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Artificial Intelligence-induced Transformation of the Value Creation Paradigm in the Economy

Jan Rymarczyk

WSB Merito University Poznan, Powstańców Wielkopolskich 5, 61-895, Poznań, Poland,
e-mail:jan.rymarczyk@wsb.merito.pl, ORCID: https://orcid.org/0000-0003-4701-439X

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ABSTRACT

Objective: The objective of the article is to determine how artificial intelligence (AI) influences and can influence changes in the value-creation model in the economy.
Research Design & Methods: The article is theoretical and conceptual, based on a literature review and the author's knowledge and reflections.
Findings: The author formulates and verifies the hypothesis that AI gradually, consistently, and significantly increases enterprises' potential for value creation.
Implications/Recommendations: Replacing people with robots will increase work efficiency, accelerate economic growth, and improve people's quality of life. However, there is also the flip side. AI may cause mass unemployment and the polarisation of income within and between countries. AI-based cyberattacks may paralyse societies. Although the reality of AI becoming a general-purpose technology is quite distant, it is necessary not only to monitor and support its development but also to take actions to limit its potential adverse effects.
Contribution: The article comprehensively presents the implementation processes of various AI devices at individual stages of the value creation chain, i.e., supply, production, distribution and communication with customers, highlighting their positive effects as well as the threats. On this basis, it recommends actions to mitigate the potential adverse effects of AI implementation.

It presents the significant cognitive value of the phenomenon, which will radically change not only the paradigm of value creation but also the functioning of societies as a whole.

Article type: original article.

Keywords: paradigm, value creation, artificial intelligence, Industrial Revolution 4.0.

JEL Classification: L2.

1. Introduction

Artificial intelligence is widely regarded as a breakthrough technology that will, in the next few decades, radically change the functioning of societies. Its importance is comparable to the use of steam in the first, electricity in the second, and microprocessors in the third of the industrial revolutions.

The term "artificial intelligence" (AI) is attributed to John McCarthy, who, at the turn of the 1950s, described it as "the science and engineering of making intelligent machines" (Peart, 2020). Currently, it is defined as computer systems capable of performing tasks that usually require human intelligence, such as observing the environment, learning, understanding, thinking, reasoning, planning and making decisions (Abrardi, Cambini & Rondi, 2019; Roy, Vertesy & Damioli, 2020). Its construction draws on achievements from many fields of knowledge, primarily mathematics, logic, engineering, computer science, biology, neuroscience, linguistics, psychology, and philosophy.

There is a distinction between narrow (weak) AI, general (strong) AI and superintelligence (Joshi, 2019; Ray & Seamans, 2019; Coombs *et al*., 2020; Collins *et al*., 2021). The first is software that uses highly complex algorithms to determine action patterns from the data provided and predict how certain phenomena will unfold in the future. This type of AI can match and exceed human intelligence, albeit only in specific cases, such as solving equations or playing chess. Systems based on narrow intelligence may also recognise speech and faces, analyse images, translate texts, compose music, prepare financial statements, or operate devices such as the Internet of Things, advanced robots, drones, driverless cars, and other devices at various stages of value creation. The concept of general artificial intelligence refers to software that can perceive, understand, learn, and perform other functions at a human level. It is a system programmed to solve problems without human intervention. It is equivalent to being classified as "machines with the ability to understand and empathise." The third type, superintelligence, is a form of intelligence that exceeds human intelligence in every respect. It is the highest level of intelligence, not yet present on Earth, and it possesses self-awareness. If it comes into being, it will have incomparably greater memory capabilities for analysing data

and processes, and for predicting and making optimal decisions across all fields of human activity. Achieving this is the subject of intense research, and many scientists, offering different time horizons, claim it will arrive in quite a distant future. However, there is no shortage of sceptics questioning its possibility. Still, there is no doubt that the development of AI in companies will radically change the paradigm of their value creation, making it far more effective than the traditional one.

2. Literature Review

2.1. Development of Artificial Intelligence

There is a consensus among scientists that the development of artificial intelligence has become possible thanks to (Manyika *et al*., 2016; Ernst, Merola & Samaan, 2018; Manyika & Bughin, 2018):

– the development and widespread application of digital communication devices, such as the Internet and "cloud computing," that have enabled the collection, analysis and use of big data sets necessary for the functioning of AI;

– a drastic decrease in the cost of digital technologies; in this way, the barrier for small technological companies (startups) to enter this sphere has been reduced;

– the ability to acquire a massive amount of data, available for processing by software neural networks;

– innovations in the field of adaptation of neural networks, sensors, machine vision, algorithmic navigation, mapping and satellite technology, e.g., LIDAR1, etc. devices.

Paradoxically, the digital development of small businesses has led to the emergence of new forms of industrial concentration in the shape of eco-platforms such as Apple, Amazon, Facebook, Google, Baidu and many others that may be compared to industrial and commercial giants such as General Motors, General Electric, Bosch, Dunlop, Philips, Coca-Cola, Ford, Hewlett Packard, Daimler-Benz, Unilever, Toyota, Wal-Mart and many others.

Contemporary research on AI and its applications concerns mainly two fundamental areas of its functioning: autonomous robots and artificial neural networks (Cockburn, Henderson & Stern, 2017; Chui, Manyika & Miremadi, 2018). The most spectacular examples of the first application include industrial robots, i.e., precision devices programmed to perform specific tasks. They have a certain degree of operational autonomy within a defined environment. Specific types of robots are used in car communication (driverless cars), in aviation (drones), in medicine (robots supporting medical procedures, the so-called telemanipulators, for research

[1] LIDAR (Light Detection and Ranging) is a device that is a fusion of laser and telescope. It has been applied in meteorology, seeking for objects on land and the environment protection, to name a few.

purposes, often in an environment unfriendly to humans (e.g., space exploration), for military purposes, in training, entertainment, in care for the elderly and disabled, etc. Highly complex devices, still in the research phase, include nanorobots that interact with nanoscale objects with nanometre precision. Their application in medicine, for example, may significantly prolong human life or even make them immortal.

In turn, artificial neural networks involve hardware and software that operate on principles similar to those of neurons in the human brain. They consist of many layers of neurons that sequentially receive input data, process it, and pass it to the last layer as output. They have an extensive range of applications, including speech-to-text processing, image and handwriting recognition, weather forecasting, predicting stock exchange rates, sales volumes, and the prices of raw materials and finished products, and analysing the creditworthiness of bank customers, etc.

Refining the performance of the above-mentioned functions, i.e., their autonomous development through experience-based learning using complex algorithms and neural networks, is called "deep learning." It constitutes an advanced form of "machine learning," i.e., the process of autonomously detecting patterns in processed data and predicting future logical or physical events.

2.2. Contemporary Implementations of Artificial Intelligence

The application of AI devices across various spheres of societal functioning is gradual. It is determined by a set of factors, including progress in research and development, economic, social, and political considerations, and competition. The basic AI-supported devices include advanced robots, autonomous vehicles, the Internet of Things, cloud computing, 3D printing, big data, digital twin, augmented reality and blockchain. They are characterised by varying degrees of technological maturity and varying ranges of practical application. High-tech industries, telecommunications, automotive and assembly industries, financial services, media, entertainment, retail trade, transport and logistics, education, healthcare and professional medical services, building materials industry, construction, and travel and tourism are areas in which AI has found the most excellent applications so far. It is estimated that about 60% of all resources globally spent on the development of AI are currently allocated to machine learning, because it enables the development of many other technologies, such as intelligent robots and speech and image recognition (Bughin *et al*., 2017; Chui *et al*., 2018; Furman & Seamans, 2018; *What Countries Are Leading the AI Race*, 2023).

The higher a country's level of development, the greater its involvement in artificial intelligence research and development. Both the outlays for these purposes and the investments into their implementation are higher. Significant financial resources and research laboratories equipped with cutting-edge equipment attract talented staff

not only domestically but also from abroad. The United States and China account for the most significant research and investment activity in AI (Bughin *et al*., 2019; WIPO, 2019; Hoffman & Nurski, 2021). Germany, Japan, Canada and the United Kingdom follow suit, also achieving significant successes in the commercialisation of AI inventions due to the economies of scale and networking associated with their enormous market potential. A high level of research and implementation of AI is also demonstrated by relatively small countries that are among the most developed in the world, namely Belgium, the Netherlands, South Korea, Singapore, and Sweden. The third group includes Italy, Brazil, India, and Malaysia, whose positions are generally significantly weaker than those of the previously mentioned countries. In some areas related to AI, however, they present a comparative advantage – for example, India in the field of information technology. Meanwhile, the largest group of emerging markets and developing countries lags behind the world leaders due to underdeveloped research infrastructure, limited R&D funding, a lack of highly qualified staff, and a limited scale of economic digitisation. For example, Poland ranked 18th out of 23 countries in a study of AI readiness (Bughin *et al*., 2019).

The conducted research shows that transnational corporations focusing on the construction of cyber-physical devices, autonomous robots and vehicles, machine learning, speech and image recognition, supporting retail sales, and virtual agents are the centres of R&D and AI investment. The leaders primarily include large digital platforms such as Amazon, Facebook, Yahoo, Apple, Baidu, Google, Netflix, Twitter, LinkedIn, Instagram, and Pinterest. The second group consists of industrial corporations, including Toyota and BMW, developing autonomous cars; ABB; Tesla; Bosch; General Electric; Siemens; Microsoft; Toshiba; and many other industrial giants investing in AI related to their core businesses. IBM, for example, allocated USD 3 billion for the construction of an intelligent robot.

To increase efficiency and shorten the time to R&D implementation, large corporations enter into hundreds of strategic alliances, make mergers and acquisitions, and post complex problems on Internet platforms for competitive solutions. Establishing branches in high-tech clusters such as Silicon Valley, Seattle, Boston, Bangalore, and many others is an important way to acquire knowledge and monitor competitors' R&D progress on an ongoing basis. They enable the spill-over of modern technological solutions and the capture of talent. A critical problem is the shortage of highly qualified specialists, including scientists and engineers. To acquire them, large corporations buy high-tech startups and are willing to pay as much as USD 5 to 10 million for a high-class specialist (Bughin *et al*., 2017; Furman & Seamans, 2018). Hedge funds, venture capital firms, private equity firms, business incubators, and business angel funds are also increasingly important for investing in the AI sphere. In general, however, such investing is in its early stages and mainly concerns large companies that have already invested in AI-related

digital technologies, such as the Internet of Things, cloud computing, and big data. They view AI as the next, higher stage in the development of these technologies. They see it as an opportunity for a breakthrough increase in the innovativeness of their products, lower costs, greater efficiency, and, consequently, an advantage over competitors.

However, the vast majority of companies do not undertake any R&D or AI adaptation activities. This applies primarily to small and medium-sized enterprises and is mainly due to limited financial resources, insufficient professional staff, limited knowledge and a lack of willingness to take risks, the need to focus on current operations, and the inability to act on a large scale. Therefore, support from governments and NGOs is of extreme importance to them. Generally, AI implementation will be long-term. It is expected that, in the next 10 years, it will be used in many spheres, and in 45 years, in virtually all spheres of the functioning of the economy and society, while, in 120 years, all human work will be automated (Peart, 2020).

3. Methodology

To achieve the goals defined at the beginning of the article, the method of studying literature, subject-related items in periodicals and compact publications, and various Internet sources located on websites such as Google, Scholar, and Web of Science were adopted. A combination of the desk research method together with the knowledge and thoughts of the author, resulting from research conducted for several years on the impact of artificial intelligence (AI) and other inventions related to the Industrial Revolution 4.0 (IR 4.0) on the way in which enterprises had created value, allowed for a holistic approach to the studied phenomena and their creative interpretation. The article, in accordance with its logical structure, moves from general issues to specific research results and primarily presents the essence, development, and forms of AI, as well as the current state of its implementation in the economy. The central part of the article presents theoretical findings, supported by results from other research, on the positive impact of AI on the basic spheres of value creation, i.e., R&D, demand forecasting, procurement, supply, production, and distribution. It also includes findings on the threats posed by AI implementation and the need to take the necessary actions to eliminate them. The author's research is qualitative, using techniques such as indirect observation, cause-and-effect analysis, predictive analysis, synthesis, induction, and description. The use of these classic research techniques and the desk research method verified the hypothesis at the beginning of the article: the change in the value-creation paradigm resulting from the implementation of artificial intelligence has led to an extraordinary increase in value creation potential.

4. Discussion and Results

4.1. Positive Artificial Intelligence Effects for Value Creation

According to the general opinion of the researchers including the author of the article, AI has a vast potential and, to a limited extent, an actual positive impact on the way the companies create value by (Bughin *et al*., 2017; Bessen *et al*., 2018; Chui *et al*., 2018; Zahrani & Marghalani, 2018; Rymarczyk, 2020; Douge, 2020; Al Zadjali & Ullah, 2021; Buntak, Kovačić & Mutavdžija, 2021; Woo, 2021; Marr, 2022; Zhang, 2022):

– optimisation of research and development (R&D),

– better prediction of demand for products and services and their design,

– improvement of supplies,

– an increase in their ability to produce goods and services at a lower cost and of higher quality, and goods that are personalised,

– contribution to the increase in sales efficiency and customer satisfaction by offering goods at the right price with the correct information (advertising) and in a way that is convenient for them.

AI can significantly improve the effectiveness of R&D. Machine learning can provide information that helps researchers assess the probability that a designed product will achieve market success. Both the design and testing of different patterns of a given product can be carried out much more quickly and with better results than with conventional methods. The development of more efficient models will help reduce waste from the outset. A significant decrease in the design period will allow for a faster product launch and shorten the product life cycle. Accelerating the product innovation process will help companies gain a competitive advantage.

Forecasting trends in demand and, on this basis, designing product types, their features, sizes, and production scope is the next step in value creation chains, the effectiveness of which can be enhanced through AI. Compared with traditional forecasting methods, AI can absorb and process much more data, thereby improving forecast accuracy while reducing development time and related costs. Subjective assessment, the factor that often leads to erroneous conclusions, may be eliminated. Forecasters may follow random intuition. It may bring desired results, but it also brings failures, and it is absent in machines. Proper demand forecasts ensure the optimisation of the company's stock levels, i.e., raw materials, components, work in progress, and finished goods. Their scale will flexibly and adequately adjust to changes in expected demand.

The automation of the ordering process, including the purchase of raw materials and components, their storage, and their transfer to production, rationalises the process, resulting in time, space, and cost savings. Purchasing planning, requests for quotation, supplier financial analysis, contracting, and payments may be performed

by intelligent, autonomous devices. The Internet of Things, big data, algorithms, and neural networks enable the collection, sorting, and analysis of vast amounts of data in a predictive manner. Critical data will be recorded by sensors, collected, analysed and converted into activities performed by various cyber-physical appliances. They provide a better understanding of suppliers and markets, the identification of threats, and the selection of optimal sources of supply. Fully automated product storage and retrieval systems and their quality control can be particularly useful in warehouses with rapidly changing loads due to fluctuating demand. They will enable optimising the warehouse space and its use while ensuring an appropriate and flexible level of stock.

Production is the area where AI can contribute most to the company's growth in value. Intelligent manufacturing is based on automation and the application of cyber-physical systems that identify the environment and communicate and collaborate safely with people. They use internal and external information to make autonomous decisions, implement them, monitor the production process, and correct errors. AI enables preventive maintenance of machinery and equipment, reducing downtime from failures and extending their lifespans. Reprogramming production due to changes in demand, which typically requires human intervention and machine stopping, can be done autonomously. This is particularly important in discrete, low-volume production. Its implementation will commonly be achieved at a relatively low cost through the use of "additive manufacturing" technology, i.e., 3D printing. It involves the production of three-dimensional objects based on a computer design. According to the programmed pattern, a special device (a printer) applies successive layers of material until the final shape of the product is obtained. The widespread use of these devices will make product customisation much easier, cheaper, and better. International supply chains may thus be shortened. Complete production may be carried out at the point of demand and intensify reshoring, i.e., a reversal of locating particular segments of the value creation chain in places of comparative advantage, mainly in the form of cheap labour. The ultimate effect of using AI in production will be a significant increase in work efficiency, expressed as machines replacing people, shortened production cycles, innovation, excellent product quality, mass customisation, lower production costs, and, thus, increased scale and scope of production.

Automation and digitisation will cover the distribution process for goods. Activities related to order acceptance, packaging, labelling, shipping, invoicing, payment tracking, transportation, reloading, returns, servicing and maintenance will be performed with minimal human involvement. Here, an important role will be played by the Internet of Things, autonomous vehicles, augmented reality, and blockchain technology, i.e., a distributed and decentralised database that serves as a register

of concluded transactions and smart contracts, as well as payment systems using cryptocurrencies based on the database.

Building the right customer relationships and driving sales are other areas where AI can increase value for both manufacturers and consumers. Interactive communication between these entities is the basis for decision-making regarding product customisation. Its digitisation, the use of "cloud" technology, big data, the Internet of Things, and artificial intelligence will enable a more in-depth analysis of consumer tastes across various segments, anticipating and even suggesting tastes based on historical observations. The high quality and effectiveness of these activities should translate into close adjustment of the offers to the changing needs of customers. In turn, their satisfaction will lead to an increase in the company's size and income.

Setting the correct prices is extremely important for effective communication with the client. While introducing an innovative product, a company can use the "creaming-off" strategy, i.e., obtaining the highest possible income from sales in a short time at a high price (Rymarczyk, 2013). Alternatively, it may aim to achieve greater benefits through a "penetration pricing" strategy, i.e., a relatively low price for this product, to secure a higher market share. If there are similar products already on the market, the company will likely set the new product's price at the market level, i.e., it will follow the market price. Choosing the optimal strategy requires a complex, dynamic, real-time analysis of a lot of data to determine the price elasticity of demand. From the company's income perspective, the effectiveness of such AI analysis will likely be much higher than that of traditional methods. AI will enable companies to predict individual customers' behaviour and price sensitivity, and consequently refine their differentiation across customer groups (Goldfarb & Tucker, 2017).

AI can also help identify the company's most profitable customer segments and the promotional measures that will keep them loyal. AI devices, generally based on the registration of behavioural and demographic characteristics of customers, can indicate the most effective prices and promotion measures (rebates, discounts, coupons, gifts, samples, etc.) and even their personalisation in relation to individual customer segments. The information can be transferred to customers' mobile communication devices (smartphones) while they are shopping. It is estimated that algorithmic price differentiation can even double sellers' profits (Abrardi, Cambini & Rondi, 2019). A relatively new invention, used by Amazon, for example, enables customers to shop in-store without stopping at the checkout and to have their accounts debited automatically. Delivering purchases using drones is also at the design stage. In general, based on 2021 data, it is estimated that by 2030, AI will increase global GDP growth by 1.2% annually, i.e., by over USD 10 trillion. To a large extent, companies using AI will grow three times faster than others (Bughin *et al*., 2018).

4.2. Threats Related to Artificial Intelligence

The concentration of capital, knowledge, innovation and income in the hands of the leaders of digitisation already taking place and progressing at high speed as well as the emergence of companies that are "super-stars" in this sphere will lead to the marginalisation and bankruptcy of companies that, for various reasons, are not able to keep up with the revolutionary changes in the manufacturing technology. In accordance with the "winner takes all" principle, the space for companies that do not rely on AI to operate will be drastically reduced. A significant further widening of the gap between income from capital and labour will occur, leading to large-scale social conflict. Industrial Revolution 4.0 may trigger social revolution 4.0. Conflicts based on the modern industrial revolution may go beyond country borders and take on an international character of a clash between "AI countries" and other countries of slower development, with such consequences as enormous migration pressure from the non-AI countries and the destabilisation of the global order in trade, investments and other spheres of international cooperation.

The potential impact of AI on labour markets is the most significant source of concern. In general, AI can cause the following employment effects (Ernst, Merola & Samaan, 2018; Baecker *et al*., 2023):

– the substitution effect – robots will replace workers in many sectors,

– the complementarity effect – there will be an increase in the demand for employees necessary for the development, installation, monitoring and cooperation with robots,

– the expansion effect – an increase in labour productivity will cause a decrease in the prices of goods and an increase in the income of the population and, as a consequence, a greater demand for goods, services and an increase in the volume of their production and employment.

It is not possible to determine at present which of these effects will prove dominant. Specialists differ in their opinions, focusing mainly on the substitution effect. The negative impact of new technologies on global employment is estimated to range from below 5% to as much as 80% (Frey & Osborne, 2013; Manyika *et al*., 2016; Oxford Martin School, 2016; Berriman & Hawksworth, 2017; Bonciu, 2017; Brückner, LaFleur & Pitterle, 2017; Kurz, 2017; Marr, 2017).

There is no shortage of optimism in opinions that the decrease in employment will be compensated for by the creation of new jobs (Absenger *et al*., 2016; Aepli *et al*., 2017; Brynjolfsson, Rock & Syverson, 2017; Saithibvongsa & Yu, 2018; Badet, 2021). Assuming that the impact of technological progress on employment will be similar to that in the period of the first, second and third industrial revolutions, optimists should be proven right. However, there is consensus that employment structures will undergo far-reaching changes (Hirsch-Kreinsen, 2015; Zenhäusern & Vaterlaus, 2017). There will be an increase in the global employment share by

people with high qualifications, in particular related to the Industrial Revolution 4.0, as well as people with lower qualifications performing activities related to unique movements, interaction, physical and mental contact with the environment (e.g., nurses and healthcare professionals, the entertainment sector, catering, sports, hairdressing and beauty services, servicing, recreation and tourism related services). This will be accompanied by redundancies among workers with medium and low qualifications who perform repetitive mental and physical activities. Changes in the structure of employment will cause significant income polarisation in societies. Groups whose employment is related to AI devices will achieve very high incomes. At the other extreme, there will be people doing menial jobs and contracted workers (online gig economy). At the third extreme, there is a large group of unemployed people who are the potential recipients of the planned universal basic income (UBI) project.

In addition to those related to employment, the most serious negative consequences of AI include (Excell & Earnshaw, 2015; Schwab, 2016; Bostrom & Yudkowsky, 2018; Boukherouaa *et al*., 2021):

– Threat of cyberattacks. Hackers are already breaking through the security systems of many companies and institutions, stealing secret information and technologies, and introducing false information that can, among other things, influence the outcome of political elections. There are, for example, justified suspicions that Russian hackers who supported Donald Trump, the opponent of Hilary Clinton in the US presidential election, disseminated fake news about her;

– Privacy threat. The accuracy of decisions made by AI devices regarding the type of manufactured products, their features, and the scale of production and marketing depends on the amount and quality of information they collect and process. It can be used in ways customers did not expect or that conflict with their interests. The lack of transparency into how companies use data may lead to privacy breaches;

– Super-intelligent systems may carry out programmed projects regardless of their adverse side effects, e.g. changing the ecosystem, and they may approach human endeavours to stop that as an obstacle that should be overcome;

– The use of super-intelligent weapons by terrorists;

– Unforeseen failures of complex cyber-physical systems may cause considerable losses in industrial production, trade and finance and other spheres of functioning of societies;

– If left without supervision, intelligent machines can trigger a third world war;

– Experiments in genes can release organisms that are dangerous to human health and life;

– In general, the possibility of constructing robots with intelligence far superior to that of humans, which would eliminate humans and take over the world, is treated

as science fiction. Some researchers warn that such a scenario of AI development is real.

For the reasons cited here, there is a need for both national and international coordinated actions aimed at preventing the adverse or even catastrophic effects of AI development (Cheatham, Javanmardian & Samandari, 2019; Thomas, 2023). First of all, long-term measures should be taken in education. Graduates of various types of schools should be prepared to work with the appliances of the Industrial Revolution 4.0. Particular emphasis should be placed on IT knowledge and operating sophisticated computers. Educational institutions should teach critical thinking, practical problem-solving, creativity, social and communication skills, and flexibility to adapt to changing conditions and take up jobs that do not yet exist. Multi-channel investment in human capital and the stimulation of such activities by business entities should be a priority for the relevant authorities.

Governments should achieve a more socially equitable distribution of income – a transfer of profits from capital to income from work – through the tax system and other fiscal and financial policy instruments.

The state should strongly support small and medium-sized enterprises and new forms of entrepreneurship, especially in AI startups and venture capital.

Antitrust legislation should be strengthened, and its enforcement effectiveness increased. In light of the increasingly common cyber-attacks involving not only the interception of confidential information and instructions of companies but also making an impact on political decisions in a given country (elections) and posing a threat to the security systems and infrastructure, strong security measures, based on relevant agreements, are required to be introduced both on the national and international scale.

Regarding the protection of private data and its use, specific measures have already been taken in many countries, especially in Europe, where, among others, the General Data Protection Regulation has been introduced. However, it has an enormous capacity to download, store, and process vast amounts of data. In contrast, its ability to control these processes remains limited; the widespread use of AI will pose new challenges.

In parallel with research on the development and application of AI, scientists should develop effective systems to protect against the possibility of its autonomous actions that are incompatible with people's intentions and interests.

Striving for success may cause some scientists to exceed acceptable ethical and research-safety limits, leading to the effects of their research spiralling out of control. These valid fears are shared by many experts dealing with the problem, including Stephen Hawking, the late astrophysicist; Bill Gates, the founder of Microsoft; and Elon Musk, the founder of SpaceX and the designer and organiser of private space flights (Metz, 2023).

In general, the activities of the authorities of individual countries and international organisations in the field of AI should consist of supporting its development, as well as of reducing, through appropriate legislation and administrative action, the risk of its use that would pose a danger to people.

5. Conclusions

AI should provide applications that will significantly reduce costs across various spheres of the economy and the functioning of society, increase labour productivity and income, and enable a more ecologically sustainable use of natural resources. Thanks to AI, the pace of economic development in countries that implement AI-based appliances in practice and the well-being of their societies should increase.

Apart from the undoubted benefits, however, AI also carries significant risks. Although some of them, such as AI surpassing human intelligence and robots eliminating humans, seem like science fiction, the most significant real threat lies in their possible impact on labour markets, i.e., causing mass unemployment. A real threat with unimaginable catastrophic consequences may also be the use of AI by terrorists. There are also areas where potential changes will bring effects that are difficult to assess unequivocally. These include transhumanisation and the expected, practically indefinite extension of human life through gene interference and the use of nanomedicines. The fact that the world is already struggling with overpopulation poses the question of what would happen if people were to become "immortal"? It is currently impossible to predict which of the scenarios for AI's development will come true. It can elevate value-creation processes to an unimaginably high level of quality and, consequently, lead to a massive increase in social well-being and quality of life. However, it may result in catastrophic consequences.

Therefore, actions that would stimulate AI development while preventing Armageddon are necessary. Some actions, such as investments in human capital and public safety, and a fairer distribution of income, can and should be implemented by the authorities and institutions of individual countries. Others will require cooperation between countries and the activities of international organisations. These include establishing the ethical and safety boundaries of the research and its supervision, as well as eliminating the widening gap between highly developed countries and others in terms of technical development and income. The extreme importance of the discussed issues requires constant observation of the changes taking place, their predictive and prescriptive analysis, and on this basis, taking measures adequate to the needs. The article's word limit prevented the inclusion of case studies that would undoubtedly have enriched its content.

Conflict of Interest

The author declares no conflict of interest.

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