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### Civilizational Cycles and Economic Development in the Context of Technological Transitions and Global Pandemics

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#### ABSTRACT

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*The study of theories of civilizational cycles under modern economic conditions is becoming increasingly important. Humanity can discern that long-term forecasts to a certain extent comply with theories of cyclical development. The issue of proving that the iteration of civilizational cycles in historical retrospect may correspond to their recurrence of the Fibonacci series remains open. The objective of the study is to do research into the wave theory in terms of economic development; to determine whether it is possible to apply the "principle of the golden ratio" based on the Fibonacci series; to explain how civilizational cycles are formed in the context of technological transitions; to identify patterns and characteristics of these fluctuations; to describe trends of further economic fluctuations. The object of study are economic relations in the context of civilization development, and their impact on of education, culture and personal freedom. Using the methodology of the Fibonacci numbers, namely, the rule of the golden ratio revealed the patterns of large economic fluctuations, explained the reasons for accelerating the pace of cyclicity and made a forecast of their further development. The results of the study allowed to claim that the current decade is decisive in terms of forming a new civilizational cycle of economic development. It is proved that the trend of the new cycle of civilization will be determined by the symbiosis of a human and artificial intelligence.*

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## INTRODUCTION

Due to the unsustainable development of the society and the world's economies, there is an urgent need to find out how to minimize the crises emerging on the global scale, as well as to ensure a favorable level of economic security. In recent years, the issue of the causes of crisis phenomena in the modern economy has been quite popular in the scientific community. Many analysts and experts have argued that the imminent deep crisis in the world economy is inevitable. However, none of the existing economic theories dares to suggest its causes and effects. Moreover, no one takes responsibility for developing countermeasures and attempting to forecast future trends.

Along with the growing focus on cyclical development, more and more economists are carrying out their research based on the achievements of the school of institutionalists. This connection is not accidental. It was institutionalism that played a crucial role in shaping the theory of cyclical economic development, classification, causation, and the sequence of cycles. However, institutional theory pays little attention to the nature of institutional cycles, their sequence and causation.

In the generally accepted macroeconomic approach to the study of economic dynamics, there are three types of cycles: a) long-term cycles – Kondratiev cycles, associated with technological changes; b) medium-term cycles – Juglar cycles, related to the life cycle of buildings and structures, i.e. fluctuations in the construction market; c) short-term cycles – Kitchin cycles, associated with the specifics of monetary circulation. However, all these fluctuations are purely economic in nature, aimed at solving current and tactical problems, and are unable to resolve the emerging contradictions between institutions and public relations.

Cyclicity is a universal and general form of movement of all social processes (regardless of the levels of the economy they belong to). The cyclical processes are manifested in the form of fluctuations in economic conditions. The cyclical nature of economic development means that the major indicators and parameters of this process have a wave pattern that recurs over time. The life cycles of individual waves intersect, which significantly complicates the process of studying the factors influencing the ability to ensure economic growth. Accordingly, the search of the economic policy capable of optimizing the conditions and pace of structural changes in the economy is complicated. An effective use of the theory of cyclical dynamics to determine the place of social development and its forecasting remains a topical issue of modern scientific thought.

## 1. THEORETICAL BASIS

The study of the cyclicity problem dates back to Ancient Greece and Ancient China. It was not until the XVIII century that economists paid attention to it and put forward various theories explaining business fluctuations. Researchers studying market dynamics divide into those who do not recognize the existence of recurring cycles and those who argue that economic cycles recur as regular as tides do. Research into cyclical development of economic processes and objects has intensified in recent years. Both in Ukraine and abroad, published has been a large number of works on theory and practice, covering various aspects of this complex issue. However, despite the large number of works on the problem of cyclicity, there is no single concept of the reasons for this phenomenon.

Despite the fact that modern economists acknowledge the wave-like nature of development, the essence of cyclical processes is still one of the most controversial issues in economic theory. Thus, according to the famous twentieth-century American scientist A. Hansen (1951) *"the origin of cyclic fluctuations is a problem that has no solution"*. In his works, the father of the theory of cyclical development, J. Schumpeter (1982) states that *"the real causes of crises are beyond the scope of purely economic factors, crises are the consequences of violations of economic processes caused by external factors"*. According to the history of human development, secondary and unpredictable factors are the impetus for resolving the accumulated contradictions.

The trend of new institutional transformations is set by a new unifying idea, which forms a worldview of interpersonal relations with further creation of a basis for economic relations between individual entities and entire units (Simovic, 2020). Such a worldview idea manifests itself in a new religious or political movement. A. Toffler's theory of civilization waves (Toffler, 1980) and L. Gumilev's (2001) passionate

theory of ethnogenesis most closely reveal the essence of such cycles. According to the researchers, the duration of cycles is 1000 – 1500 years. In addition, recently, scientists have been paying more and more attention to the principle of the golden ratio in the analysis of the development of exact and natural sciences.

In terms of the topic of our paper, the results of such world-known scientists as a philosopher S. Olsen (2009) and mathematician A. Stakhov (2009) are of particular interest. They claim that the so-called a “golden ratio revolution” in modern mathematics is the core that unites all the sciences. Starting from the essence of the Fibonacci numbers and their generalization, scientists derive a new interdisciplinary direction of modern science. Recent discoveries in various domains, especially in natural sciences, such as biology, genetics, astronomy, as well as computer science, programming, chemistry, physics and many others are based on the principles of the golden ratio. The authors mathematically prove that everything is subject to this universal law, which can be the basis for the assertion of a general scientific "golden revolution", which dramatically affects the development of modern science and education.

A famous British-Austrian philosopher and sociologist K. Popper (1959) considered science as a system that is constantly changing and developing. The author put forward the concept of the growth of scientific knowledge, which occurs because of bold hypotheses and theories that solve scientific problems. In this case, the new hypothesis must proceed from a simple and new idea, be open to independent tests and pass new thorough tests.

An American philosopher and historian of science T. Kuhn (1970) presented the development of scientific knowledge as a process of paradigm shift. Thus, long periods of development of science within a certain paradigm were followed by periods of scientific revolutions. According to Kuhn, the pre-paradigmatic stage of science is characterized by the presence of different points of view and fundamental theories, which leads to the creation of a single paradigm based on the consensus of members of the scientific community. According to this paradigm, during the normal development of science, anomalous situations occur, thus leading to a crisis, and then – to a scientific revolution. At the same time, T. Kuhn distinguishes between local scientific revolutions, which cover a single science, and global, which cover the whole science and lead to a new vision of the world. The author singles out the following global scientific revolutions: a) the emergence of classical natural science (17th century), where all scientific achievements were embedded in the general Galician-Newtonian picture of the world; b) differentiation of science (late 18th – early 19th centuries); c) revolutionary changes in various fields of knowledge (late 19th – early 20th centuries): the discovery of the theory of relativity and quantum mechanics, the revision of ideas about motion, time and space, the formation of cybernetics and genetics; d) the beginning of the global restructuring of all knowledge about the universe (late 20th - early 21st centuries).

As opposed to Kuhn, I. Lacatos (1977) proves that in the history of science there are very few periods when a certain paradigm dominates. P. Feyerabend (1999) argued that many types of knowledge and methodologies contribute to the development of knowledge, so it is impossible to create a good empirical methodology, because it is legitimate to adopt any theoretical concept. The history of science, in his opinion, are chaotically intertwined ideas, hypotheses, facts, errors, and discoveries.

The idea of using the golden ratio in economic studies is not new. Most of these theories are devoted to the study of processes at micro- and meso- levels, the most striking example being the Elliott Wave Theory, devoted to the study of stock market fluctuations (Elliott, 2012). There are far fewer approaches determining the dependence of macroprocesses from the Fibonacci number. Thus, an interesting example is the optimal tax theory by A. Laffer (2004).

V.A. Morgun (2013) paid attention to the definition of civilization waves based on paleoclimatic cycles, each lasting for 1620 years. The Fibonacci number in the scientist's study is central both to the civilizational processes on Earth and to all oscillations in the solar system and space in general. R.N. Elliott (1914) studied the development of the stock market and the ability to predict changes in the value of securities. He determined that in the stock market game, like in any social relationship, there are wave-like changes that are subject to the rule of the golden ratio. The ratio of the growth stage to the rollback is equal to the Fibonacci number – 1.62. In his studies, A.P. Stakhov (2009) focused on finding a mathematical formula for harmony. As a result, he concluded that all harmonic proportions are based on the principle of the golden ratio. When exploring possible application of the budget concept by A. Laf-

fer in fiscal policy, I. P. Tverdokhlib (2013) came to the conclusion that this theory works effectively due to the principle of the golden ratio.

A.O. Kasyanova (2013) uses the Fibonacci numbers to predict changes in GDP growth in some countries and trends in short-term fluctuations, based on the fact that the numerical ratio of growth to roll-back should give the coefficients of the golden ratio. A.V. Vereshchagina and G.O. Korobkova (2012) consider the use of the golden ratio theory and Fibonacci numbers in stimulating the innovative activity of enterprises. In their works, B. Buhm and L.F. Punzo (2006) identified the causes of economic development, and found that economic shifts are based on profound changes that transform the economic structure itself. V.N. Podkorytov (2013) in his study considers the possibility of compiling all known theories of cyclical economic development to build a mathematical rationale based on the Fibonacci series.

Thus, science is a cyclical phenomenon, due to social practice, but is relatively independent with the internal logic of its development, and its own laws. In our opinion, it is expedient to combine the theory of civilizational fluctuations with the theory of cyclicity based on the Fibonacci number. This combination is grounded on the assertion of the acceleration of global economic, political and civilizational processes. The speed of acceleration of these processes exhibits the twisting of the golden ratio spiral.

The aim of the research is to study the wave theory in terms of economic development, to determine the possibility of applying the golden ratio principle based on the Fibonacci series to explain the processes of civilizational cycles in the context of technological transitions, and to identify patterns and characteristics of these fluctuations.

## 2. METHODOLOGY

In the study, we applied the methodology based on the use of Fibonacci numbers in the theory of cyclic development. The principles of this method are as follows:

- The sum of any two adjacent numbers is equal to the next number in the sequence.
- The ratio of any sequence number to the preceding number is approximately 1.618.
- The ratio of any number of sequences to the following number is close to 0.618.

The ratios specified in items 2 and 3 is very close to the mathematical essence of the equation of the golden section:

$$x^2 - x - 1 = 0 \tag{1}$$

$$x_{1,2} = \frac{1 \pm \sqrt{5}}{2} = \begin{cases} x_1 = +1,6180339887 \dots \\ x_2 = -0,6180339887 \dots \end{cases} \tag{2}$$

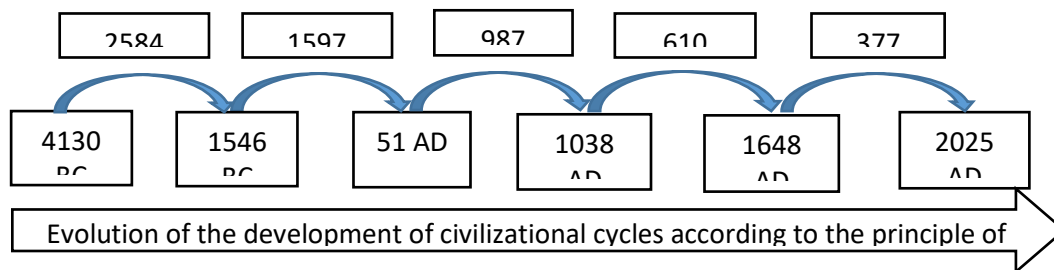
The Fibonacci series goes as follows: 0; 1; 1; 2; 3; 5; 8; 13; 21; 34; 55; 89; 144; 233; 377; 610; 987; 1597; 2584; 4181; 6765 ....

As the numbers in the Fibonacci sequence increase, the value of these coefficients is getting closer to the values of X1 and X2. The Fibonacci series has many other coefficients, but in economic theory and practice these are the most common. The Fibonacci numbers are commonly used to predict the future situation in economic processes. It is the first time this approach has been utilised to evaluate and forecast the cycles of social development from 2021 onwards.

## 3. RESULT

Of significant interest in the context of this study is the approach by V.N. Podkorytov (2013), who considers a set of economic cycles, using the Fibonacci numbers in arranging their length, thus building a general trend of development. He proves mathematically the relationship between all the existing types of cycles, reaching 200-year fluctuations, and concludes that there are larger waves that determine the overall relationship.

The essence of the study is to identify such waves of civilization, the causes and patterns of their occurrence, using the universal method of the golden ratio. Fig. 1 shows the waves of civilization.



**Figure 1.** Sequence of the development of civilizational cycles

Source: developed by the authors

Following the evolution scale, both the civilization waves and the periods of the transition from one cycle to another accelerate. Based on this, we can present a sequence of civilizational cycles according to the Fibonacci pattern in table 1.

**Table 1.** Sequence of the development of civilizational cycles according to the Fibonacci sequence

<i>Bifurcation period (years)</i>	<i>Beginning of a cycle</i>	<i>Grounds</i>
≈ 233	4130 BC (VI-IV centuries BC)	The first large general division of labor. "Neolithic Revolution". The dawn of modern settled civilization
≈ 144	1546 BC (XVI-XIV centuries BC)	Invention of the method of smelting iron from ore. The beginning of the Bronze Age
≈ 89	51 AD	The first Jerusalem (Apostolic) Council, development of the doctrine of the spread of Christianity
≈ 55	1038 AD	Transition from the Early Middle Ages to the High Middle Ages. Establishment of the feudal system in Europe
≈ 34	1648 AD	Westphalian peace treaty, which led to the collapse of the Great Roman Empire, religious tolerance, the spread of Protestantism
≈ 21	2025 AD	Symbiosis of a human and a robot based on the new philosophy of human life in coexistence with artificial intelligence. Institutionalization of human and machine synthesis. Strengthening the political and economic importance of self-government of large cities

Source: developed by the authors

Despite the fact that each subsequent wave of development comes from a series of cataclysms, it is not antagonistic to the worldview of the previous one. Each new cycle is based on the energy reserve of a new idea, which in fact is a reconsideration of the foundations of the previous one. Thus, we can argue that the general civilizational movement has a certain continuity and looks like a transformation of worldview doctrine, taking into account the experience gained and information received.

We can scrutinize the essence of each cycle more thoroughly in terms of this paper. The fourth wave is associated with the transition from the Early to the High Middle Ages. It is difficult to identify the exact date that would become the Rubicon of the new era. Even in historical science, this transition is determined by a period of 50-60 years from the beginning of the 11th century. The reign of Henry III the Black (1039-1056), when the Great Roman Empire reached its peak, can be considered decisive in the formation of the new era. The influence of this emperor on the development of European civilization is significant and remains underestimated. For example, because of the ardent support for the church reform, the religious crisis of the Western world was overcome. This period is marked by the beginning of the ideological confrontation of Western and Eastern civilizations, namely the final schism of Christianity in 1054, the first crusade of 1096-1099, the consequences of which the world is facing nowadays. However, the most significant event, in our opinion, was the liberation of cities from feudal dependence, which began in the 11th century. Later it developed into the Magdeburg law and launched creation of Western European self-government, which is still developing. It was the emergence of this right that boosted economic development of medieval cities, and then of European states.

Of great importance, in our opinion, in the formation of a new institutional wave is the bifurcation period – the transition period, when the vector of further development is determined. This stage is marked by the struggle of equal alternatives and opposition to the remnants of the current system of values and worldview. The length of the bifurcation period is also affected by the golden ratio and decreases with each subsequent cycle.

The fifth wave, the decline of which we are experiencing now, is based on industrial development and has lasted for 300 years, since the middle of the 18th century. Social contradictions that arise when a cycle declines, generating a surge of a new wave, in our opinion, include:

- recognition and observance of human rights and dignity by the state and other members of society;
- suspension or slowing down of social elevators, when political, religious and cultural elites lose their objective connection with public life;
- growing inequality in the distribution of economic goods.

The trend of the last cycle was set by the Protestant movement that determined the worldview of modern capitalism, with the institutional foundations being laid by the Westphalian Peace Treaty of 1648. However, we cannot regard this date as a direct transition from one cycle to another, as in purely economic waves: the next cycle dawns in the depths of the previous one. In addition, the scale of processes and heterogeneity of worldview transformations looks like a chain of historical civilizational events that outline political and economic development of a society and civilization as a whole. Many prominent modern scientists confirm our calculations and forecasts in their works. Thus, according to Alvin Toffler's theory (Toffler, 1980), the current state of development of human civilization is in the transition to the third wave, the so-called "post-industrial" society, which is likely to begin in 2025.

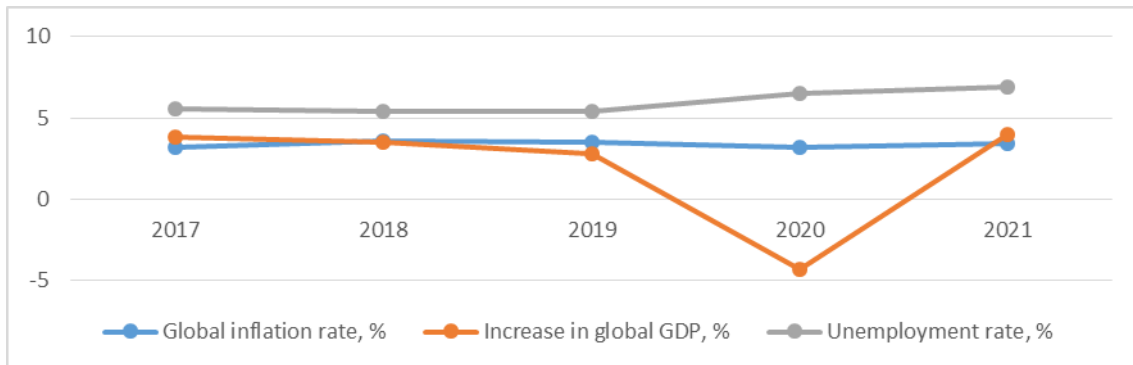
Similarly, Immanuel Wallerstein (1995) argued that since the 1990s, humanity has entered another crisis in the world system that will allegedly last until about 2025. This will result in the spread of interstate conflicts, chaos and weakening compliance with international law. Against this background, calls for authoritarian leaders with "strong hands" and a stricter public supervision to confront chaos seem to be attractive.

On the other hand, according to Wallerstein (1995), increasing migration caused by solely objective factors and the uncertainty of their legal status and limited civil rights along with reaching critical mass can lead to contradictions. These processes occur not only in developed countries. Even in Ukraine, we can observe similar processes related to the limited civil rights of internally displaced persons. Procrastination in resolving civil rights and social protection issues for this category of citizens, which reaches 5% of the total population, increases tensions. Thus, we can talk about the general nature of this factor. It is these tendencies, of today's "advanced liberal democracy", that may aggravate the above-mentioned contradictions, which will cause a new cyclical civilizational shift.

As the history of humanity shows, secondary and unpredictable factors become the catalyst for the aggravation and manifestation of the accumulated contradictions (Kozlovskiy, 2010). Such an impetus for resolving modern contradictions was the global pandemic COVID-19 (2020), which proved the growing role and influence of the societies having effective institutions, the increasing power of states having traditional regulatory mechanisms overall, a relative weakening of traditional international institutions, and transformation of global leadership forms (Kinnunen et al., 2021). As of March 25, 2021, more than 125 million cases of COVID-19 were registered. About 101 million people got over the disease, while more than 2.7 million died (Statista, 2021). The United States, India and Brazil are the countries most affected by the pandemic. The SARS-CoV-2 virus is the seventh known coronavirus to infect humans. The main problem is that viruses mutate naturally, and eventually their aggressiveness disappears. In turn, the new strains of SARS-CoV-2, discovered in the UK, South Africa and Brazil, are even more aggressive.

The pandemic has caused a unique economic crisis and has led to uncertainty, so forecasting in these circumstances is an extremely challenging task (Banaszyk et al., 2021). The EU GDP will grow by 4% in 2021, which is less than previously forecast, and by 3% in 2022 (European Economic Forecast, 2020). All this means that outputs in the European economy will hardly return to the pandemic level in

2022. According to estimates, in 2020 the global economy lost 4.36% of its gross domestic product (GDP) due to the transformation of the virus into a global pandemic. To understand this figure, we give the estimate indicator: global GDP in 2019 was estimated at about US\$ 87.55 trillion. This means that the 4.36 percent drop in economic growth makes up almost US\$ 3.94 trillion of lost output (The World Bank Group, 2021).



**Figure 2.** Dynamics of global economic indicators before and during the pandemic Covid-19

Source: The World Bank Group, 2021

The main reason for the economic damage caused by the COVID-19 pandemic is the fall in demand (Kozlovskiy et al., 2021). This trend is present in such industries as tourism, passenger traffic, oil production and car manufacturing. Companies operating in these industries are cutting jobs to make up for the lost income, which result in a downturn. Consequently, it distributed to disturbances in social and economic development and increased of social inequalities (Maheshwari and Maheshwari, 2021). So, economists have to ponder upon a global recession as deep as the Great Depression that the COVID-19 pandemic can cause. Thus, global stock markets fell sharply due to the outbreak of coronavirus: Dow Jones reported its most dramatic decline ever – almost 3,000 points on March 16, 2020 (Statista, 2021).

Thus, the pandemic has changed the world and provided an opportunity for international institutions that can demonstrate a coordinated and effective response. It has also shown that only the introduction of new “virtual” or properly organized by the state economic models can restore economic growth – in new formats, with new labor organization and labor relations. At the same time, the rate of recovery will vary from country to country, due to differences in the number of diseases, incentive measures, vaccination rates, differences in economic structures and domestic policy responses. Thus, none of the state formations managed to be effective in overcoming the crisis. All forms of state organization, both liberal and autocratic, are weak under the conditions humanity is experiencing. According to the logic of our study, the length of the transition period should be 21 years, and the new cycle of civilization will start in the mid-20s of the 21st century. One can argue that human civilization is in the bifurcation period that will last 21 years, and humanity will choose a new vector and worldview for the next wave of civilizational development of about 233 years.

Scientists are increasingly claiming that the Fifth Industrial Revolution has begun, although it was only in 2011 when they started talking about the Fourth Industrial Revolution, which indicates a small gap between them and the accelerated technological growth. The Third Industrial Revolution began in the second half of the last century. Any industrial revolution arises due to scientific advances, technological breakthroughs and their widespread introduction into production. The basic components of the Fourth Industrial Revolution are the phenomenon of information entity (Big Data), cyberphysical systems that include autonomous robots, modelling (Simulation), used throughout the product life cycle, Horizontal and Vertical System Integration, the Industrial Internet Things, the use of cloud technologies (The Cloud), Additive Manufacturing, virtual reality technologies and cybersecurity.

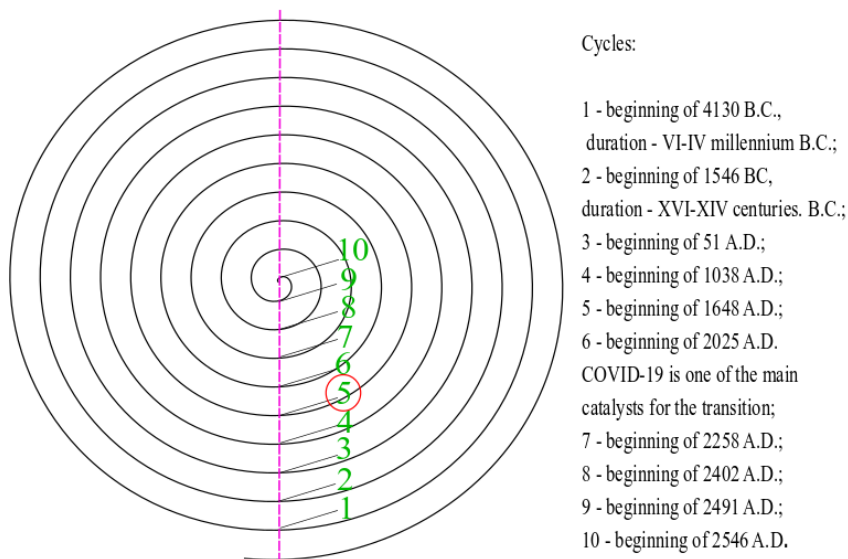
Noteworthy is the fact that the term "the Fourth Industrial Revolution" is combined with the concepts of "circular economy", "green growth economy" and "shared economy". It should be noted that some economists, such as D. Efstafiev (2017), deny the revolutionary nature of Industry 4.0, emphasizing that

it lacks new energy and transport platforms for economic breakthrough, truly revolutionary approaches to energy efficiency and mass introduction of fundamentally new materials, and the only revolutionary element is a radical restructuring of financial communications (Kozlovskiy and Fonitska, 2013) and financial and investment relations (Brychko et al., 2019). So, if the basic technologies of the Fourth Industrial Revolution are the Internet of things, digital ecosystems, big data analytics and digital platforms, then the basis of the Fifth Industrial Revolution is a symbiosis of human and artificial intelligence.

A striking example is the emergence of cobots – universal robots that work in collaboration with people, maximizing work efficiency (Østergaard, 2018). Elon Mask’s plans and developments called "Neuralink" are more far-sighted. To boost the process, it is expedient to institutionalize robotics, to develop philosophy and ethical norms of coexistence of humans, robots and artificial intelligence. A number of neurosciences have emerged and developed that have acquired interdisciplinary status.

On the other hand, industrial revolutions are significantly changing the direction and volume of international investments, as noted by Klaus Schwab (2016); technological progress is one of the main causes of stagnation and sometimes declining incomes of most developed countries. The demand for highly qualified (Koziuk et al., 2020; Snieska et al., 2020) specialists is growing, with the demand for semi-skilled workers increasingly falling. As a result, either unskilled people or specialists will be in demand with semi-skilled workers not being employed. Based on the above, the reduction in time and amplitude, i.e. shocks during bifurcation and cyclic fluctuations, will graphically look like a spiral that twists to the middle rather than a sine wave with a positive trend (Banegas Rivero et al., 2020).

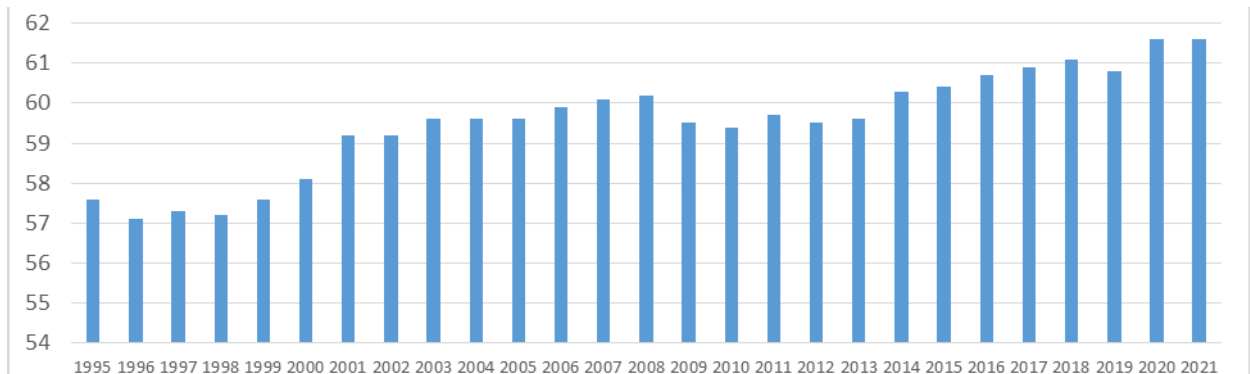
This image of evolutionary cyclical development (Figure 3) is more appropriate from the point of view of the etymology of the term “cycle”, because it comes from the Greek κύκλος – circle. Thus, evolutionary economic cycles are the passage of human civilization through the same phases – certain stages of rise and fall, which recur in time lasting for a shorter period, and have a general global tendency to develop human freedom based on science, culture and education. It is worth noting that personal freedom is the foundation for economic freedoms that ensure economic development. Economic freedom is the fundamental right of individuals to manage, dispose of and use their own property, resources and labor. The government must retain and protect all these rights. Thus, in economically free societies, individuals independently choose where to work, what goods or services to produce, and what to invest in. In these societies, the government allows labor, capital and goods to move freely, avoiding coercion and pressure on freedoms, and intervening only if necessary to preserve and operate the state entity. Thus, according to research, over the past 25 years global development leaders has been rapidly growing due to the promotion of liberalization of societies and economic freedoms in these countries (Altman, 2008).



**Figure 3.** The spiral of civilizational cycles of social development

Source: developed by the authors

One of the indicators of economic freedom is a special index (The Index of Economic Freedom), annually estimated by the Wall Street Journal together with the Heritage Foundation since 1995. Today, data from about 180 countries are used in calculating this index (Fig. 4).



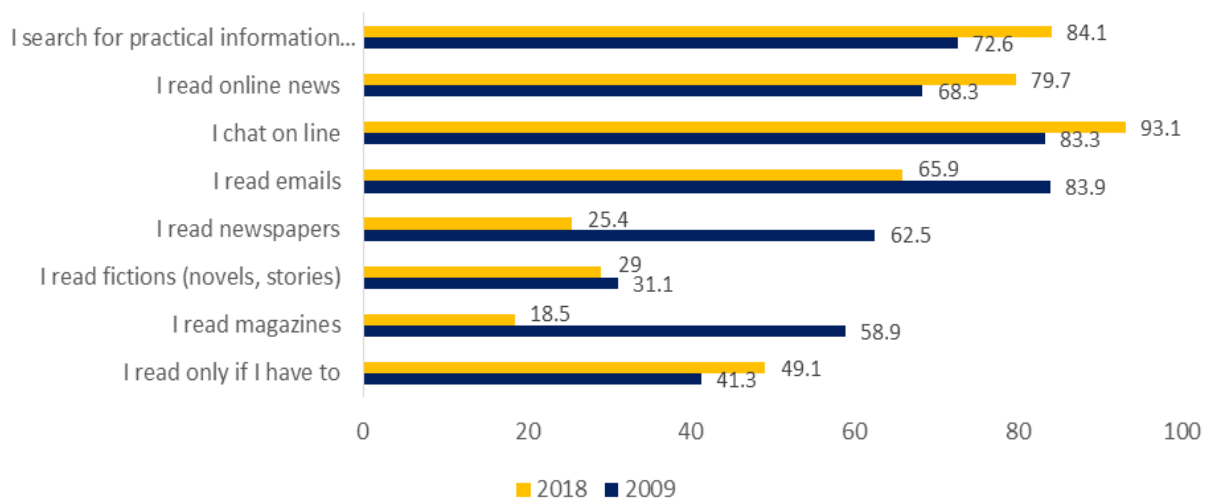
**Figure 4.** Dynamics of The Index of Economic Freedom over the whole period of estimation

Source: The Heritage Foundation, 2021.

Having analyzed the indicators of the index since 1995, we can assert that there is a steady upward trend, which means the desire of humanity to strengthen individual freedoms worldwide.

Regarding the development of culture and education, we must say that there has been a period of rapid digitalization over the past decade. New technologies have changed the ways in which humanity reads and exchanges information. At the same time, reading has become a rarer way of entertainment for today's youth: students all over the world read fewer books, magazines and newspapers, using online sources to read more for their own practical needs (Fig. 5).

Thus, rapid digitalization of communications has a profound impact on the nature of information literacy and is the basis for Industry 5.0.



**Figure 5.** What and why students read, mean value according to OECD, %

Source: PISA-2018, 2021.

The study of the entire Fibonacci series enables us to argue that human civilization is transiting from the fifth to the sixth wave being in the spiral ring, i.e. in the middle of its development, and their total number reaches ten. The final twisting of the spiral will take place somewhere in the early 27th century. Then "the end of history" will come, as Francis Fukuyama claimed (Fukuyama, 1989).

The term "the end of history" means that humanity will reach such a level of self-awareness, general worldview and social order that civilization will not need cyclical fluctuations for further development.

## 4. DISCUSSION

Modern civilization is at the stage of bifurcation, searching for a new landmark for its further development. This allows us to claim that the current decade, which is just beginning, should be crucial in shaping the spiritual, ideological and world-view potential of the next civilizational wave, which, according to Fibonacci, will last 233 years.

In his study, Fukuyama F. (2006) argues that *"the principles of sovereignty and inviolability of the nation-state, which are the basis of the Westphalian system, have actually been destroyed and today are not adhered to because what happens within individual states – in their internal governance – often greatly affects the lives of other members of the international community.... The Westphalian system is no longer an adequate lever for regulating international relations, because it was built in terms of obvious lack of understanding of legitimacy issues"*.

We explored the essence of modern world transformation processes, the nature of the current crisis, and the use of the above signs of the emergence of new cycles of civilization. Now we can argue that the major problem that needs solving to ensure new development is to determine a qualitatively new self-identity of the state, its functions, place of its citizens and their features, rights and responsibilities.

National entities that could bring a new meaning of the basis of their existence and their functions, a fundamentally new approach to the essence of state institutions, the concept of a citizen, their rights and responsibilities, will be able to pass the bifurcation period, set a trend and become leaders in the next institutional cycle. Having scrutinized all the above waves of development, we can assert that the new state forms should be civic-centric in nature with a high level of personal freedom and responsibility. Thus, Francis Fukuyama (Fukuyama, 2004) sees further expansion and deepening of decentralization as a source of political and economic development of modern societies in the future. According to the logic of the study, human civilization is in the bifurcation period that will last 21 years, and humanity will choose a new vector and worldview for the next wave of civilizational development of about 233 years. Thus, scientific discoveries in both fundamental and social sciences, the emergence of new political, philosophical and religious trends to take place in the current decade, are crucial in shaping the next cycle.

## CONCLUSION

Our study provides theoretical conclusions regarding further dynamics and general trend of cyclical development of society. We established that the use of civilizational cycles of social development in the context of technological transitions based on the Fibonacci sequence could explain the development of modern society, especially in conditions of force majeure, such as the Covid-19 pandemic. It takes a cycle less time to form, because of larger global civilizational fluctuations that set the trend of development of all social relations, including economic ones. The Fibonacci numbers prove the accelerating nature of cyclic fluctuations of all social processes. According to the logic of the mathematical interaction of the components of cyclical development based on the rule of the golden section, the growth stage accounts for 61.8% of the cycle duration with 38.2% of the decline stage. Based on this mathematical dependence, it is proved that the modern wave of civilization, which began in 1648, taking into account the bifurcation period, was to go into a cycle of decline at the beginning of the 20th century, which we were able to observe (the crisis of 1933, World Wars I and II). At the same time, we can see the emergence of signs of a new civilization cycle due to the active development of computer and digital technologies, which began in the 1970s and continues to this day.

Based on all of the above, we can argue that the current decade (2021-2030) is decisive in terms of forming a new civilizational cycle of development. The following processes will determine the trend of the new wave: the symbiosis of a human and artificial intelligence, which leads to the emergence of a new society with a new social contract based on strengthening the self-government of large cities; personal

freedom; the growing importance of education through the evolution of its forms, sources and ways of its acquisition.

The new scientific results obtained by the authors, substantiated theoretical conclusions can be the basis for further theoretical and applied research in the field of welfare economics, social development and theories of cyclical development.

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