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IMPLEMENTATION OF DIGITAL SUSTAINABLE DEVELOPMENT CONCEPT IN MODERN ECONOMIC CONDITIONS

Nikitenko V.O.

Zaporizhzhia National University, Engineering Institution
Ukraine, 69600, Zaporizhzhia, Zhukovsky str., 66

vitalina2006@ukr.net

ORCID ID 0000-0001-9588-7836

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The article is devoted to the actual problems of implementation of digital sustainable development concept in modern economic conditions, which are discussed in the context of theoretical and practical discourse. The author accumulates existing approaches to the problem of implementation of digital sustainable development concept in modern economic conditions, highlights the focus points of the topic, and investigates the problem field of the mentioned problem. The author studies scientific publications devoted to the problems of implementation of digital sustainable development concept in modern economic conditions. The article discloses that innovation is the focus of science studying complex systems and knowledge is generated through the constant retrieval of information from the external environment through education and training, requests and specifications, measurement and feedback, resulting in a direct accumulation of experience. The author concludes that technological development enables us to create more efficient renewable resources, but despite the rapid development of technology and the introduction of innovation into production, the amount of non-renewable resources is still limited, and even in the case of such minerals that have not yet become a resource to developing countries. The article analyses that in order to implement the concept of sustainable digital development, it is necessary to take into account the development of modern trends of modern society - information, economic-financial, spiritual-philosophical, demographic, climatic, contributing to the continuous change of the modern world, determined by digital technologies that cultivate the digital economy and digital management. The digital economy is not a machine operating on the surface of the world; it is embedded in it as a heart and circulatory system, so it should be directed to reform the economic structure in the formation of the digital world, in the development of institutions and policies between digital and planetary borders.

УПРОВАДЖЕННЯ КОНЦЕПЦІЇ СТАЛОГО ЦИФРОВОГО РОЗВИТКУ В СУЧАСНИХ ЕКОНОМІЧНИХ УМОВАХ

Нікітенко В.О.

Запорізький національний університет, Інженерний інститут
Україна, 69600, м. Запоріжжя, вул. Жуковського, 66

Ключові слова:
планетарні кордони, економічна структура, стійкий розвиток, цифровий розвиток, цифрові технології.

Статтю присвячено актуальним проблемам реалізації концепції цифрового сталого розвитку в сучасних економічних умовах, які обговорюються в контексті теоретичного та практичного дискурсу. Накопичено існуючі підходи до проблеми впровадження концепції цифрового сталого розвитку в сучасних економічних умовах, висвітлює основні моменти та досліджує проблемне поле зазначеної теми. Вивчено наукові публікації, присвячені проблемам реалізації концепції цифрового сталого розвитку в сучасних економічних умовах. Розкрито, що інновації – це фокус науки, що вивчає складні системи, а знання формуються за рахунок постійного пошуку інформації із зовнішнього середовища через освіту та навчання, запити та технічні характеристики, вимірювання та зворотний зв'язок, що призводить до прямого накопичення досвіду. Зроблено висновок, що технологічний розвиток дозволяє нам створювати ефективні відновлювальні ресурси, але,

незважаючи на швидкий розвиток технології та впровадження інновацій у виробництво, кількість невідновлюваних ресурсів все ще обмежена, і навіть у випадку таких корисних копалин, які ще не стали ресурсом для країн, що розвиваються. Проаналізовано, що для реалізації концепції сталого цифрового розвитку необхідно враховувати просунення актуальних тенденцій сучасного суспільства – інформаційного, економіко-фінансового, духовно-філософського, демографічного, кліматичного. Це сприяє постійним змінам сучасного світу, що визначається цифровими технологіями, які розвивають цифрову економіку та цифрове управління. Цифрова економіка – це не машина, що працює на поверхні світу; вона вбудована в неї як серце та кровоносна система, тому її слід направити на реформування економічної структури у формуванні цифрового світу, у розробці інститутів та політики між цифровими та планетарними кордонами.

Statement of the problem

Nowadays the introduction of the concept of sustainable digital development is necessary in the context of the new industrial revolution and the implementation of the concept of sustainable digital development requires taking into account the development of actual trends of modern society - information, economic-financial, spiritual-philosophical, demographic, climatic, contributing to the continuous change of the modern world, determined by digital technologies that cultivate the digital economy and digital management in the context of Industrial Revolution 4.0.

Analysis of recent studies and publications

Looking at the problem appropriately, implementing the concept of sustainable digital development with the proper reform of the economic fabric can be a set of tools that will help establish both equality and sustainability. Oxford economist Kate Raworth, a member of the Club of Rome, wrote a book called The Economics of Donut [1], which noted that dominant ideas about economics had become obsolete several centuries ago. Current students - those who will influence policy and strategy definition in 2050 - are being taught textbooks in 1950 or even earlier, despite the fact that by 2020 everyone on Earth will be connected to the Internet. The greatest growth is observed in Asia and Africa, so we must take into account the pace of change and the ever-increasing presence of technologies in our lives that are accelerated by the well-known axiom of technology known as the Moore Law [8].

Raworth notes that given the challenges of the twentieth century - from climate change to excessive inequality and recurring financial crises - this outdated approach will inevitably lead to disaster. Raworth formulates the challenges we face in the new century - meeting the needs of all systems and creatures without going beyond planetary resources and shaping the concept of a digital society [10]. She draws this scheme in the form of a donut (with a hole in the middle), which has inner and outer borders. Planetary boundaries, by definition of Rockstrom is depicted as an outer ring; and a set of social and digital problems that are largely in line with the Sustainable Development Goals - as internal [2, p. 193]. Current global digital trends cannot yet be called permanent, and the reservations of the Roman Club, published in the book "Limits to Growth", are relevant, which should be taken into account at a turning point.

Objectives of the article

- To research the problem of implementation of the sustainable digital development concept which requires taking into account the development of modern trends of modern society - information, economic-financial, spiritual-philosophical, demographic, climatic, contributing to the continuous change of the modern world, determined by digital technologies that cultivate the digital economy and digital management;

-To analyze the risks of cyber-attacks on digital systems in the context of sustainable development;

-To determine the elements which are particularly important in creating the concept of sustainable digital development.

The main material of the research

Most problem-solving solutions usually only make the situation worse, because the modern digital world needs to solve problems in the context of the new Enlightenment 2.0 ideology, where the balance between man and nature, man and machine will prevail, as well as the balance between markets and the state, foresight and myopia. "Limits to growth" is an attempt to determine the prospects for the period from 50 to 100 years, namely through the "ecological and digital imprint of humanity [2, p.14]. Graham Turner's research found that historical data from 1970-2000 confirmed the predictive value of Growth Limits, which proved to be an effective way of measuring the state of the planet from both an ecological and a digital point of view.

This recently updated Sustainable Digital Development concept was introduced in 2009 by a team of 28 world-renowned scientists led by Johann Rockstrom and Will Steffen, who noted that since the Industrial Revolution, human activity has become a major driver of global environmental change. It can be formulated as follows: "As soon as human activity crosses certain boundaries or reaches points of non-return (defined as" planetary boundaries "), there is a risk of "abrupt and irreversible

environmental changes ". Rockstrom identified nine planetary life support systems that could be formulated as follows: landscape changes; use of fresh water; biogeochemical cycle; ocean acidification; concentration of aerosols in the atmosphere; destruction of the main layer in the atmosphere; state-of-the-art chemical facilities; climate change; integrity of the biosphere [2, p.18].

We are drawing attention to the 2030 Agenda, the draft document of the United Nations post-2015 World Summit. The bulk of this document is made up of 17 Sustainable Development Goals (SDGs), as well as 169 Goals for the definition of the SDGs [2, p.48]. For a more objective and specific analysis, let's call the 17 Sustainable Development Goals.

However, the goals of the sustainable development of digital civilization have not been fully explored, which is what we are trying to focus on in our research. Not only our home and work computers are densely entangled with the Internet, it also absorbs almost all of the important infrastructures on which the future of society depends. Power grids, gas and oil pipelines, air traffic control systems, stock market, drinking water supply systems, street lighting, hospitals and sanitation systems - their operation depends entirely on technology and the Internet, - notes Mark Goodman [5.32].

In a digital society, human beings are eliminated and the trusted base is used by computers, and computers now have everything to do: where, how, when, and by what route to supply electricity to ensure power grid stability. Credit card transactions, point-of-sale payment terminals, and ATMs, which provide a flow of money and capital throughout, will be paralyzed without computers connected via the WAN. Computers now solve all our business as ambulances. However, digital infrastructures, the most important of which are computer activities, are increasingly facing attempts to break down their security systems. To make matters worse, they are deeply vulnerable to systemic failures, the consequences of which can be truly catastrophic as a result of the exponential nature of the technological world, which has given rise to the phenomenon of "technological singularity" or phenomenally rapid scientific and technological progress and presents the concept of what is called the "exponential knee" curve ”[4]. This is the inflection point on the axis of time when the exponential trend should become really noticeable. Shortly thereafter, the trend line acquires rapid growth and becomes almost vertical, as the mathematical effect of exponential growth is realized. There is overwhelming evidence that we are approaching such a turning point. Even the growing volume of new scientific discoveries - from biotechnology to robotics - is governed by Moore's Law and its aftermath [11].

For the operation of a large number of critical infrastructures worldwide, SCADA systems are used that automatically control and regulate switching, production, and other control processes based on digital data collected by sensors. These are specialized systems that do everything from establishing a train route to distributing power to the city. Increasingly, SCADA systems are being connected to the Internet, which is of paramount importance for our shared security [5].

Unfortunately, these systems have been designed without taking into account the current security and durability requirements of equipment connected to the global grid. This problem is urgent, as a survey of critical infrastructures in various sectors of the economy, conducted in July 2014, found that nearly 70% of them had suffered from security breaches at least once during the previous 12 months, which ultimately led to the loss of confidentiality. Information or system crashes. This may sound fantastic, however, according to a 2011 BBC report, hackers attacked South Houston's water and sanitation department (A local teenager in Massachusetts used his programming knowledge to break communication between aircraft that were in He even managed to turn off the runway lights that land the approaching planes, although no one was killed in the incident, but there was a huge threat large-scale catastrophe, which led to unstable information support of the system [11].

Exponential growth in the context of adopting the concept of sustainable digital development can support us very quickly and our existing non-linear thinking can be a huge risk to ourselves. At the same time, their productivity every time increases about twice. Moore has suggested that if this trend continues, the power of computing devices will increase exponentially. Therefore, exponential growth can support us very quickly and still existing linear thinking can be a huge risk to ourselves [13].

In the context of the introduction of the concept of sustainable digital development, all of humanity is striving for a widespread connection to the Internet, as a result of which we are transforming both ourselves and our world. At the same time, as the objects of the digital world become "online", people also become omnipotent. All digital change is indisputably important, effective and has potential benefits, making it a major complication of our world. The increasing complexity of software has immediate implications for global security and security measures, especially as the physical objects we depend on are transformed into computer code. Physical objects are increasingly becoming information technology. The effect of Moore's Law extends to both positive and negative aspects of technology [16].

Along with "Moore's Law", there are also "Moore's criminals": network scammers, terrorists, hacktivists who use military technology for their own purposes. These powerful new outlaws are clearly aware of the rule that if they control the code, they control the entire digital world and all information, making us incredibly vulnerable [6].

Social networks keep track of our meetings, graduation ceremonies, real estate acquisitions, new pets, marriages and divorces, births and deaths.

Most of us spend our free time browsing the Internet in search of music, recipes, investment tips, news, directions, business opportunities, secular chronicles and sports results. Google and Facebook aren't the only ones who pull our personal data from us and sell it, so do Twitter, Instagram, Pinterest, and hundreds of other companies. According to a 2012 Wall Street Journal study, one of the fastest growing businesses today is Internet browsing [7].

All beacons and cookies are combined with likes and tweets, depicting a detailed digital portrait of the user thanks to the information we "merge" as a result of our social activity on social networks. Moreover, today there are many more mobile phones in the world than people. The ubiquitous digital envelope has overwhelmed the planet and the consequences have affected everyone. Data traders, spies and criminals have also come to realize that mobile phones are a real well of information for their purposes, so they, along with marketers, are actively hunting for smartphones. In order to receive all mobile data, Google created the Android operating system for mobile phones and provided it to developers and users for free, - notes Mark Goodman [5, p.87].

According to the analysis, data merchants receive information from ISPs, credit card issuers, mobile operators, banks, credit bureaus, pharmacies, grocery stores, and even more from our credit activity. All the data we give away daily to social networks is linked, geocoded and sorted for resale to advertisers and marketers, transforming our data infrastructure from a cost center into a revenue center. Today, during the day, each one of us leaves behind a digital footprint: an endless stream of phone conversations of text messages, browsing histories, e-mails [14; 15; 16].

Further aggregation of this data, unregulated and nightly protected, is similar to a clock bomb. International crime and terrorist groups are quickly setting up their own businesses to provide a variety of data mining services. Our technological strengths are increasing, but potential risks and dangers are increasing as data is not only a raw material, a resource, but also “oil”. Therefore, digital technologies do not bring sustainability so far, and we need to shape the concept of sustainable digital development. Only one single email account on Facebook, Google, or Apple can give hackers access to longstanding mailing archives, meeting schedules, instant messages, photos and videos, phone calls, purchase histories, bank and brokerage accounts and documents [17].

There are reports that many social networking companies have been affected by the hack, including Linkedin (6.5 million accounts), Snapchat (4.6 million registration names and phone numbers), Google, Twitter and Yahoo - Mark Goodman notes [p.126]. We do not take into account the fact that time is voluntarily provided by information or through a data leak, we facilitate this task for various cybercriminals, cyberstalkers, bullers or exes as they call themselves. According to the US National Council on Crime Prevention, nearly half of American teens have suffered from cyberbullying.

We now have a large number of viruses and Trojans that allow attackers to access the microphones of your phones and record everything that happens in the audio environment, even when we are not using the phone. Smartphone malware is able to constantly monitor your location; they even allow criminals to see this place with Google Maps in near real time [5].

The introduction of the concept of sustainable digital development is necessary in the context of the new industrial revolution, as cybercriminals have developed new ways to create even more fake banking applications. Although only 7 banking Trojans were found in 2012, their number exceeded 1,300 by the end of 2013. Malware packages targeting clients of the world's largest banks - such as Citibank, ING, Deutshe Bank - have been identified, HSSC, Barclays and 66 other institutions from around the world [5].

Digitization has opened up tremendous opportunities for collecting information in the digital society. Significantly, 90% of the world's digital data has been generated in the last two years. The annual increase in the amount of digital data is 50%. Every minute, people on our planet send 204 million emails, post 2.4 million posts on Facebook, 72 hours of YouTube videos and 216,000 new Instagram photos. The total amount of digital data in 2015 reached 5.6 zt, and one zt is equivalent to one trillion gigabytes, - notes Ross Alec in the Industry of the Future [11].

The introduction of the concept of sustainable digital development is due to the fact that the digital revolution has brought to humanity universal computing, software development, personal computers and interconnected with the digital revolution of infrastructure and the Internet.

Big data is the basis of the concept of sustainable digital development of society, as well as a universal factor that describes how large amounts of information can be used to understand, analyze and predict trends in dynamics, but a mechanism must be put in place to process them. The development of storage technologies and the growth of computing power are processes that support one another. The more powerful the computers become, the easier it is to collect a large body of data and produce more extensive and in-depth analysis [3].

With the introduction of the Sustainable Digital Development concept, new terms have emerged: "Internet Ethics", "Machine Ethics", "Computer Ethics", which are based on ethical issues of specific digital technologies such as confidentiality, anonymity, transparency, trust and responsibility, formulation and

support of moral decisions, right actions and values. Data Ethics defines the creation, recording, storage, processing, transmission, distribution and use of data. It is based on the moral problems of collecting, analyzing, and applying large datasets. Algorithm ethics focuses on software, artificial intelligence, machine learning, and work. She studies the problems that arise from the increasing complexity and autonomy of algorithms. Practice ethics are interested in responsible innovation, programming, hacking, professional codes, and deontology. The purpose of this industry is to define ethical boundaries for the formation of professional codes on the path of responsible attitude to innovation, their development and use, - notes Klaus Schwab [17, p. 262-263].

Sustainable digital development concepts are expanding their footprint in the material world through cloud computing, networking with robotics, genetic sequences, portable gadgets, drones, virtual and augmented reality devices. Digital technologies handle graphical computing faster and more powerfully, allowing you to go beyond the sciences and break into industrial production, urban transportation infrastructure and interactive devices. Today, digital infrastructure creates the basis for technology change [12; 18; 19].

New digital technologies and capabilities are a key feature of the fourth industrial revolution, which is tied to radically new approaches to computing, new opportunities and challenges. The development of computing is based on innovations in the field of materials, assembly and construction. The computations can be divided into the following areas: centralized cloud computing, quantum computing, neural network processing, biological data storage, optical and cellular computing. These approaches promote the development of new software and new forms of cryptography. They create and overcome cybersecurity challenges, allowing data to be processed using natural language and can overcome the most complex modern challenges [7].

We live in a world built on computers. Computers today are more than just an important part of new cars, consumer electronics, and most home accessories. Nowadays, they are integrated into textiles and clothing, embedded in the infrastructure - roads, street lighting, bridges and pathways. Sensors that capture body language, hand gestures, and eye movement allow computers to read conscious and unconscious intentions when operating computers and other devices, such as wheelchairs and prostheses. In April 2017, Fecebook announced that a team of 60 researchers, including experts in machine learning and neural prosthetics, was working to allow users of this network to dictate to the team computer or message themselves. Computers become part of us physically as well: unprecedented possibilities open up - from integration into the body of medical systems to various variants of human perfection, - notes Klaus Schwab [17, p. 234].

The digital system should not reproduce the established processes, but radically change them. The main problems facing computing needs are related not only to the processing power (number of transistors, but also to speed, delay time, and energy savings), photonics and network computing. The big challenge for new computing technologies is to take a multifaceted perspective on how technologies will impact societies and communities. Much attention will have to be paid to accessibility, inc. and security, privacy, authorization, and cybercrime issues.

Conclusions

Three elements are particularly important in shaping the concept of sustainable digital development:

1) Widespread use of large amounts of data;

2) More reliance on algorithms while performing tasks;

3) Formation of choice and decision making, as well as gradual reduction of participation in work with automatic processes. All these points raise serious problems related to justice, responsibility, equality, and respect for human rights.

In 2015, a survey of 200 directors under the auspices of the New York Stock Exchange (NYSE) found that, after a series of unauthorized access to high profile companies, cybersecurity issues took up much more space on the agenda. 80% of the surveyed directors stated that they consider cyber risks at most or all meetings, - notes Klaus Schwab [17, p. 264].

Government organizations are becoming extremely sensitive to the risks of cyber-attacks on digital systems. Cyber security has become a national policy priority, which is why the main task is to move from cybersecurity to cyber resilience. In this context, cyber-resilience can be considered the ability of systems and organizations to withstand cyber events measured by the combination of failure time and recovery time, and must be resilient to at least three different cyber risks:

1) data confidentiality;

2) their integrity;

3) continuous access to support business operations.

Mutual investment in cyber-skills would help entire sectors, especially if they increase the number of skilled workers capable of developing strategic and operational cyber-resilience skills. The scale of cyber risk in a world dependent on “vital” digital systems requires investment and action at all levels - from individual training and new rules of conduct to organizational investment and new areas of responsibility for boards of directors; from national to international cooperation to developing flexible governance models [17, p. 270].

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