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LAUNCHING INTO FUTURE

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Abstract

The paper examines factors needed for science and technology convergence and tries to create new understanding and attitude to innovation with the help of modern educational tools in higher education institutes. The results of original research are described in this paper. The key task of the research was to elucidate students' technological literacy and to get their ideas about the development of future technologies. Elements of a new education paradigm aimed at forming a single integrated picture of the world are formulated. During the study, two issues have been found out: 1) young people have no ideas about advanced technologies; 2) they do not realize their personal responsibility for the future of technological safety. Thus, educational paradigm can be based on the following principles: 1) recognition of the unity of social and natural environments; 2) taking into account characteristics of society development with high natural, technological, social and political risks; 3) admission of personal responsibility for moving to resource-efficient and nature-like technologies; 4) admission of responsibility in forming graduates' social responsibility competence in their professional activities.

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1. Introduction

Modern society is aware of the revolutionary changes in technology that are similar to the one that led to the birth of the Industrial age. But if the 19th century is characterized by knowledge specialization with independent scientific fields, the modern stage of science development is a period of new synthesis, interdisciplinary, broad science and technology convergence. And this requires new approaches to professional training.

The study shows that students of world higher educational institutions (about 697 respondents from more than 40 higher educational institutions) do not always know what modern technologies as a technological basis present. It should be noted that 67.4% of respondents do not know what cognitive technology is; 20.4% of respondents have no idea what molecular and cellular biology is; and 25% of respondents are not even aware of alternative energy. They also do not believe in the existence of such experts as a foresight specialist (62.8%), an expert of creating unborn child's image (52.2%), living systems architect (46.6%). Professions evaluated by the point "believable"/"unbelievable" are taken from the book called "Atlas of new professions"; this list of professions was written by Skolkovo innovation center and these professions are believed to appear in the future (Luksha P., Luksha E., Peskov, Korichin, 2014). Is the youth ready for "being launched into the future"?

In the official letter to the elected president of the United States, Donald Trump, Ginni Rometty, the CEO of International Business Machines Corporation, writes that she has supported his pre-election promises to achieve the prosperity of the country by revealing the creative potential of citizens and had made a number of proposals.

Firstly, she writes about the appearance of a new class of specialists to fill "newcollar" jobs, and whose professional skills will be used in such areas as cybersecurity, data science, artificial intelligence and cognitive business.

Secondly, to prepare such specialists, a new educational model should be used. Thirdly, supporting Trump's idea about investing in America's infrastructure, she says: «The country should focus on infrastructure investments that incorporate Internet of Things (IoT) technology and artificial intelligence to improve performance. And as the infrastructure gets smarter, it also increases the need for cybersecurity, so that vital networks cannot be compromised. We recommend that your infrastructure package include incentives for states and localities to build intelligent – and secure – roads, bridges, buildings, and other public facilities» (Rometty, 2016)..

Her proposals also include the reforming of the public health system and the tax system and etc. It should be noted that all proposals are based on new approaches to the preparation of specialists using advanced data analytics, data center consolidation, and the use of cloud technologies to improve the cybersecurity of key government systems (Rometty, 2016).

This paper tries to clarify the question about the necessity to form qualitatively new understanding and attitude to innovation among the youth using educational tools. Authors use original study results carried out at the Department of Social Communication at Tomsk Polytechnic University. The key task of the research was to elucidate students' technological literacy and to get their ideas about the development of future technologies. In conclusion, the elements of a new education paradigm aimed at forming a single integrated picture of the world are formulated.

2. Literature Review

Kurchatov Institute was the first one that began to think about changes in the technological structure of modern society and the need to create a new educational system due to these changes. First, the theory of interdisciplinary started to develop in Moscow Physical and Technological Institute together with Kurchatov Institute; and then this ideology of education and research led to creating the Department of

Nano-, Bio-, Information and Cognitive Technologies (NBIC). First students for this program were enrolled in 2009.

The formation of fundamentally new technological culture, new technological civilization culture is carried out based on research convergence, nature-like technologies and systems with fundamentally new properties including anthropomorphic ones. At the first stage of interdisciplinarity, convergence takes only cognitive technologies (the study of consciousness, physiology and brain functions, reflection of brain activity and mind in the behavior of animals and people) as a humanitarian component of knowledge. First, this component of NBIC was aimed at the “animation” of created systems giving them mental functions like thinking, emotions, perceptions etc. But in the development process of this knowledge component, another component (socio-humanitarian technologies) was added. The key task is to turn the developing technologies to advantage for people and society.

Physicists have already made a turn to humanitarians. Accelerated development of society, social system formation of global scale, new challenges: potential reduction of oil reserves, extreme natural disasters, appearance of mobile diseases and refugees require a new paradigm based on the synthesis of sociological theories and other sciences. Scientists who believe that sociology and natural sciences have a common field for research succeed in understanding these realities. John Urry in his paper «Climate Change and Society» includes the analysis of climate change, world of objects, technologies, machines and natural environment studying society (Urry, 2011). He states that social and physical worlds are closely intertwined, and dichotomy between them is an ideological construct that should be overcome.

3. Research methods

A comparative analysis is used as a key research method; the research method known as survey questionnaires is applied to collect the data of a sociological research. There were 697 respondents from more than 40 higher education institutions. They are students from Russian and foreign higher education institutions mainly from Great Britain and the USA. The survey involves young people aged 18-21 (79.1%) and about two-thirds of respondents are female and one-third of them are male.

4. Analysis & Findings

The world that lacks resources needs social technologies to replace the dominant consumer model of human behavior. Post-carbon sociology helps to build a post-carbon society. Moreover, it suggests the theoretical development of institutional and legal structures that would implement “innovative resource limits”.

The problem of reducing harmful emissions into the atmosphere, especially CO₂, is solved by the efforts of world society, mainly by changes in corporate policy. A lot has been done in this direction; the results are not always positive, but environmental security and sustainable development have become a part of the corporate strategy for leading companies (Mathur, 2014). Today, scientists notice that emission reduction depends on individual choice and behavior in general (Durand-Daubin & Caron, 2014; Parker, Letelier & Muñoz, 2013; Altenburg & Reusswig, 2011). About 40% of all greenhouse gas emissions is the result of private household activities and the figure can be higher if indirect effects of private consumption are taken into account. Individual energy consumption is a great factor for increasing

the emission rate but the change of the individual behavior model can also reduce this rate. This problem became serious when the Third World countries (India, China, Latin America) with their huge population joined the association “advanced energy consumption”. It emphasizes the importance of the transition to low-carbon economies (Parker, Letelier & Muñoz, 2013), green electric power.

The promotion of social models of low-carbon energy consumption includes lifestyle analysis connected with the current energy consumption. It also includes stimulation of a lean behavioral model and assessment of effects.

This kind of research is more fruitful in Europe. The social patterns of primary energy consumption (lightning, cooking, heating/cooling and transport) are connected with lifestyle. The widespread of social structures with the models of low-carbon and resource efficient consumption is lacking in developing societies. They can be found in the upper and middle classes of society (Parker, 2014). This is explained through the concept of post-materialistic values suggested by R. Inglehart (Inglehart & Welzel, 2005).

Despite the fact that countries have different cultures, social and economic development changes their positions due to some values. As labour forces move from the agricultural sector into the industrial one, there is always a shift from traditional values to secular-rational values. Moreover, when they move from the industrial sector into the service sector, there is another shift of value orientations (from survival values to self-expression values). Those who have post-materialistic values are economically secure and they are more sensitive to environmental threats.

Personal protection increases the capacity for empathy and intensifies consciousness of threat. Confirmation of self-expression values form humanist perception of threats. It is fundamentally different from the egocentric perception of threats that is the basis of survival values. Consumption is not only the satisfaction of basic needs but it is a lifestyle with free choice.

Having undertaken some studies in 2010-2011 in Great Britain, the Netherlands, Germany, Czech Republic and Hungary, C. Altenburg and F. Reusswig (2011) established how intervention elements such as information on energy saving, goals setting and motivation for their realization influence changes in household behavior in terms of energy consumption. The questionnaire had such questions as values, perception of climate changes, life style connected with energy consumption leading to CO₂ emission. This study and its results show that motivation increases the transition probability to a new type of energy saving behavior. However, the authors consider that this study should be supplemented by the study of environmental factors influencing the household behavior, urban living conditions, i.e. to understand how the environment allows maintaining an individual low carbon lifestyle.

Behavioral changes in terms of energy consumption can be done institutionally (tariff stimulation (it means to shift their electricity consumption from peak to off-peak time)), and this can form a resource-saving consciousness. M. Durand-Daubin, C. Caron (2014) found the following: the way people perceive these stimulating innovations, whether they influence their daily way of energy consumption, what the shift results of the energy consumption peaks studied with the help of load shedding remote signals are.

J. Rueckert-John, M. Jaeger-Erben, M. Schäfer emphasize the importance of social innovations such as do-it-together, strategic consumption, community based consumption, do-it-yourself, new offers for consumption (Rueckert-John etc., 2014).

Changes in the technological structure lead to the changes in socio-economical structures and dominant forms of consciousness. This happened in the Neolithic Revolution and led to the appearance of

settled agriculture and cattle farming instead of hunting and gathering. The Industrial Revolution led to not only the birth of factory production, appearance of new classes of proletariat and bourgeoisie but also to fundamental changes in consciousness: rationalization and secularization. But having mastered some technologies influencing the world, man has imagined himself the Crown of Creation. In the past, Pierre-Simon Laplace told Napoleon that people did not need the conceptions of God to explain the world. This anthropocentric worldview is criticized as this consumer behavior to nature has led to such big global problems as pollution, ozone layer depletion, depletion of natural resources etc. Although the idea that a man is the king of nature is destroyed, human interaction with nature has not changed. It is connected with slow changes in engineering capabilities of present-day technology, uneven development of some countries and regions and slow changes in stereotype consciousness. Consumerism as a dominant of cultural and economic behavior and economic profitability as a priority of ecological security are two main components of archaic consciousness of modern man that should be changed under the influence of mass media and the educational system.

Consumer consciousness is also known as a consumer ideology or consumerism. The basis for these concepts is overconsumption, when consumption serves not for vital needs satisfaction and products have not only utilitarian values but also symbolic meaning. Their purchase and demonstration are indicators of person's significance and successfulness. A person demonstrates his/her high social status through purchases and this is a universal cultural component. In the Arsacid Kingdom (The Kingdom of Armenia), only the king had a right to wear red boots on both feet. All the aristocrats might wear only one red boot. There are many other historical examples of such high status demonstrations. The aristocratic status gave the right to have and demonstrate some things. In today's modern society, the things that can be easily bought demonstrate person's social status. These things can tell not only about person's wealth but they also can be the markers/indicators of taste, outlook, social status and other qualities of a person.

The idea about the possibility to achieve social superiority through consumption allows a consumer to believe in the fact that the act of purchasing can satisfy more than the purchase itself. Human happiness depends on the level of consumption and consumption is the goal and meaning of a human life. To give up on any addiction is extremely difficult and it is more difficult to do if this addiction does not demonstrate visible destruction but strengthens person's social status. Moreover, consumerism becomes an unnecessary waste of resources.

Nevertheless, there is an opposition to consumerism in today's society. We are not going to tell about spiritual practices that teach people to follow the idea of righteousness, we want to tell only about a social side of a human life. Anti-consumerism is a sociopolitical ideology that is opposed to consumerism, and it is against equating the level of personal happiness to the level of acquisition and consumption of material goods. It is believed that materialism creates greed, crime, conflicts between social groups in a society, wars that lead to the environment degradation and cause mental illnesses.

However, the fundamental attitude to conspicuous consumption can be changed only by formulating other markers/indicators of social superiority. The social environment is regulated by competitive relationships that involve visible signs of victory. These signs may be a bunch of Indian scalps on the belt or alchemist's secret knowledge. The problem of today's culture of the Western type is that the symbols

of superiority are only money and material benefits that can be bought. The destructive force of values and norms of society, misunderstanding of success symbols were described by Robert King Merton in the middle of the XX century (Merton, 1938). Analyzing the so-called “American dream”, he concluded that the situations when socially approved goals (for example, to become rich and famous) cannot be achieved with the help of socially approved means (for example, excellent study, and honest work) give rise to different forms of deviant behavior. Thus, it causes harm to society and environment.

5. Conclusion

It should be noted that such questions as what prevents the development of sustainable thinking, what should be done to promote resource-saving technologies might be the subjects of serious research.

Two main points have been discovered in the course of the study. These are: 1) young people do not understand what advanced technologies are; 2) young people are unaware of their personal responsibility for process safety in the future. Thus, a new paradigm of engineering education can be based on the following principles:

- recognition of a social and natural environment unity;
- taking into account characteristics of developing societies with high risks of both natural and technological, social and political ones;
- recognition of personal responsibilities due to social and humanitarian knowledge to support and justify the need for the transition to resource-efficient and nature-like technologies;
- recognition of personal responsibilities to form such skills of future engineers as social responsibility, culture of sustainable thinking.

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References

- Altenburg, C., Reusswig, F. (2011). Combining information, goal setting with an implementation intention to reduce household energy consumption. *Sustainable Consumption Towards Action and Impact. International scientific conference*. 68-69.
- Durand-Daubin, M., Caron, C. (2014). Involving People in the Mitigation of Electric Demand Peaks: Attitudes and Behaviours in a Peak Pricing and Load Shedding Experiment. *XVIII ISA World Congress of Sociology*. 245-245.
- Inglehart, R., Welzel, C. (2005). *Modernization, Cultural Change and Democracy: The Human Development Sequence*. Cambridge: Cambridge University Press.
- Luksha, P., Luksha, E., Peskov, D., Korichin, D. (2014). *Atlas of new professions*. Russia.
- Mathur, N. (2014). Corporate Initiatives for Sustainable Development: Some Case Studies and the Task Ahead. *XVIII ISA World Congress of Sociology*. 625-625.
- Parker, C. (2014). Social Patterns of Energy Consumption and Lifestyles: Towards a Low Carbon Society? A Study in Chilean Society. *XVIII ISA World Congress of Sociology*. 744-745.
- Parker, C., Letelier M., Muñoz J. E. (2013). Climate Change and Agency in a Developing Society: the Chilean Case. *Environment, Development and Sustainability*. 15(5). 1337-1363.
- Merton, Robert K. (1938). Social Structure and Anomie. *American Sociological Review*, 3. 672-82

- Rometty, G. (2016). IBM CEO Ginni Rometty's letter to the U.S. President-elect. Retrieved from <https://www.ibm.com/blogs/policy/ibm-ceo-ginni-romettys-letter-u-s-president-elect/>
- Rueckert-John, J., Jaeger-Erben, M., Schäfer, M. (2014). Social Innovations for Sustainable Consumption – a Typology for Their Political Promotion and Further Development. *XVIII ISA World Congress of Sociology*. 828-828.
- Urry, J. (2011). *Climate Change and Society*. Cambridge: Cambridge University Press.