

Troublesome Evaluation of Technological Innovations. Balancing Between a Blessing and a Bane of the Technological Progress

Kłopotliwa ewaluacja innowacji technicznych. Balansowanie między dobrodziejstwem a przekleństwem postępu technicznego

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Abstract

Technological innovations are the driving force of the technological progress. They must be multiplied and accelerated so that people could live, the humanity be preserved, to survive in a world full of threats, to develop people, to improve the standards of living and to satisfy ever growing needs. For this reason, we assess them favorably. On the other hand, however, there are certain disadvantages because they generate different and serious threats to people and the natural and social environments. This includes nuclear, chemical, biological, psychological and information weapons, as well as robotics, use of pesticides, genetic engineering, and interference of techniques in the consciousness and the sub-consciousness of men. Certain threats manifest immediately and others – after a long time, like ticking time bombs. Therefore, the evaluation of innovation is very troublesome. It is also problematic and ambivalent because of the huge diversity of people who make the assessment.

Key words: technology, civilization, progress, evaluation, mankind

Streszczenie

Innowacje technologiczne są siłą napędową postępu techniki. Koniecznie trzeba je mnożyć i przyspieszać, żeby żyć w ogóle, zachować ludzkość, przeżyć w świecie pełnym zagrożeń, rozwijać się, mieć się coraz lepiej i zaspokajać wciąż rosnące potrzeby. Z tego względu oceniamy je dobrze. Ale z drugiej strony, oceniamy je źle, ponieważ stwarzają różne poważne zagrożenia dla ludzi i środowiska naturalnego oraz społecznego. Chodzi tu o broń jądrową, chemiczną, biologiczną, informatyczną i psychologiczną, jak i o robotyzację, chemizację, inżynierię genetyczną oraz ingerencję techniki w świadomość i podświadomość. Jedne zagrożenia dają znać o sobie natychmiast, a inne po dłuższym czasie, jak tykające bomby zegarowe. Dlatego ocena innowacji jest wielce kłopotliwa. Jest też problematyczna i ambiwalentna ze względu na zróżnicowanie ludzi, którzy jej dokonują.

Słowa kluczowe: technika, cywilizacja, postęp, ewaluacja, ludzkość

*The technology will reach such perfection
that man will be able to do without himself
(Stanisław Jerzy Lec)*

The technology ensures that people live, and the human species survives in the struggle with nature. It also helps people win in the competitive struggle in various aspects of social life, especially in the military, economic and political spheres. Thus, from the

beginning, keeping this in mind, the man constantly develops technology – improves technical devices and modernizes technologies. Thanks to this, the progress accelerates proportionally to each new innovation. The principle of acceleration, like in the development of civilization (the progress of civilization depends, after all on the technical progress) applies here. It is necessary to accelerate technological innovations so that people could live, the humanity

be preserved, to survive in a world full of threats, to develop, to improve the standards of living and to satisfy ever growing needs. This shows the recent history of technology (from the beginning of the 20th century), when the number of innovations began to grow rapidly, including a lot of well-known revolutionary and epochal inventions. Technological progress cannot be stopped. Moreover, it would not do any good by returning us to the state of savagery. Then, as if on our own volition, we are doomed to the technological progress that occurs at a galloping pace.

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Some people, named *statists*, are passive observers of technical progress, fond of the past and want to preserve the world as it is out of the fear of an uncertain future, are afraid of the technological progress, while the others, named *dynamists*, are keen on all the news and fondly discover themselves and the world (Postrel, 1998). The former and the latter are guided by some subjective or objective rations in order to justify their attitudes. Technological progress results in an improvement of the quality of our life, intellectual development, greater physical and mental efficiency, growth of consumption, better, greater and more extensive satisfying of various needs, constantly changing and growing, more comfortable and faster communication (transport and connection), the ability to collect huge amounts of information and easy access to them, which reduces the bodily and intellectual effort, alimentionation of growing population, improvement of health, and many other benefits. Certainly, one could have doubts about this, because there are both advantages and disadvantages, one thing is gain and another is lost. Thus, for example, *research in the field of medicine have made such enormous progress that today – practically speaking – no-one is healthy* (Russels). Benefits of the technological progress are well known to everyone, as experienced in their daily life. At present, people are increasingly willing to take advantages of the latest technologies, more and more intricate technical devices and gadgets, to a greater extent than ever before in everyday life, work, learning and entertainment. However, in spite of the undeniable benefits of the technological progress, many people experience a growing fear of these innovations from various reasons. People do not trust the technology and are afraid of it, because it creates a lot of real and potential threats and big risks related to the nuclear, chemical, biological, psychological, and information weapons, with robotics, chemization, genetic engineering as well as the interference of technology in the consciousness and the subconsciousness. In addition, the negative historical experience from the period of industrialization, when the technology was associated mainly with machines, which were perceived as enemies and as relevant causes of exploit-

tation, unemployment and other misfortunes, lingers on. The fear of technological progress is fuelled by the mass media, which present shocking information about the risks for human health and life. Some of them are founded, others – irrational. It is hard to say why the consciousness of the masses perpetuates more what harms than what helps. Perhaps, this is the result of upbringing in the culture of prohibitions (Sztumski, 2011), where the fear prevails over the boldness and the risk of loss seems to be greater than the chance to achieve the benefits. One should think that people aware of the dangers posed by the technological progress should oppose it – they should slow its pace, reduce it to the necessary dimension and control it. However, the truth is different – the majority of people, both in the developed and underdeveloped countries, is fascinated by the achievements of the modern technology and by benefits resulting from these. Even if these people are aware of threats, they are too engaged in their paid work and affairs so they do not pay attention to any dangers. either because they do not have time or they do not want to worry too much. Therefore, these people behave like careless moths rushing to the flame which burns them. Why should they be afraid of technology, when it does so well. Why should they limit the technical progress and suffer discomfort? Is this because one day, perhaps, according to forecasts conducted by corrupt experts and pessimists, it comes to the destruction of mankind? Even if so, then it is not worth worrying about such a distant future. Indeed, it is important to focus on here and now. What if the forecasters are mistaken and this nightmare scenario will never come true, and the development of technology will, as before, help the human species in the struggle for existence and survival as well as in the pursuit of maximum comfort and well-being?

The causes of such relation to the threats of further unlimited technological development are following:

- Intentional stupefying by consumerism lobbyists undermining justifiable fears of environmentalists.
- The disappearance of future oriented thinking.
- The excessive optimism resulting from the well-known adage: *what technology spoils, it is able to repair*.
- Dissemination of exaggerated courage by proclaiming an otherwise known appeal: *Do not be afraid!* – in this context of monster technology. It grows in the power, develops and winds up the endless spiral of production and consumption to the delight of the masses and multiplies the wealth of world financiers.

Presentist thinking becomes more and more widespread. It results from the fact that people do not worry too much about their future and about the fate of coming generations, except perhaps of their own children. The most important thing is what is hap-

pening now. The technology itself does not repair anything. It only constitutes a potential, which can be used by people to repair the harms caused by it. Unfortunately, not all damages can be repaired because some are irreversible. It is well known that only a stupid person is not afraid of anything, because they are not aware of the threat and ignore it, in spite of the common sense (that is why soldiers are administered before the attack, thus boosting their courage). A man of sound mind and having the appropriate knowledge, always has fear and is not ashamed of it. And the more knowledge he has, the more he is afraid: fear is growing proportionally to life experience, education and awareness of the risk or danger. Stupidity and lack of knowledge are not only causes of disregarding threats, but also of exaggerated fear related to the use of new technologies in everyday life. It turns out that together with the formation of a knowledge society, despite the steadily increasing number of students at different educational levels (resulting in a growing number of people with diplomas, but unfortunately, less and less educated) people seldom use their reason and have growing gaps in general knowledge, especially in the field of logic, science, technology and nature (Nowacki, 1983). Computerization or the use of artificial intelligence does not help, because as stated by the American writer, artist and philosopher Elbert Green Hubbard (1856-1915): *artificial intelligence does not stand a chance against the real stupidity* (Hubbard E. & B., 1946). In addition, the current population of fools is about 80%, but will increase at an accelerated pace with the progress of civilization because stupid reproduce more and generate even more stupid people than themselves.

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Many things indicate that recently (about half a century ago), the technology began failing in fulfilling its basic function, i.e. giving people a greater chance of survival. In this respect, it could do more harm than good. Especially when the technology and its progress are managed by irresponsible people and lacking imagination, as rightly pointed out by A. Einstein: *technological progress is like an axe in the hands of a pathological criminal*¹. As stated the Flemish writer Phil Bosmans: *computers do not have a soul. In the hands of soulless people they can be dangerous* (zamyslenie.pl, 2017). The man built a lot of great devices, but is not able to properly handle them and control the technological novelties. Their consequences are unpredictable and dangerous mainly because of human own interest, corruption, greed and abuse of power. Technological innovations do not support the natural or instinctive desire to survive that is characteristic of all living beings,

¹ *Technischer Fortschritt ist wie eine Axt in den Händen eines pathologischen Kriminellen*, <http://gutezitate.com/zitat/276803> (11.01.2017).

but on the contrary, they contribute to its atrophy and therefore may accelerate the degradation of the human species in several dimensions, and even lead to its total destruction. When this happens, then – as Einstein said that: *the universe will not shed tears after the humanity*². The advancements technology and stronger interference of ingenious technological devices in the human life have a negative impact on the human relationships life environment and the important features of human species. Increasingly faster technology changes from an effective tool supporting human life in an equally effective weapon for destroying its creators and promoters. This is the effect of alienation of technology which raises concerns of many wise people and experts in various fields of science. However, their appeal to control the technological progress in the context of the idea of sustainable development is ineffective when the old primitive thinking in modern economics which prefers extreme desire of profit and increasing wealth wins in the competition with the common sense. There is no greater enemy of a man than the lack of common sense that is stupidity, because, as ancient Romans would say, *Whom Fortune wishes to destroy she first makes mad (Stulum facit fortuna, quem perdere vul)*. In addition, the number of wise people calling for a judicious attitude towards technological progress in the name of humanity welfare and its survival is much lower than the number of its uncritical enthusiasts. Thus, their ability to influence the masses is very small. *Even Hercules cannot cope with a lot (Nec Hercules contra plures)*. However, the crowd is not governed by reason or wisdom, only by foolishness. Therefore, the masses succumbing to the presentist philosophy characteristic of the neoliberal ideology are not afraid of the technology and do not care about how will their attitudes to technological innovation, actions or omissions harm the future generations.

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The technology is understood as a means by which the people satisfy their different needs, make their own life easier and expand the framework of freedom. This instrumental treatment of technology has always motivated people to technological creativity and progress. However, in the minds of the majority of people, the encoded use of technology which subdues, tames and devastates the nature, lingers on. Indeed, mainly due to these purposes, technology is reduced the Darwinian survival of the fittest. On the basis of such an understanding, the present relationship between the technology and treating it as something which allows wielding the nature and wasting its resources with impunity, was born. Therefore, Ernst Bloch rightly noted, that: *our hitherto technol-*

² *Das Weltall wird der Menschheit keine Träne nachweinen*, <http://janko.at/Zitate/Autoren/Einstein.htm> (11.01.2017).

ogy is like an army occupying forces in enemy territory (Bloch, 1954).

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The understanding of technology and the attitude towards it have changed since it has begun playing a new role. Namely, the technology has not only become a necessary tool for survival, to outwit and to consume the natural resources, but also a tool which people use consciously to transform the realities of nature and society. It is also a tool in the hands of a man who involuntarily changes himself. Modern technology is increasingly becoming a human partner in the process of realizing their existential and non-existential goals. After about a hundred and fifty years, the prophetic aphorism Ralph Waldo Emerson has updated: *people have become tools of their tools*³. This means that:

- Things that were invented in order to make our life easier become the things on which we depend in many respects.
- They control our life and, to a large extent, we rely on them in making responsible decisions.
- We cannot function without our laptops, mobile phones, televisions, etc. during work and in the free time.
- Not so long ago, after working we put our tools aside and went home. Now, we have the tools with us always and everywhere, and we must adjust our life accordingly to them.
- Things that we have created in order to help us, require our care for them (repair and maintenance) and so, in some sense, they use us as their tools.

Not without reason, more and more people talk about highly developed technological device called a *brother robot*, emphasizing the need for subjective treatment. As a result, one perceives it not as an enemy, and rather begins to relate to it like to a friend. Thus, the technology began to play an important new role in the life of people. For various reasons it seems to be more important than the previous one.

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At present, the technology simultaneously realizes two important functions:

- It is a tool of man in the struggle with the forces of nature.
- It is a partner of a human in shaping his life environment.

How long before the destructive forces of nature and unpredictable natural phenomena (tsunamis, volcanic eruptions, typhoons, earthquakes, floods, etc.) occur, directly threatening our existence? Probably one will never be able to accurately predict, fully control them and prevent their effects – as long one has to use technology to outwit the nature. On the other hand, we do not outwit other species of living creatures (with the exception of some insects, bacteria and viruses) in the Darwinian survival of the fittest, because already they are no longer dangerous for us. We are more threatened by other people. Now we increasingly often threaten the existence and survival of other species. That is why, unfortunately, we began caring for them and protecting them from extinction a bit too late.

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Following facts influenced the formation of a new way of relating to technology:

- Awareness that technology is not an addition to life, but a necessary condition for the proper functioning and survival.
- Technological progress satisfies the most sophisticated human needs, created naturally and artificially to an increasingly larger degree.
- We grew accustomed to using the most intelligent technological devices in everyday life – at work, in entertainment and while studying to a much greater extent than ever.
- Technological devices increasingly often are taking over our functions in the production, thinking, memory, calculation and even creativity; they are more and more frequently used to support or substitute our natural internal organs.
- Thanks to the technological progress in the field of cosmetics, one can freely change the appearance.
- Technological devices, above all different kind of computers and robots, which replace humans in the areas of performance, controls, are more and more distrusted by people which allows them to reduce the responsibility for their own decisions and actions (often in critical situations, a person completely relies on a device and this device, rather than them, make the choice. The man forgets that the final decision belongs to him and it is more important than that which prompts technical device. Therefore, blaming the device is meaningless).

³ *Men have become the tools of their tools* (Ralph W. Emerson (1803-1882), American poet and essayist who was called *the American Socrates* by Adam Mickiewicz).

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The process of alienation has led to the fact that modern technology increasingly gets out of control and it governs itself almost independently. The human can influence it and its development only marginally. For now, the technological progress is the work of the people, because they are the creators of innovations and inventions. However, this may change if a device will be able to reproduce itself, and improve without the participation of the people. Construction of such devices is only a matter of time and money (yet in 2005, researchers led by prof. Honda Lipson of Cornell University in Ithaca, NY, have developed a self-reproducing robot⁴). Therefore, the sense of powerlessness of people is growing in relation to the ultra-modern technological products, along with the awareness that if one cannot fight with them, it is better to live together and adapt. If one cannot stop the avalanche of technological progress, then one should get used to it. However, the problem is the question whether the possibility of adaptation of people is endless. If not, then the technological progress, which guaranteed the survival of the people, will be the gravedigger of mankind. As for now, we have to live in symbiosis with the technology for as long as possible.

For various reasons, people are connected with different kinds of technological devices and innovative technologies to the extent that they become reliant on them as if on stimulants or drugs. It is said already, for example, about the Internet disease. Surely, the ideology of consumerism has significantly contributed to this. Technological innovations, especially gadgets, which are produced in increasing amounts, have become fashion elements and indicators of modernity. Who would dare to oppose the canons of fashion or pass as someone non-progressive and be socially excluded? It is better to *be on top* and become a slave of technology. This shows a specific paradox of the technological progress. On the one hand, without a doubt, it makes us free, because it allows us to overcome the powers of nature and frees us from the constraints originating from social life, and, on the other hand, it contributes to an increasing enslavement. Edward Younkens (Professor of Accountancy & Business Administration, Executive Director of the Institute for the Study of Capitalism and Morality in Wheeling Jesuit University, West Virginia) argues that there is a mutual dependence (positive feedback) between the development of technology and freedom: freedom is a necessary condition for technological progress and the technological progress expands freedom. That is why neoliberalism creates the best conditions for

technological innovation, and new technologies promote the development of a free society, because they provide new opportunities to communicate, work, competition and deal with other people. While the older technological innovations (steam, internal combustion and electric engines, circle, incandescent lighting, etc.) boosted and supplemented human bodily powers, the today's innovations (microprocessors, Internet, cryogenics, photovoltaics, aerogels, fuel cells, radio-controlled lighting, etc.) reinforce and supplement human intellectual powers (Younkins, 2000). Man, for whom technology is a condition *sine qua non* of life, health and social functioning and who fell into the technological slavery, is not being able to control the technological progress to a sufficient degree, became a kind of a prisoner or a hostage of the technology.

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The difficulty of evaluating the technological progress results from the following reasons:

- Its role in people's lives is ambivalent.
- The results of studies on the harmful effects to health are not fully objective, because the expertises vary diametrically depending on whose behalf they are made and what company pays for it.
- Confirmation of results obtained from experimental studies can only occur after several generations.

Some of the technologies and innovations are unquestionably harmful, others do not (Unger, 2014). These mainly include all kinds of deadly weapons and ammunition, especially those that threaten the entire population. Other innovations which are not intentionally produced for killing or maiming people may cause such effects unintentionally. A good example of this is the car. In the United States, despite a number of security measures and strict observance of the Highway Code, approx. 300 thousand victims of car accidents are noted annually, and worldwide – up to 1.2 million. According to the World Health Organization approx. 260 thousand children annually die of car accidents⁵. The second example constitutes simplified technologies that enable the household production of natural drugs (opium, cocaine, etc.) and synthetic (e.g. crystal methamphetamine). Drug abuse has ruined the lives of millions of people. It is difficult to say how many, because of the lack of reliable statistics. Moreover, it is difficult to estimate the number of deaths caused directly or indirectly by illegal drugs. Though other inventions do not create a direct threat, they either generate side-threats, or the long-term threats. They become apparent with

⁴ It does not possess any useful functions with the exception of self-replication, but soon it will be possible to create robots that will replicate or at least regenerate themselves. See. B. Steele, Researchers build a robot that can reproduce, in: *Cornell Chronicle*, May 2005.

⁵ I quote from B. Wilson, Traffic Accidents Top Cause of Fatal Child Injuries, in: *NPR Science* 10.12.2008; <http://www.npr.org/templates/story/story.php?storyId=98055567> (11.01.2017).

more or less delay, and so they are similar to time bombs. Among other things, these technologies utilize lead and asbestos. In 1920, lead was added to the gasoline for economic reasons, in order to increase the efficiency of gasoline engines. After several years it was proven that these innovations are very harmful to the health of many millions of people. Lead emitted from the exhaust pollutes the air and enters the blood of humans and animals. Despite this, it is still not removed from gasoline, but its emission is limited through the use of catalytic converters, because the economic reasons are more important than environmental ones. Equally harmful are the technologies using asbestos (LaDou, 2010). The degree of danger coming from the use of mobile phones is unknown – negative effects may appear only after many years. For now, it is believed the experts lie about their harmlessness. That is why mobile phones are very popular worldwide. Currently, more than 250 million people in the US and about 5 billion around the world use cell phones exposing themselves to an unexplored risk. Another real, serious and long-term threat of technological innovation is Decerebration of people. It threatens not only each new generation, but in the future may contribute to the destruction of the whole human species. This threat is growing at an accelerated rate, proportionally to the technological progress, but especially since the so-called smart machine began replacing natural functions of the human brain – ranging from logical thinking to creativity.

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Thinking and creativity have evolved with the development of civilization from the very beginning, since it was necessary to cudgel one's brain how to survive in a world full of various threats more in natural reality than in social. Therefore, wisdom grew the fastest in the earlier stages of human evolution over thousands of years, when living conditions enforced the growth of intelligence. However, probably in ancient times, the so-called Athenian man was already at the zenith of wisdom. From that moment onward, the phase of the loss of wisdom began, above all, sequentially due to urbanization, industrialization and technological progress. As a result of urbanization, people became increasingly less mobile and more attached to their places of residence. Industrialization attached people to workplaces often for the entire life. As a result of technological progress, people become not only increasingly domesticated, because they had everything within the home, but also more lazy both bodily and mentally. Since recently, human started transforming into a couch-potato who watches TV for hours on end, and into an iPad-man, who is chained to his portable computer. The tech-

nological progress, owing to which a modern man makes his life more comfortable, weakens the need to develop his intelligence. As a result, it reduced the human ability to eliminate (by natural selection) the genes responsible for the deficiency of intelligence. Therefore, at a fast pace – in proportion to the technological progress – it rapidly reduces the number of genes that favor the development of intelligence. Thus, is in accordance with the first law of Lamarck: *the permanent disuse of any organ imperceptibly weakens and deteriorates it, and progressively diminishes its functional capacity, until it finally disappears*. In line with his second law: *all these changes are preserved by reproduction to the new individuals which arise*, we have to deal with a progressing decrease of the intelligence of people from one generation to the next. The changes in their life environment caused by the technological progress make the process of human intelligence deterioration natural and inevitable. Therefore, people will become fools a lot faster than they think. Perhaps, the nature defends itself and abreacts against destructive activities of those intruders who systematically destroy it and in this way, it wants to get rid of the human. The simplest way is to fool them systematically, because *Stultum facit nature quem vult perdere (Whom Fortune wishes to destroy she first makes mad)*⁶. Thus, the belief that the human should become increasingly smarter as a result of the natural evolution is untrue. The conviction that human species is the most intelligent and smartest among other species, is spread on the basis of achievements of technology and culture, as well as on the ground of the anthropo-chauvinism. However, it turned out that the natural and cultural evolution clearly aimed at something entirely opposite, namely at the mass and global stupidization of people. Intelligence and wisdom of people are attacked by nature and culture, but the culture fools people to a greater extent and more efficiently than the nature.

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Evaluation of the technological innovation is made by means of a variety of parameters more or less important to the life and functioning of the human, depending on the perspective from which this assessment is made. According to some people, the assessment of the technological innovation is positive, according to others – it is negative. Therefore, the evaluation by means of a single parameter or partial criteria must be relative. The absolute evaluation can be accessed using a systemic criterion. The problem is that it is not. Therefore, based on partial criteria, one would find out what is beneficial for the people, and what is harmful, what promotes or can promote their existence and development, and what creates or may

⁶ This is my paraphrase a well-known Latin aphorism *Stultum facit fortuna quem perdere vult (Whom Fortune wishes to destroy she first makes mad)*.

create threat or further fate of mankind. Then, one must make the balance of the actual and potential gains and losses. Such a procedure is neither simple nor easy. Furthermore, statistical inference is problematic, because it is rarely confirmed. Besides, due to the huge differentiation of people (racial, ethnic, cultural, etc.), one can have serious reservations regarding what is considered as good and as bad for the whole of humanity understood as global and homogeneous set of individuals. Therefore, there is no other option than to consider two extreme assessments of the technological innovations: a blessing and a curse for people, for in fact the truth lies between the two extremes. However, this ethical evaluation does not change our actions. Constantly subjected to pressures of economics, we do everything to create conditions favorable for increasing the technological innovativeness. In this way, we accelerate the progress of technology, which at one time turns out to be a benefit for us, and at another time – a curse.

References

1. BLOCH E., 1954, *Das Prinzip der Hoffnung*, Suhrkamp, Berlin.
2. DOMINICZAK M., 2017, *Księga mądrości*, <http://booklikes.com/ksiega-madros-ci-maciej-dominiczak/book> (11.01.2017).
3. HUBBARD E., HUBBARD B., 1946, *The Philosophy of Elbert Hubbard*, H. Wise & Co., New York.
4. LADOU J. et al., 2010, The Case of Global Ban on Asbestos, in: *Environmental Health Perspectives* July.
5. NOWACKI W., 1983, *Civilization and Logic: the Law of Inversely Proportional Stupidity*, Forest Hills, NOW Mail Order Books, New York.
6. POSTREL V., 1998, *The Future and Its Enemies: The Growing Conflict Over Creativity, Enterprise and Progress*, Free Press, New York.
7. STEELE B., 2005, Researchers build a robot that can reproduce, in: *Cornell Chronicle*, May.
8. SZTUMSKI W., 2011, Jeszcze jeden kodeks etyczny? Rzecz o kulturze zakazów, in: *Sprawy Nauki* No 11.
9. SZTUMSKI W., 2009, The Mythology of Sustainable Development, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol. 4, no 2.
10. UNGER S.H., 2014, *Is Progress in Technology Always Beneficial?*, <http://www.opednews.com> (11.01.2017).
11. WILSON B., 2008, Traffic Accidents Top Cause Of Fatal Child Injuries, in: *NPR Science* 10.12.2008.
12. YOUNKINS E., 2010, Technology, Progress, and Freedom, in: *Foundation for Economic Education*, January.
13. ZAMYSLENIE.PL, 2017, *Komputery nie mają duszy, w rękach ludzi bezdusznych mogą być niebezpieczne*, <https://www.zamyslenie.pl/aforyzm/komputery-nie-maja-duszy-w-rekach-ludzi-bezdusznych-moga-byc-niebezpieczne-3235274> (14.02.2017).

