down this path, they also will be able to avoid conflicts resulting from competition for the accumulation of both real and simulative goods and lay the foundation for the onset of a new stage in the development of human civilisation which we refer to as *the noospheric civilisation*. Under the noospheric civilisation, production will overstep the boundaries of technology and enter the realm of human intellect (reliant on strictly material processes of *noo*industrial production which could not exist or develop without the material aspect). Simultaneously, we will see a sharp increase in the social role of knowledge since it allows discovering new, more efficient ways for satisfying reasonable human wants (contrary to the current quantitative increase in consumption that has its clear limits), resolving conflicts and tensions which typically accompany major technological and social shifts.

Culture in a broad sense of the phenomenon molds the most important element of the society's civilisational code: internal self-restriction that can shift priorities from unchecked consumption and pursuit of various chimeras and simulacra to the formation of sensible wants (*noo*wants) and the emphasis on the quality of wants and consumed goods. Culture also provides the foundation for a new quality of interpersonal communication in the process of creation/labour and public activities. Simultaneously, technological progress lays the foundation for the change in the cultural code of our civilisation.

The development of trust definitely stands out among all social and cultural shifts that are pivotal for further progress. Trust is not only a factor in progress, but also its consequence as manifested in the invention of relevant technologies (the author refers to them as "technologies

of trust"), i.e. technological solutions that allow establishing trust virtually devoid of the risk of deceit. One such technology commonly known as blockchain has been tested, for example, in electronic payment systems (cryptocurrency, or bitcoin). This technology ensures transparency and verifiability of transactions and can be used not only in finance and banking, but also in other areas.

The emergence of technologies that guarantee trusted transactions between business partners gradually leads to the creation of a new cultural environment where total strangers can routinely trust each other, their level of trust akin to that shared by close relatives.

New technologies can introduce other major changes in the milieu. As a result of the technological revolution, the future will inevitably bring profound, almost impossible shifts. For example, the nature and principles of using materials in production and everyday life will change. Previously, construction materials had to withstand adverse natural conditions: provide insulation (heat and cold protection), endure physical stress (hence, the engineering discipline entitled "the strength of materials"), perform in aggressive chemical media, ensure waterproofing (resisting the ingress of water), etc. The NIS.2 industry will be based on more profound penetration of human knowledge into the nature of things and, therefore, will exploit natural elements to the benefit of the people by creating materials for effective use of all those factors that are currently perceived as unequivocally adverse. Thus, an increasing number of input parametres of the natural environment will be made to serve people.

And that is only one example in a series of options that will be implemented more and more *autonomously*. Artificial intelligence (AI) networks will enable complex production systems to perform self-examination, self-diagnostics (self-knowledge), self-treatment (repair and restore) and self-adjustment in order to accomplish specific tasks. Such systems will further evolve to include goal setting, which will potentially allow self-reproduction and self-development, "socialisation" of sorts, i.e. integration and networking of various systems. Ultimately, we can expect the formation of *fully autonomous systems* and a "technetic" society capable of functioning and developing *without any human involvement*.

Obviously, many collisions and questions will arise. For example, under Keynes' current biological paradigm, the introduction of smart manufacturing can backfire due to uncontrollable release of redundant workforce. However, it will be able to actualise some of the aforementioned opportunities in the foreseeable future under the nooparadigm. These are not idle speculations, but actual capabilities of neural networks. Extensive research is currently held to ensure the amiability of such autonomous systems, and not by elaborating on the famous Isaac Azimov's Laws of Robotics, but by offering specific technological solutions.

The process will definitely be accompanied by and closely connected with the inevitable evolution of people and wildlife. We have already engineered genetically modified plants, and animal testing is under way. It is quite possible that people will turn into synthetic neobiotechnetic beings: synthetic, because people will undergo biological and non-biological technological modifications; neobio, because to a certain degree the evolution of our species will be based on the implementation of biological solutions that do not alter humans as biological beings, but change their biological characteristics; and technetic, because human modification will involve non-biological technologies.

The conflict between these two evolutionary trends, namely modification of humans as biological beings (genome purification and improvement which have already been performed in Israel and some other countries) and transformation through concrescence with non-living matter which enables the creation of technologically altered people, is also quite possible. It is not that difficult to imagine a firefighter with enhanced fire-resistance and insulation characteristics and respiratory organs upgraded to accommodate a filtration system. Can there be direct confrontation between beings created by these distinct trends in artificial evolution?

Conclusion

In any case, the era of slow natural selection is coming to an end, and the new selection process will be based on artificially accelerated development and prenatally programmed composition of human (or inhuman?) characteristics.

Undoubtedly, we should be prepared for potential crises arising from such conflicts. Social stratification with its high level of material needs satisfaction based on new technologies is destined to become a thing of the past either as a result of social upheaval or peacefully. However, it will be replaced by a new type of social stratification based on the difference in aptitude for knowledge and culture acquisition and unequal access to favourable environment (bound to happen if civilisational development takes the path of unchecked increase in material consumption, depletion of resources and destruction of the environment).

The resolution of these issues depends on the ability to subjugate human development to sensible imperatives and create a true noocivilisation that would rely both on knowledge acquisition and profound self-knowledge required for self-regulation of the society and its members governed by cultural and ethical values. Ultimately, knowledge itself is an element of culture, for culture supplies values and sets goals for the application of knowledge. In turn, culture can be interpreted as a special type of knowledge, substantiated, objectified and actualised in experience and traditions that ensure a society's survival, self-reproduction and progress towards a noospheric future.

It is important to address future issues that are being shaped today, however grave current problems look like. In order to find answers, we need to abandon the position of economic hegemony, nationalism and superiority and refrain from imposing our vision of the future upon other countries and peoples, yet avoid the other extreme of retreating within national boundaries as well. We must understand the imperatives of further global development. It requires global ideas and projects that can combine the interests of main strata of the global community irrespective of countries and continents.

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Новое индустриальное общество второго поколения: к ноосферной цивилизации

С. Д. Бодрунов

Исследуется развитие концепции нового индустриального общества второго типа в условиях глобального изменения цивилизации. Уточнены основные положения индустриального общества второго типа. Доказано, что вместо перехода к постиндустриальному обществу цивилизация движется в направлении трансформации материального производства. Новое материальное производство характеризуется снижением удельного веса материалоемкости и капиталоемкости, возрастанием знанииемкости в продукте производства. Выделены причины реиндустриализации российской экономики, изучены проблемы перехода российского производства к новому типу индустриального общества второго типа. Проведен анализ технологий, которые будут формировать экономику второго поколения. Обосновано влияние знания как главенствующего фактора в формировании ноосферной цивилизации.

Ключевые слова: новое индустриальное общество; ноосферная цивилизация; деиндустриализация; знаниеинтенсивное производство.

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