Digital environment, information systems and robotics: an absolute benefit or a new economic and political threat?

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Abstract. The introduction of new technologies into all spheres of human activity is rightly perceived by the scientific community as a qualitative leap in the development of human civilization. The effect of the introduction of information achievements, breakthrough technologies and communications, the spread of electronic data exchange, digitalization of the environment, etc. contributes not only to the growth of interdependence of the world economy, but also to the rapid improvement of the life quality. Therefore, the accepted set of values defines the central role of new technologies, which are often considered an absolute good. But the authors wonder whether this is an absolute good, or whether behind the facade of the actively developing process of exploiting the world and expanding science and technology into all types of human activity there is a fundamental change in the means of production and ways of human exploitation. The authors also conclude that the digitalization of the urban environment, appearance of autopilots and navigation systems, development of modern IT and nano-technologies, improvement of communication and production technologies open the questions not only of a military, but of an economic and political nature as well. The pursuit of technological efficiency does not take into account the “human dimension”, and the humanistic and sociocultural meaning of many technological achievements gets lost. Keywords: new information technologies, information systems, robotic technology, artificial intelligence, breakthrough technologies and communication, “smart cities”, “smart house”

1. Introduction

N. Bostrom, a lecturer at the University of Oxford, was the first to systematically explore the cultural and philosophical premises of a person’s desire to acquire new abilities. In 2005, in the work “The History of Transhumanian Thought”, the scientist revealed the desire of a man to go beyond the natural borders within the framework of positivism [1]. N. Bostrom's research is extensive and deals with a class of new threats associated with breakthrough technology development. According to the researcher, there is a number of potential ethical and social problems.

Considering the phenomenon, K. Schwab and R. Samans operate with the term “Fourth Industrial Revolution” and predict the forthcoming increase in the social inequality because of the mass unemployment with the advent of robots [2]. The researchers fully agree with N. Bostrom that governments must prepare for the possible negative consequences of automated work spread in the society.
The same approach to the social problem of digitalization, robotization and development of information systems is shared by M. Ford who assumes that the introduction of new technologies brings benefits to the oligarchic top of countries, and the society will suffer from growing unemployment. The scientist proposes to solve the problem by ensuring a universal basic income [3].

E. Brynjolfsson and T. Mitchell have made a significant contribution to the study of the interdependance between economic and political risks from the introduction of new technologies into everyday reality. After an in-depth analysis, the researchers concluded that the negative consequences of automated work spread in the society were extremely undervalued [4].

The researchers, S. Russell, S. Hauert, R. Altman and M. Veloso, focus on the invention and implementation of deadly autonomous weapons systems. The scientists express fear that the development of new technologies of that character is directed against the civilian population [5]. The assumption for discussion is put forward by R. Arkin, P. Ulam and A. Wagner, implying the benefit of replacing alive soldiers on the battlefield with robots, as robots programmed not to violate the war laws (legal requirements for warfare) will be more useful [6]. The term “techno-Leviathan”, first introduced in B. Scott’s paper on the problems associated with the introduction of crypto [7], is, in our opinion, able to describe not only increasingly introduced deadly autonomous systems, but for the whole process of new technologies application, which resembles a situation when children pick up a dangerous toy to play with. Iyad Rahwan is deeply confident that artificial intelligence algorithms affecting our lives should be “transparent, fair and accountable”. He offers a conceptual framework for regulating the impact of artificial intelligence on the society. The scientist proposes “a pact between various human stakeholders mediated by machines” [8].

An in-depth analysis of the ethical perspectives of robotics and artificial intelligence development is presented in J. Torresen’s extensive scientific paper “A Review of Future and Ethical Perspectives of Robotics and AI”. The researcher concludes that misuse of new technologies carries more dangers than the technology itself, getting out of control [9]. Considering the benefits and potential dangers of introduction of engineering innovations in different spheres of human life, the robotics lecturer at the University of Bristol, S. Hauert, insists on having a “balanced discussion” on a social media platform, because “denying robotics is not productive” [10].

Some researchers take the opposite view. For example, D. Acemoglu and P. Restrepo claim that in parallel with the development of technology, the ways will be found to support the welfare of the unemployed and to cope with the risks of “smart cities” [11]. Russian researchers also positively assess the forthcoming total automation of production. Thus, the works of M.I. Velyada, V.I. Fedorova, I.S. Bondarenko [12], S.A. Tolkachev and A.D. Kulakov [13] present an analysis of the international market of robotics in terms of influence on labor resources. The researchers bring the evidence that the introduction of robotics can only have a positive impact, the automation has led to an overall increase in labour demand. Assessing the socio-economic consequences of the robotics industry rise in the USA, S.A. Tolkachev and A.D. Kulakov assume that there is no direct link between the introduction of automation and the growth of unemployment and write about “futuristic fears” [13].

Despite the fact that a significant number of scientific works has been devoted to the most important problems of the consequences of the digital environment development, information systems and robotics, the scientific explanation of the phenomenon remains insufficient, and a number of key positions are in opposition to each other. As the researchers of Edinburgh University of Napier rightly point out, most of the scientific research that deals with this problem are technological in nature. So, they emphasize that scientific research lacks social intelligence, cultural artifacts, and environmental attributes [14].

2. Research Methods
The aim of our study is to analyze the negative consequences of actively undergoing world development and the expansion of science and technology to all types of human activity. In connection with which the research objectives include:
interpretation of the digital environment essence;
- analysis of the trends associated with the digitalization of the human environment (“smart city”, “Internet things”, etc.);
- study of the negative consequences of the use of unmanned aerial vehicles for the safety of civil airlines;
- study of the negative consequences of the autonomous weapons systems and unmanned aerial vehicles use by terrorist organizations;
- study of the processes of robotization and the use of artificial intelligence as factors enhancing the processes of economic and political imbalance in the future;
- identification of a new class of threats that carry new technologies related to the activities of different countries in outer space.

In general, the research questions are as follow: How much does humanity benefit from the growth of technology? Does the process of robotization, automation, computerization, digitalization, etc., have long-term consequences in the form of economic and political negative factors? This is the problem area for analysis of the risks of new technologies development that needs more attention from the scientific community.

In accordance with the purpose and objectives of the study, we have applied a set of general scientific methodological principles and concepts.

Thus, a number of key positions were developed based on a systematic analysis of the development of new technologies in modern conditions.

The choice of functional comparative analysis as the main methodology in this study helps to focus attention on the common features and tendencies of modern technologies development in the field of digital media, information systems and robotics, to reveal the functional entity of the further explosive growth of the processes of automation, computerization, digitization, etc. The principle of empirical verifiability and objectivity, as the benchmark for which particular types of technical innovations serve, has allowed uncovering a number of possible consequences of their implementation in the form of economic and/or political risks of different levels and scales.

3. Results
Let’s start with the tempting vision of the future: the so-called “smart city”, which has many technologies, such as free wi-fi provided by the street lamps, controlled from a single center of traffic lights, lighting, parking, automated garbage collection, smart meters for utilities and public transport, information platforms, etc. All of them are connected and working online. We agree that social integration and equality are part of a reasonable and sustainable city [15], but are forced to note that the question “How hacker safe is our city?” remains open. Because of the openness of the “digital cities” to hackers, R. Kitchin and M. Dodge criticize the current concept of smart cities, as technologies contain critical vulnerabilities and are exposed to the risk of hacking exploits (computer programs designed to identify vulnerabilities in the software and used for cyberattacks) [16].

Exploits can be used at a distance, and the attack can be masked, which reduces the probability of detecting and catching criminals. In particular, in 2016 the hackers blocked the Municipal Transportation Agency in San Francisco, extorting free travel for all passengers [17]. In 2017, 35% of hospital trusts in the UK suffered from ransomware WannaCry focused on the UK health care system [18]. In 2017, in Washington, D.C., hackers attacked police surveillance cameras on the eve of the inauguration of the 45th President of the USA, D. Trump [19]. 2016 was marked by the hacker attack on the urban transport system of Moscow. Denis Legezo, an employee of Kaspersky Lab’s, easily proved the vulnerability of the system to control traffic in the capital and manipulated the transport sensors [20]. The hacker confessed that it was easy because the manufacturer’s instructions for the sensors were available on the Internet.

Cesar Cerrudo, a CTO of the research security company IOActive Labs, decided to affect remotely the operation systems of the traffic control to identify the vulnerability in the software of “smart cities” [21]. Having selected as a test platform a number of high-tech cities worldwide, the researcher found
that by using unmanned aerial vehicles (UAVs) it is possible to control the switching of the traffic lights in every capital of the world. The general opinion of the specialists is that the greatest damage that can be caused is the capture of the city energy system (when nuclear reactors, airports, metro, mobile communication stop functioning, it also affects hospitals, malfunctions occur with the water supply, etc.) [22]. For example, in 2003, in the United States, several people died after a power outage in several cities of Ohio because of a failure in the software. The financial damage then amounted to $ 6 billion. The leaders of the grouping “Brigades of Abu Hafsa” that belong to the al-Qaeda terrorist organization, said that it was the “operation quick lightning” carried out by the order of Osama bin Laden, “The Soldiers of Allah plunged the lives of Americans into darkness, just as the American fugitives plunged into darkness the lives of the Muslim peoples in Iraq, Afghanistan and Palestine. The Americans lived a black day that will never be erased from their memory, a day of fear, horror and anxiety. Now they know what anarchy and chaos are” [23].

Scientists rightfully express concerns that city authorities and governments that purchase software do not test the security systems. Moreover, there is no proper level of data encryption and a general lack of strict security measures. Given that by 2020 about 50 million devices will have been connected to a global network of the “Internet of things”. It is easy to imagine what a global opportunity attackers have, for they are able to manipulate the intelligent system of water supply or electricity, ATMs, wastewater facilities, traffic control, etc. In the case of a large-scale cyber attack the digital system's failure threatens to create chaos.

Another acute socio-political discourse was started after the events in London’s Gatwick airport (the second busiest airport after Heathrow) in December 2018. It had been closed for 36 hours because of the unidentified UAV, unmanned aerial vehicles (drones). According to the operating director of the airport, Chris Woodroffe, only the measures taken by the military men, allowed “a small part of the passengers” to take their flights [24]. The remaining 120 thousand passengers stayed in the terminal for more than a day, but despite the chaos and collapse that prevented most passengers to get home for the Christmas holidays, passengers noted that they preferred to obey the security decisions [25]. The UK government offered a reward of $ 63,000 for information about the criminals who used a UAV, but they were never found. The airport was subsequently forced to spend $ 6.3 million dollars to install the UAV detection systems. Experts say that seemingly innocuous drones can be very dangerous. A small in its size RC quadcopter can be a cause of an airplane crash.

In Canada, in 2007, a drone collided with an aircraft, whereby the aircraft’s wing was damaged. Although the aircraft was able to land successfully, the head of the company QuantumAviation working in the field of aviation safety, says that at first glance a fragile quadrocopter contains large batteries, and getting into an engine or a fuselage, drones become many times more dangerous than birds [26]. Robot researchers at Imperial College London claim that “a drone weighing more than two kilograms can damage a cockpit glass” [27]. The USA Federal Office of Civil Aviation, together with the experts from the NATO Alliance, dealing with security of unmanned aerial vehicles, came to the conclusion that a quadcopter on the way of an aircraft is a high risk, since the drone stuffing of lithium-ion batteries is not destroyed, but becomes the cause of fire in the body of the aircraft. The world community is worried about the fact that only in 2017 there were 92 cases of drone and aircraft dangerous approaches recorded [27].

A great public resonance was caused by the actions of the ISIS militants who use the UAV for intelligence, strikes and propaganda [16]. To be fair it should be noted that the pioneer in the use of controlled drones that carry ammunition was Israel, still having armed drone “Harpy” (carrying munitions drone of IAI type). How military experts write, such drones patrol in the air for more than 7 hours and can be operated at the distance up to 500 km. The operator on a control station finds a target and sends a “Harpy” to it and explodes a warhead weighing up to 32 kg. ISIS fighters had the opportunity to use the gadget for transferring of TNT weighing up to 1 kg with fuse percussion, and manually via a standard control channel Lightbridge to strike the Syrian provinces of Damascus, Idlib, Homs. UAVs of the “aircraft” type are able to stay in the air for more than an hour, and the radius of their destruction is 100 km.
The use of “helicopter” type quadcopters (Phanton II and III class) by the ISIS fighters prove to be more successful since they have a positioning system in the absence of a GPS signal (the “aircraft” type loses its position in the failure of a GPS signal). Phanton II and Phanton III carry up to 1300 grams of load, which indicates a relatively high carrying capacity, and with two explosive devices can easily maneuver in any urban area up to 25 minutes. As a result, with the help of drones, the militants were able to destroy a “soft” fuel tank in Mosul from New Jersey, USA (manufactured by Aero Tec Laboratories, Inc), several units of tankers and lightly armored vehicles. In January, 2018, with the help of a drone bomber, an explosive charge was delivered to the open hatch of the Iraqi Hammer, which was transporting ammunition for the Iraqi army. It should be noted that to teach to use drones ISIS organized “schools for media training and development” for all comers, including teenagers.

Many previous achievements in the development of drones can be surpassed by a unique tiny FlyCroTug drone developed at Stanford University. FlyCroTug can penetrate into any room through the ventilation hatches, then put a loop on the door handle of the locked room, fix itself on the wall and pull the cable effectively to open the door. The engineers and scientists who developed the drone claim that it is intended to help people during accidents and blockages: move the first-aid kit, deliver water, means of communication, tools, etc. since it is capable to move objects 40 times heavier than it is [28]. But it is so easy to imagine how, where, by whom and for what purposes these drones will be used after their launch into the commercial production.

In turn, the firms involved in the development and sale of drones do not offer the ways to neutralize the software and hardware of drones in the zones of limited use, since they fear of a decrease of the demand for the products. The above factors indicate that commercial production and sale of drones refers to focusing events, that is, those events that should not remain without an appropriate political reaction, that should direct public attention to various aspects of the problem. Another aspect of this problem is the lack of extensive UAV detection systems, which are currently deployed only in the territory of superdeveloped states.

To the factors enhancing the processes of economic and political imbalance in the future, we relate the process of robotization and the use of artificial intelligence in industrial countries. Such a statement, at first glance, seems fantastic. However, the Director of the IMF (International Monetary Fund) Christine Lagarde, delivering her speech in the high-level Panel of the UN on economic empowerment of women in the New York Council on International Affairs in September 2017, noted that the introduction of modern technologies will negatively affect the economic sphere of several countries, including some highly developed ones. In this case the indicator of the negative phenomena would be unemployment. The IMF Director attributed the jobs occupied by women to a particular risk group, “the processes of robotization and the use of artificial intelligence in the coming years will lead to the disappearance of some jobs, and women will be affected stronger than men”, said Lagarde. According to the head of the IMF, “11% of jobs that are now occupied by women worldwide, will be affected in varying degrees, or even disappear”, and the processes of robotization will impact, in varying degrees, 7% of jobs occupied by men. “In other words, in 30 industrialized countries, the processes of robotization will affect 28 million women, and if we extrapolate these estimates to the whole world, in varying degrees, they will affect 280 million women, unless some action is being taken to retrain them for other professions... and to solve this social problem a political solution should be worked out”, said the head of the IMF [29].

But we can rightly say that under the risk not only women are, as there are some recent developments in the field of male labour replacement. The Ministry of business, energy and industrial strategy of the United Kingdom has invested about $ 9 million [30]. The research project is titled “micro-Robots”. On a competitive basis, this research is delegated to four leading universities in the USA, and the first achievements in this field will be used for servicing underground communication networks of the UK. The solution to this problem will cause a real revolution in the repair of city infrastructure around the world, as the scientific research in this area has been conducted for a long time, and different versions of robots-repairers intended for autonomous check of underground pipes exist in different countries. But such works as digging in urban areas, demolishing of asphalt...
pavements and repair of damaged pipes, until the recent time, remained a daunting task for modern robots. In the long term the project involves the creation of “inspection bots” of a size less than a centimeter. The army of bots will have bigger supporters to repair the found damages. Robot inspectors carry diagnostic equipment and are able not only to move quickly on any surface, but also to swim and fly. In contrast, the “working” robots will have the energy and the working substance to clean and to install patches on the pipe using the cable. The economic effect is expected to be huge, because only in the United Kingdom annually they have 1.5 million roads excavations, leading from idle transport time to billions of dollars in damages (up to 6.3 billion a year). This leaves a question: Does this multi-billion-dollar economy with the use of robots mean good for the workers who were previously employed in these industries?

With the rapid development of robotics all areas of physical labor application in the world will gradually get extinct. For example, today there is a full version of a robot bricklayer “Hadrian X”, which is able to build a one-bedroom house literally from a scratch. The Australian company completed Fast Brick robot construction in 2015. And the company can be proud of it because the laser alignment system of a robot bricklayer involves laying blocks and bricks of different sizes and combinations with an accuracy of 0.5 mm. “Hadrian X” is equipped with a 3D model software, allowing to calculate the position of each block or brick in a building under construction. It is noteworthy that the concrete slab construction of the house is inspected with the laser scanner, which critically evaluates the construction according to all the requirements and standards. The robot Builder is accompanied by a 28-metre articulated telescopic boom crane that loads and stacks bricks together with the help of special glue. Therefore, we can assume that the construction companies that are interested in quality construction in the near future will purchase these robots, which will lead to significant male unemployment around the world.

Risks of a larger scale are represented with new technologies associated with the activities of different countries in the outer space. At the end of February, 2019, the chief of the U.S. Air Force Staff said that the war in the space would be possible in a few years. Unfortunately, the general is absolutely right: intelligence and communication capabilities are in the outer space, as well as on land and at sea. National interests allowed US to use the opportunity: in August, 2019, the President of the United States, Donald Trump, announced about the establishment of the U.S. Space Forces. The comment of the President was brief, “The enemies of the United States with the help of new technologies threaten American satellites” [31]. Analyzing this position, we note that the militarization of space and the competition for superiority in the space represent a threat to everyone’s safety. And given the plans of the American company, Space Tango, to build a space robotic factory, “ST-42”, in the earth orbit in the next few years, we understand that the time has come for new ways of controlling the environment. On the other hand, humanity hopes that the new technology, including the organization of production in the space based on new possibilities of the environment, will truly bring salvation to people from certain incurable diseases, will bring additional opportunities and comfort into the lives of people.

We have discussed some of the technogenic factors, which could negatively affect the future of the mankind. Along with the digitalization of the urban environment, “smart cities” and “smart houses”, technically advanced household appliances and cars, autopilots and navigation systems, there are still vital and open topics for discussion, namely: How will the rights and freedoms of a man in the age of information transparency be ensured (provided a chip implantation and tracking tools, managed via a satellite, will be implemented)?; What will the limits of the authorities control be?; Will the communities become more integrated and interact outside the boundaries of the countries?; What will be the consequences of new technologies application and growing capabilities of criminal groups?, etc. Here is also an important question: How is it possible to use most of the technologies of a “smart city” as some people have no computer skills, or possibilities to buy expensive devices and gadgets? And how will the disappearance of a number of professions affect the growth of mass unemployment because of the epochal leap of robotics? In our opinion, the social stratification of the population will become deeper in the future and the social gaps will only increase.
But, according to the researchers of the Napier University in Edinburgh, a large portion of scientific researches, that are related to this problem, are purely technological by their nature. Unfortunately, they emphasize, that there is a lack of social intelligence, cultural artifacts, and environmental attributes. Therefore, a look through the prism of chaos of the globalization era at the very complex and controversial socio-economic and political processes of our time leads to the understanding: the scientific progress and the positive aspects and advantages of globalization in the form of a single information field and a growing exchange of technological innovations lose their attractiveness due to the growing inequality in the development of countries, the increasing gap between the rich and the poor, as well as the unpredictability of political events in separate countries and regions.

4. Conclusion
Given the foregoing discussion, we have come to the following conclusions:

1) we are witnessing an actively developing process of exploiting the world and the expansion of science and technology to all types of human activity;
2) the means of production and methods of exploitation of a man by a man are radically changing, moving into an artificial environment;
3) in the pursuit of technological efficiency and / or commercial profit, manufacturers do not take into account the “human dimension”, the humanistic and sociocultural meaning of technological achievements gets lost;
4) the cycles of technogenic processes are often many times higher than the rate of restoration of natural resources and landscapes;
5) the issue of female and male unemployment is acute around the world;
6) the cities become more vulnerable to hacker attacks by terrorists;
7) the outer space is becoming an arena of people’s activity, focused on the domination over it and the development of the military-industrial complex.

In this regard, we should consider the following:
- firstly, political decisions, regarding the growth of mass unemployment around the world and the critical attitude towards manufacturers, promoting technical devices on the mass market, are potentially dangerous when used by dishonest people;
- secondly, governments when purchasing software solutions for “smart cities” should rely not only on whizz-bang functions, but also strive to provide real security for cities through testing for hacker penetration;
- thirdly, in each city there should be an operational team for responding to emergency situations related to the city software.

All of the above is associated with social transformations in various fields in the age of new technologies and makes political decisions relevant, the purpose of which, paradoxically as it sounds, is to protect people from their own achievements.

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