

# Technological Revolutions and the Political Economy of Time

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## Summary

The paper investigates the role of time as one of the most precious politico-economic resources. It shows that the compression of time during every successive industrial revolution brings contradictions that change the logic of the politico-economic system. To prove this thesis historical and politico-economic approaches are used. The historical approach shows the correlation between the development of technologies, time and society. The politico-economic approach emphasizes on the different dimensions of this change, trying to answer the question about the transformation of the role of time in contemporary economy and politics. One of the main contributions is that time is correlated with the different technological revolutions. Thus, I first examine the correlation between time and technological changes during different technological stages. Then the exponential character of the technologies of the Fourth Industrial Revolution is shown, as well as the transformation they bring to politics, economics, society, science, human beings and so on. I finish with the necessary transformation of the state as a result of the technological revolutions and particularly as a result of the ongoing Fourth Industrial Revolution, and in the conclusion I provide

some possible answers to the contradictions brought about by exponential technological changes.

**Key words:** industrial revolution, time, space, exponential technologies, competitive advantage

**JEL:** H12, L50, O35, O38, P47

## Introduction

The key objective of this paper is to investigate the changes in time during the ongoing Fourth Industrial Revolution. In order to perform this task the connection between changes in time, different stages of development of technologies, and the needs of the politico-economic systems is shown. Historical, systemic and politico-economic approaches are used for this purpose.

Time is a complex category that can be a subject of many different sciences and when we are talking about political and economic time it is a subject of political economy. Christoph Hermann from University of California, for example, in his book *Capitalism and the Political Economy of Work Time* explores the economic and political factors that change the duration of working hours (Hermann, 2014). Others are concerned with the economics of time use and the data pointing to the changing ratio of time spent on domestic work versus market purposes (Aguilar, Hurst and Karabarbounis, 2012:

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373-397). Elizabeth Cohen relates time with the struggle for power and resources, and examines the political economy of time from the perspective of rights, power, and resource allocation (Cohen, 2018: 120-152). This is one of the many aspects of the discussion of time, which according to some authors has peripheral character (Lim, 2019).

In this sense, we can talk about political economy of time that considers the economic peculiarities of time and the related characteristics of politics and political institutions within which the economy operates. Of course, there may be different political economies of time with different scope of research and theoretical analysis of systematic relationships between time and many other categories.

The different types of time and its measurement are a result of the different stages of the development of capitalism, market competition, and the widespread reproduction. The emergence of linear time and related theories of progress occurred during the first centuries of capitalism, when competition led to a slow increase in social wealth, coupled with changes in the organization of labor, the development and the use of new technologies. The acceleration of time occurs after every industrial revolution. The winners in market competition are those who are able to outrun the rest in expanding markets, in offering new products, and reducing production time. The main instruments for this are the improvement of the organization of labor and the introduction of new technologies. New technologies facilitate and cheapen the movement of goods, thus helping in the conquest of new markets. They make it possible to accelerate the production of public wealth, to seek out and/or create new consumers. Competition is constantly accelerating this process. In this sense,

market competition where winners are those economic entities and countries with better organization and technologies is inseparable from the changes in time and the use of time. Time in its various dimensions is an essential characteristic of the functioning of politico-economic systems. Those countries which are moving forward at a faster pace differ from the rest as they are able to accelerate their development and use of time with the help of new technologies.

Time becomes a leading category, similar to working time in classical political economy. Karl Marx, for example, considers the origin of surplus value to be in additional working time. Then, the economic role of leisure becomes important, as time for consumption of the increasing amount of goods emerges as a leading economic category in Keynesian political economy. The ratio between domestic work and wage labor for the different age and gender groups is changing. There is a growing importance of the role of time in capital turnover, economic cycles, depreciation of fixed assets, education and preparation of labor force and human capital, the increasing quantity of production per unit of time, the speed of updating of all production elements, and the changes in consumer preferences.

As an economic category time has many different manifestations and dimensions. For example, the economic development and the economic thought are unfolding in time, so economic history and the history of economic theories investigate the change of economy and economic theories that occurs in time. There are many different time cycles within which different economic phenomena develop – from the time cycle of production and distribution of goods to the time cycles of the increasing and decreasing of certain economic characteristics, cycles of crisis and so on. At the same time the ratio between

working hours and free time, working life and retirement, the planning and the strategies of development with their time horizon, the competitive ambition of a company or a country to surpass others in terms of production and profit of certain goods are basic characteristics of the economic system. The term *weekend* appeared during the industrial revolutions and is connected with the changes between working and free time in contrast to the agrarian era when employment was connected with the rhythms of nature. The same is true with notions like *career*, connected with the time cycle of a person's working life. The idea of retirement as a stage of personal time also arose during the industrial revolutions and gradually become a basic socio-economic notion of the time horizon of modern man. We can see economic time in the financial sphere, starting with notions like credit, rent, loan, interest rates and finishing with futures and other derivatives in the financial markets. Different stages of the development of the economy in different industrial revolutions change politics and political time, because the reaction of the state to certain processes depends on the speed of change in the economy, and that speed is strongly dependent on relevant policies and institutions.

### 1. Technological changes and time

The logic of capitalist economic development suggests acceleration of time to gain competitive advantages and overtake others. When the state does not intervene through laws and regulations, capital governs working time and as a kind of commodity the workforce is a kind of working time. Market rationality is based on the law of value, and its main premise is the need to reduce production time below the average of what is socially required in order to sell the goods. A key objective of capitalism is to increase

profit by reducing the time needed to produce the product. This determines the emergence and dynamics of what is called *modern era* – the organization and division of labor in order to reduce the working time necessary for a unit of production. This can be done through organization and division of labor, as well with new technologies. They are both aimed at accelerating the production processes in order to gain competitive advantage. The very logic of capitalism suggests integration of new technologies, continued reduction of working time, and on that basis – acceleration of all processes – production, exchange, distribution, and consumption of goods. "This means that speed and riches are completely related concepts. And that the history of the world is not only about the political economy of riches, that is, wealth, money, capital, but also about the political economy of speed. If time is money, as they say, then speed is power" (Armitage and Graham, 2001: 113).

Every industrial revolution is a qualitative leap in the creation of technologies that accelerate the cycle of production, exchange, distribution, and consumption of certain goods. Every industrial revolution allows more and more goods to be produced per unit of time, and then transferred and consumed faster by end users.

***Acceleration is a characteristic of production technologies.*** The consecutive transition from craft to manufacturing and then to industrial production increases the quantity of products produced per unit of time and reduces the cost of production. With successive industrial revolutions, we have a process of acceleration of the renewal of production, of innovations. This not only changes production and personal consumption but leads to the rapid transformation in division of labor, types of employment, regulation and the whole politico-economic system of society.

***Speed is growing consistently with the introduction of the different transportation technologies.*** Transport infrastructure is a factor in the development of the relationship between time and space, which alters human perception of both concepts. The movement of triangular sails of ships in the mercantilist pre-industrial era to steamers and railways, cars and airplanes, and then to the missiles of the subsequent industrial revolutions, is to accelerate the time and the amount of people and products carried at decreasing marginal costs. This is how the time of exchange is accelerating.

***The same process unfolds with communication technologies*** that create the opportunity for faster transmission of information to an increasing number of people. The beginning of this process was the introduction of the printing press that changed communication in the preindustrial era. Then it was amplified with the arrival of the First Industrial Revolution and the telegraph. After that with the telephone, radio, television of the Second Industrial Revolution, then Web 1.0, Web 2.0 and the first versions of cell phones of the Third Industrial Revolution, and finally with Web 3.0, 4G and 5G communication systems of the Fourth Industrial Revolution. Material wealth, data, information, knowledge are increasingly produced, and are ever more rapidly spreading to a growing number of people.

Unlike previous industrial revolutions, which were linear, with one-way connection between customer and supplier, and based on incremental change and continuous improvement, the current Fourth Industrial Revolution takes place to a much larger extent within ecosystems characterized by multidirectional relationships and "goods" being exchanged inclusive of data, insights, and services (Deloitte, 2018: 9). This is changing the way people work and interact,

the social and economic time, transaction costs, and marginal value of manufactured goods. Time is becoming an extremely important competitive advantage for the countries that first start the production of particular goods, because with the increase in the quantity of goods produced per unit of time and without increasing the labor force at the same rate, their marginal value decreases. This allows these countries to offer goods at lower prices and thus to conquer the competitors' markets. Likewise, a competitive advantage can be gained by accelerating the transfer of goods at lower costs to more consumers. One of the ways to overcome the cyclical crises of capitalism is through technological revolutions which allow new technologies not only to create new products but to do so and distribute them much faster. Most of the goods require increasing consumption and instruments are created to accelerate the time for that consumption. Advertising and marketing play a leading role in this process, and a growing number of new products are predicated on accelerated cycle of consumption. These characteristics of technological and economic change, however, become systemic characteristics of the change of all elements of society. The time of production and emergence of new products is accelerating. The development of new needs associated with newly created products is accelerated. The time needed for a product to reach more people is accelerating. Thanks to transportation and communication technologies time to transfer goods, finances and intellectual products is accelerated. The speed of transmission of information and financial transactions is also accelerated. The exponential advance of the technologies of the Fourth Industrial Revolution promises huge opportunities and at the same time causes a dramatic disruption across business and society. It is changing

the whole politico-economic system, because it transforms human relations.

The acceleration of social and economic time is associated with an increase of material wealth created per unit of time, which in turn accelerates many other processes - the speed of GDP growth, the speed of exploitation of natural resources, the speed of change in education, lifestyle, and consumption. The changes in economic time, related to the various stages of economic development, change the stages of individual life, the cycle of this life, the perceptions of young and old age. Research shows that for a long time phenomena such as childhood, adolescence, youth are almost absent, because the nature of work does not require qualification and pre-training. It is not a coincidence that at the beginning of the First Industrial Revolution child labor, early marriages and high birth rates were widespread. With the technological improvement of production and the increasing requirements for labor qualification, the periods of childhood and youth appear and develop, during which the person gets the necessary training in order to start his working life. This process is extended by industrial revolutions, affecting more and more people, and changing the relationship between young and old age, between preparation for working life and working life. It is altering human perceptions, because unlike linear developments, the exponential ones are very hard to predict and understand.

## 2. Technological revolutions and stages of change in time

For about 200,000 years, since the emergence of Homo sapiens, around 99% of the social and economic time is inseparable from physical time and natural cycles. In agrarian civilizations economies and the entire life of the people are completely dependent

on climate, seasons, temperature changes, landshaft specifics.

With the development of the **mercantilist pre-industrial stage of capitalism**, and especially with the transition from agrarian to industrial societies, there is a separation of social from natural and meteorological time, and a shift of the speed of time, which is continually increasing. Moreover, the newly created technologies allow its measurement. The idea of linear time and progress towards a better society emerges thanks to the use of knowledge and the creation of new goods. The duration of working time is much greater than in agrarian civilizations where it is dependent on changing natural cycles. Production is now driven by profit, and the longer working time separated from natural time is a factor to increase profit. Working time becomes an important economic category, a factor for estimating the value of the product created by labor. This is a driving factor behind the invention of the mechanical clock. An important category is also the time related to trade and sale of products. The Great geographical discoveries, the conquest of new territories, the transportation of goods, precious metals, and slaves over long distances requires improved seafaring and much more accurate time measurement. The reduction of time for the transmission and sale of products becomes a competitive advantage. It is no coincidence that in 1748 Benjamin Franklin, while giving advice to a young tradesman, pronounced his famous phrase, "Remember that time is money."

In the initial phase of the **First Industrial Revolution**, when wages are based on working hours, the relationship between time and economy seems to be self-evident. Workers offered their time in exchange for money. Working time became an economic category that measured the value of the goods. The telegraph created the sense of simultaneity

of events that happen over great distances and was one of the main reasons for the synchronization of time across the world. This happened at the International Meridian Conference, held in Washington in 1884, where it was decided that the Greenwich Meridian that passes through the territory of the United Kingdom should be accepted as the starting point for hourly coordination. The invention of railways also required unification of time for different states and regions, which led to the substitution of the local forms of measurement of this time with a common global version. Different types of time were distinguished – individual, collective, economic, technological, political and so on. The idea of economic cycles emerged.

The acceleration of changes during the First Industrial Revolution makes societies face the fact that development is connected with contradictions between their various subsystems and social groups. *Typical examples of the concerns associated with the acceleration of development at the beginning of the First Industrial Revolution and the emergence of various imbalances and contradictions between social subsystems and social groups was the emergence of Malthusianism, Luddites, and various versions of socialism.* On the one hand, there is an improvement in living conditions and as a result the so-called demographic transition – acceleration of demographic growth that impressed Malthus at the end of the XVIII century and gave birth to his theory of the differences in economic growth rates and the number of people whose needs must be satisfied. On the other hand, some countries and social groups might be more profitable than others and this created a risk of conflicts between them. This caused reaction from socialists and anarchists who were trying to find a way to overcome this contradiction. Thirdly, some systems of society can develop

faster than others and this may cause conflicts among them. A typical expression of such a contradiction was the Luddite movement at the beginning of the XIX century, whose members believed that the mechanization of production will lead to mass unemployment, i.e. there was a contradiction between the speed of industrialization and the changes in the workforce. After that the stages of development of the state were connected with the creation of mechanisms to overcome the contradictions among the various subsystems of society, and with the synchronization to some extent of their development.

This created the need for much more accurate measurement and coordination of individual and collective time, and was a factor for the appearance of early versions of personal watches. In developed countries, they appeared at the end of the XIX century among the richer and educated part of the population. Women wore them as a part of the jewelry, and men used pocket watches whose production grew rapidly as they were needed not only to measure the time of individuals and groups, but also to coordinate processes in the military sphere.

**The Second Industrial Revolution** accelerated the processes even more, but some regions and countries where new technologies were developing faster than others and this gave rise to growing contradictions at all possible levels – from changes in the geopolitical balances that caused two world wars to contradictions within countries, requiring the creation of new institutions, rules, regulations and changes in the political-economic systems.

The Fordist organization of production and the conveyor belt, as a characteristic of the Second Industrial Revolution, required synchronization and regulation over time of production of different types of products, which accelerated the dissemination of

technological tools for that purpose. The much greater synchronization of production, exchange, distribution, and consumption of the Second Industrial Revolution's products became characteristic of societies as a whole, and created new industries to measure time through which these processes can be realized. During the First World War wrist watches were widespread in the trenches among British soldiers, and since the 1930s they have replaced pocket watches in developed countries, becoming part of the lifestyle and the continuous synchronization and regulation of collective work and free time for a growing number of people. Initially, pocket watches, and then hand watches, became elements of the everyday life of billions of people who needed to organize their personal work and leisure time, and to coordinate interactions with others.

The process of accelerating social time became part of the strategies of countries that were trying to speed up their socio-economic development and, at the same time, to resolve the contradictions that arose from the acceleration of all processes. The countries which seemed richer and more developed became a model of development and the ambition of others was to catch up and surpass them. Still during the First Industrial Revolution, strategies for speeding up time were emerging and competition between countries was intensifying in the pace of development. Germany and the United States created their own economic theories through which they wanted to accelerate their development and to surpass Britain. Then, during the Second Industrial Revolution in the Soviet Union, the slogan "to catch up and surpass" became popular. The idea was that the countries of the periphery must speed up their development to reach developed capitalist countries within several decades. Planning and strategies in different spheres

became instruments for purposeful and accelerated development. The race in time accelerated with the emergence of new and disruptive technologies, where competition was to outrun and surpass the others in the creation and use of those technologies. States were struggling to create more advanced weapons and, above all, nuclear weapons. They were fighting to conquer the cosmos and every other significant technology. National strategies were developed to catch up and overtake more advanced countries by speeding up the development.

At the beginning of the **Third Industrial Revolution**, Gordon Moore, the founder of Intel, identified a pattern of the changes in the computational power of microprocessors, and formulated what is known as Moore's Law. According to him, the density of transistors in the chips and, respectively, the computing power of processors grow exponentially, doubling on average every 18-24 months. Thus, in 1965, he predicted that in 1975 the amount of elements per chip would increase from  $2^6$  (64) to  $2^{16}$  (65536). This exponential growth of new and advanced versions of microprocessor technologies was a typical example of the exponential nature of technological change that has unfolded since the Third Industrial Revolution. This was also an economic change, because with such exponential speed the economic value of the power of the chips and computers was decreasing. At the same time, the economic change is a prerequisite for a comprehensive social change.

In 1970 Alvin Toffler published his bestseller *Future Shock* where he was trying to show the destructive stress and disorientation of people undergoing too much change in a short span of time. That raised the question of the limits of adaptability of society and humans. He pointed out that in 1966, 55% of all the items sold in American supermarkets did not

exist ten years earlier. And of the products that existed ten years ago, 42% have faded away altogether. The relationship between people and products became more and more short-lived since the sharp increase of those products that were for a single use so Toffler said that we face a rising flood of throw-away items and a life in high transience (Toffler, 1970: 71-73).

### **3. The Fourth Industrial Revolution and exponential technologies, economies, and societies**

The speed of change, both in the production and distribution of goods, as well as in innovation, technology and the organization of labor, is becoming a hallmark of the latest technological development stage. To describe this feature of Fourth Industrial Revolution technologies, the term "**exponential technologies**" is used, and exploration of their implications for humans refers to "exponential life" (Gilles, 1997).

To get a sense of this exponentiality, we could use the legend about what happened when chess was invented in ancient India. The Indian king was so impressed by the game of chess that he offered its inventor to choose whatever reward he wanted to receive. He asked for grains of rice – one grain of rice for the first square of the chessboard, two grains – for the second, four grains – for the third, and so on, doubling the number of grains for each of all 64 squares. The king laughed and said he would fulfill the request, which seemed to be very small for the inventor's great achievement. But then he was struck when he realized that 1000 times more rice was needed to fulfill his promise than there was in the world at that time. This example shows us that it is intuitively difficult to understand the essence of the exponential growth (Tahan, 1993: 113-115).

Typical of today's digital economies is **the speed that leads to the destruction of existing realities**, to a qualitative leap in interdependence, to a compression of time and space, to increased uncertainty. A typical example in this respect is the change in the speed of distribution of the leading technology devices across the various industrial revolutions. Every industrial revolution starts in the developed Western countries and then spreads as a wave to the others parts of the world. The first two industrial revolutions lasted for about a century and decades were needed for the spread their discoveries. In many respects, they can be described as linear, because they were simply designing for the future some already existing tendencies and the predictions for the trends they bring seemed to be believable. Their waves were slower and some of them have not yet covered the whole world. In order to extend beyond the borders of Europe the First Industrial Revolution needed about 120 years, and the wave of the Second Industrial Revolution, which began at the end of the XIX century, still does not cover 17% of the world population, or 1.3 billion of people who still have no access to electricity. The Third Industrial Revolution sped up the process and continued for several decades, involving billions of people in the new Internet realm. Radio needed 38 years after its creation to spread amongst the first 50 million users, TV needed 12 years, Internet – 4 years, iPod – 3 years, but the social network Facebook reached 100 million users for only 9 months, and downloaded apps for iPhone for a nine-month period stood at the giant figure of 1 billion (Falls and Deckers, 2013: 102).

The speed of change is also driven by the fact that science has never so far in history produced so much new knowledge, and hence innovation and new technologies at such a high speed. During the Fourth



Industrial Revolution this speed is increasing in all areas, which in turn increases the speed at which a growing number of products and services reach consumers as their marginal value decreases exponentially. A typical example in this regard can be taken from the field of genomics. To decode the human genome a 13-year project was conducted by many scientists from all over the world, at a price of 3 billion dollars. Fifteen years later, the cost of decoding the genome per person has fallen drastically, and in 2019 anyone can ask for his individual genome to be decoded for the price of 600 dollars and to know what his hereditary features are and what measures can be taken to improve his health (Hun, 2019).

We can observe this acceleration process in many other spheres. Typical in this respect is the world scientific community engaged in generating knowledge and new technologies, which is also growing exponentially. Of all scientists in human history, 90% live and work today, i.e. they have the qualitative potential to create nine times more scientific discoveries and technologies than in the whole history of humanity before. In reality, however, because of advances in science and technology, they have the potential to create much more. It is also known that the scientific degree "doctor" was first awarded in 1915. In 1955 around 20,000 people in the world received this degree, and in 2010 they were 160,000. In 1883 several thousand patents for new discoveries were registered annually in the world, in 2010 they were over 1 million a year. If we take the published scientific articles in the world since the middle of the XX century, we will find that they doubled exponentially every 9 years. This exponential growth of scientific knowledge is also a factor and expression of the exponential nature of change (Gastfriend, 2011).

To reach 50 million users aircraft needed 64 years since the start of its production, car - 62, phone - 50, electricity - 46, credit cards - 28, television - 22, computers - 14, mobile phones - 12, internet - 7, Facebook - 4, the WeChat - 1. It took 19 days for the Pokemon Go – the popular reality-added game – to reach 50 million users and this was about 1100 times faster than the car – one of the main products of Second Industrial Revolution. A newly created product is distributed 1100 times faster today, and is rapidly changing the lifestyle and behavioral elements of 50 million people, and with it important elements of the overall social system. A hundred years ago it took half a century, now it takes 19 days. One of the most important factors for the much higher speed of time today is that in the first case we deal with a material product, while in the second case – with a digital one whose marginal value approaches zero with its spread, and that can reach a virtually unlimited number of people (Desjardins, 2018).

Today, if we take a simple tablet used for reading, communications and web browsing, we will find that it has the ability to accumulate and process information equal to that of 5000 office computers 30 years ago and at the same time the value of its ability to collect information approaches zero. The storage of one gigabyte of information now costs less than 0.03 dollars a year, while 20 years ago that price was 10,000 dollars. We should also keep in mind that this speed is related not only to the changing price of technology, but also to those who produce these products. For example, today's explosive digital companies such as Airbnb, Uber, Alibaba did not exist a few years ago, but today they are market monopolists with millions of users, having a disruptive effect on a number of industries. The iPhone technology first appeared in 2007 and today we see it everywhere. In January 2008 Apple sold nearly 3.7 million of these devices.

In June 2014 the number of smartphones sold exceeded 500 million (Gringard, 2017: 9). In 2010 Google announced for the first time that it had created a fully automated car without a driver, and in the coming years these cars are expected to become widespread on streets and highways (Schwab, 2016: 8-9). When Amazon introduced the IA Alexa in 2014 it had only 15 skills and by September 2017 it had over 20,000 independent vendor-developed skills, which is even faster than exponential growth (Jacobstein, 2018: 9).

The increased rate of innovation spread leads to the fact that even in the most backward countries new technological discoveries come today at a rate of tens of times faster than in previous industrial revolutions. For example, to exploit the advantages of such a technological invention of the First Industrial Revolution like the steamer *Indonesia* needed 160 years after it was invented. To take advantage of such Second Industrial Revolution technology like electricity Kenya needed 60 years after its creation and first use. Vietnam began introducing Third Industrial Revolution technologies like computers only 15 years after their launch in the most developed countries. Mobile phones and the Internet have spread to these countries over the course of only a few years. The paradox is that in the world today more households in developing countries have mobile phones than access to electricity and good sanitary conditions (World Development Report, 2016: 5).

There are four key factors for the accelerated introduction of new technologies. The first one is that, unlike the technologies of the First and Second Industrial Revolution – railways, telephone, cars, electricity – computers and electronic networks need much less infrastructure, which can be created much more quickly. The second major factor is that humanity is already strongly connected, and information and new products can reach very

quickly every single person in a globalized world. The third factor is related to the better education and the growing aggregate wealth of mankind, which reduces the relative share of the poor and makes a growing number of people potential users of new products. The fourth factor is the rapid reduction of marginal costs of digital products.

If radical changes in the economy and society the pivotal points in past periods of history happened over many generations, they are now becoming something that happens many times within individual human lives, rapidly changing perceptions of economy and society. If we take as an example technology, we will see that in 2012 80% of Apple's giant profits came from products created in the past five years. The world is changing rapidly and this type of companies are able to adapt, unlike other companies like Kodak for example that have now disappeared. So we should bear in mind that digital technologies have a disruptive effect that affects all social systems. If 80% of technologies change within five years, it means a sharp acceleration of change in society. This change seems inevitable and unpredictable, it blows up social realities, and turns some politicians into helpless people who promise one thing, but reality is pushing societies into other directions. Politicians lose confidence and fail, because they have failed to understand what is happening and what they have to do. Tomorrow will not be like today, as it has been for millennia, and those who want to live tomorrow should adapt very fast to survive.

Due to the exponential nature of technology, a number of preconditions that have worked so far in economic science do not seem to work anymore. Events that previously needed a hundred years to unfold, are now unfolding for a week and this has unforeseeable consequences.

All of this has two basic implications. **The first one** is that *linear forecasts for the future do not work anymore, as realities change non-linearly*. The future seems increasingly indefinite and unpredictable. Strategies and forecasts made even by big think tanks fail. The majority of people expect the world to move in one direction, but something totally different is happening. The reason for this is the growing imbalance of social systems as a result of the acceleration of changes, which is leading to a growing asymmetry between causes and consequences, to the appearance of unexpected and previously unseen factors or individuals that can push events in an unforeseen direction. Traditional prediction models and theories do not work, and the aspiration is to compensate for this flaw by creating algorithmic models for processing large amounts of data, through which to foresee the direction of development of different events.

**The second consequence** is that *not only economies are changing with previously unseen velocity, but all social relationships as well, which makes it difficult for the social systems to adapt to these changes*. This generates constant crises, imbalances, breakdowns in one sphere or another, or in society as a whole. A growing number of people are now shopping differently than their parents and grandparents, they are earning their money in a different way, and digital technologies are changing their working and leisure time, their interpersonal and emotional relationships, even their cognitive characteristics. Politics is changing and political campaigns are increasingly based on the collection of large amounts of data and personalized targeting of voters, and behind the political power are powers with growing economic influence. The tendency is for these processes to expand much more rapidly in the coming years.

The changes are also related to ***the emergence of new characteristics of the economic system which, unlike previous economic systems, make orientation towards the future and the increasing individual and collective value of time its fundamental trait***. The delay in time today can be fatal for individuals, as well as economic subjects and civilizations. The loss of individual and historical time when it moves much faster than before, and the consequences can be much more fatal than in the past, can turn individuals, companies, states into losers if they do not act fast enough. The probability of being a winner is now much more related to the ability to compress time and space, to do something faster than others, minimizing space-time constraints. This has the following main consequences.

**First.** The orientation towards the future and the ability to adapt to unexpected and rapid changes becomes a key feature of business in an economy where innovation and the ability to look beyond the present are leading competitive advantages. Under these conditions, uncertainty as a characteristic of economic behavior, which neo-institutionalists have been talking about over the past few decades, is increasingly dependent not only on market interactions or competition, but on the uncertainties associated with one or another technological discovery or innovation. The two institutional mechanisms through which the capitalism of previous stages imposes orientation towards the future on the participants in the economic process, are competition and credit. That role is now played by technological innovations, as the speed of their introduction and the magnitude of their implications become a major factor for uncertainty.

**Second.** The speed of change means that the marginal cost, marginal value, marginal utility of each new commodity or service goes

to zero at a speed greater than ever before, and the one who is able to adjust to the speed is the one who wins. At the same time, the rapid reduction of marginal cost is a precondition for much faster and wider dissemination of the product. Products are becoming obsolete faster than ever, being constantly replaced by newer and more sophisticated versions, as their marginal cost is dropping too fast.

**Third.** The speed of change and the immense amount of information around us transform radically the attitude towards time and give birth to the so-called "attention economy" where the winner is the one who can attract the most attention to his product. Man in the digital age, as a consumer and as a member of the workforce, is changing as a result of the speed of technological innovations and inventions. The increased speed of innovation means increased speed of the creation and consumption of products and services. The accelerated time gives birth to the hectic person phenomenon, whose time is constantly not enough, who is worried that he is lagging behind, wasting time or getting late. The more humans, as workforce or as consumers, are included in the digital age, the more this phenomenon manifests itself. It changes both the characteristics of the consumer and of the workforce. Today much more than in the past lost time seems like a genuine loss. A growing number of people are searching for the short narratives to get quick information. On the Internet, it is common practice for most sites to initially specify the time needed to read the material, so that one can decide in advance whether to invest time reading it. According to a survey made by Google, sites that are 250 milliseconds slower relative to their competitors, get less traffic. More than one fifth of Internet users would not bother with an online video if it takes more than 5 seconds to load it. If the utility of things is measured by the milliseconds required for

their consumption, this means that seconds are viewed predominantly from the standpoint of the economic value they provide. People are becoming impatient when using particular services. Emails and smartphones also increase the impatience and anxiety related to the shortage of time. This changes the character of the relationship and even the etiquette of behavior among people. The e-mail etiquette today suggests that the answer to a letter should not be slower than 24 hours, and the general expectation is that the sooner it is sent, the better. As the value of time increases, dealing with the ever-increasing impatience in digital consumer behavior, is becoming one of the many new problems faced by modern business. The significance of the new and different elements in the product increases. The main characteristic of the perception of time becomes the feeling that it is never enough. A growing number of people who want to keep up with the digital age strive to quickly change their commitments, to deal with several things at the same time, and they constantly live with the feeling that something is not done properly. This sense of shortage of time and the change in the way people work and live also leads to changes in the way they experience their leisure and working time. Studies show that these feelings are strongly correlated with the degree of education. They point out that today's high-profile cadres will work longer than their less educated peers. For example, a Harvard Business School survey held among 100 professionals shows that 94% of them work at least 50 hours per week and half of them work over 65 hours, which is much more than the officially accepted workweek. Another study shows that 60% of the people who use smartphones are working 13.5 hours or more a week than those who do not. The smartphone use correlates with working time and the sense of shortage of time. Research

also shows that although global leisure time has increased over the last decades, most of the increase happened between the 1960s and 1980s. Since then, with the acceleration of time during the Third and Fourth Industrial Revolutions, there has been a deepening "leisure time gap". The bulk of it is consumed by people with lower education, who do not feel so sharply the exponential growth of the changes and the shortage of time (Why is everyone so busy, 2014). An element of the dualization in the labor market becomes the different perception and length of working and leisure time. One of the differences between social groups is related to their division into those constantly short on time, and those with too much time on their hands. Groups and people are divided into hectic and slow, running and walking. For some, time acquires value greater than everything else, and to others many other things are more important.

A large number of goods and services are becoming uncompetitive very rapidly, because the parameters that used to matter in competition hold no significance any more. The rules of competition are fundamentally changed. Previous strategies, predicated on reducing the value of goods in order to gain efficiency and thus compete successfully, are no longer adequate. In order to remain competitive, companies and countries must be leaders in innovations in all spheres and must offer things that others do not. If a company does not do so, it dies and is replaced by a new one, while a state is quickly becomes a laggard in the global race. Innovations come and become obsolete much faster. Consumers' allegiance to products becomes short lived, which has disruptive consequences and leads to minimizing the role or the disappearance altogether of entire industries and powerful companies associated with them.

In order to explain the specific traits of this new economy, it should be noted that the digital technologies that underlie digital business models have the ability to create exponentially increasing value. A notion emerges, which some call the "law of accelerating returns" (Bloomberg, 2015). If previous business models were based on the idea of doing something better in order to attract consumers, now the guiding principle is to do something different. If incremental improvements over existing products and the achievement of 10% profit, for example, used to be considered satisfactory, the profit is now expected to be a lot higher. If earlier business models, especially those from the Second Industrial Revolution, used machines for mass-production to increase profits, digital business models use network effects to create what is characterized as *an accelerated return on scale*. The main difference lies in the fact that the industrial models are linear, while the digital models are exponential (Ismail, 2014). This explains the success of high-tech companies such as Google, Facebook, Amazon, Uber, and so on. The speed at which a company can grow and turn into a monopoly, or disappear, as a new company exponentially grows with something new and different, becomes faster than ever.

Having all this in mind, Amin Toufani speaks of the emergence of "exponential economics" or "exonomics" related to technologically-driven changes in human beings as a result of changes in the workforce, property, production, prices, power, politics, prosperity. Technology allows people to do things that only companies or governments were able to do before. They have a democratizing effect, because they allow a small team of people to do things that can have a huge effect. Just a few people in a team are able to create things that have tremendous economic and social consequences and those people can

be located in a different parts of the world. This is particularly noticeable for different innovations when a discovery can lead to billions of profits within just a few years. At the same time, the Internet feeds a kind of nano-economy where a growing number of people are without a permanent contract and work for digital platforms for minimal wages. This magnifies the opportunities for rapid increase in wealth through relevant entrepreneurial activity, but at the same time destroys the socio-economic status of many people (Ramirez, 2015).

Exponential changes associated with continuous innovations dramatically increase all kinds of uncertainties. The speed of the changes and their disruptive nature lead to the disappearance of the previous seemingly linear and predictable nature of development. They make any steady structures, attitudes, and expectations unpredictable, increase uncertainty, and creates preconditions for crisis processes within societies, institutions, large groups of people who are marginalized by the change, feel like victims, and are dragged in an unknown direction, full of risks and dangers. Mass perceptions are geared towards living in an increasingly risky society. This causes a growing number of prognoses, plans, strategies to fail, while states appear to be unable to cope with the uncertainty that leads to the emergence of populist and authoritarian tendencies. In any case, the increase of uncertainty and risk imposes more than ever the need for relevant organizations, institutions, rules that could become an instrument for reduction of individual and collective insecurity. The problem lies in how to reconcile the inherent contradictions between institutions and the change, and between rules and creativity.

#### **4. The acceleration of technological and economic changes and the transformation of the state**

One of the most important transformations is connected with the need for transformation and adaptation of the state to the ongoing technological revolution. In fact, every technological revolution has systemic consequences associated with accelerated changes that transform the economy, as well as countries along with their institutions. The exponential nature of the Fourth Industrial Revolution refers not only to the speed, but also to the nature of change. It does not unfold in a linear fashion, which would make it relatively predictive, because certain trends can be transferred from the present to the future. Rather, it develops with speed and scale that makes it hard to see the future, because it brings qualitatively new features in the political, economic and social systems that are very difficult to predict. Systems are changing at an increasing speed, so they become more and more unbalanced, and in unbalanced systems small changes can bring huge consequences. At each stage, this raises the need for a rapid change in regulatory mechanisms, institutions, countries, and feedback systems. If the states fail to do so, they disintegrate and disappear, or wars and severe conflicts are born that also lead to breakdowns.

*So we can talk about political economy of time that is interested not only in the changes of time within the different economic systems during the subsequent technological revolutions, but also in the question of how acceleration of economic processes makes social systems more complex, while also being inseparable from changes in the state. The classic relationship between the state and the market has temporal dimensions. It is not by chance that we find that from the very beginning of the pre-industrial age onwards*

*every subsequent technological revolution has changed the state with its policies.*

In the **pre-industrial mercantilist era**, when changes were still too slow, the absolute monarchy appeared, imposing and enforcing common rules within a certain territory, while also conducting mercantilist policies and assisting in the development of a national market. At that stage, the most important thing was to have an institution that created security and imposed common rules within a certain territory. Absolute monarchy began to unite the population of these territories around a common language and identity, and gave birth to the nation states as stabilization instruments, through which to implement the tasks related to the rise of capitalism. In the XVIII century the idea of Enlightenment and the "enlightened monarch" arose, founded on the knowledge created by scholars and enlighteners. Along with this, the idea of the separation of powers as an alternative to the absolute power of the absolute monarchy unfolded – as it became evident during the French Revolution, the main flaw of the existing absolute monarchy was that it failed to respond adequately to the emerging contradictions as a result of changes in the social structure of society associated with the rise of the bourgeoisie.

**The First Industrial Revolution** accelerated the development and creation of profits through the economy. It imposed the need for changes in political institutions, as well as in the speed of their reaction to social and economic processes. The acceleration of changes in the economy and hence in the social structure and social needs implied the need for rapid reactions from the states and for relevant feedback allowing a relatively quick response to the problematic situations in order to avoid crises, breakdowns, or revolutions, as was the case with the French absolute monarchy in 1789. It is not a coincidence that

the UK, the country where the First Industrial Revolution started, became the country where liberal democracy first emerged. It provided feedback on the problems of different social groups through parliament and political parties that expressed the interests of these groups. This created preconditions for quick decision making by the state in the face of emerging controversies, and gave stability to the rapidly evolving economic system. Parliaments became necessary, because permanent changes required the emergence of new rules to govern the functioning of different areas of social life, and that could not be done without the relevant representative institution which is able to respond to the needs of society.

During the **Second Industrial Revolution**, the contradiction between the growing numbers of mass-produced products, thanks to the Fordist organization of production and the availability of sufficient number of consumers of these products became important. The number of media responding to different processes and legitimizing the status quo power increased. Powerful trade union and employers' organizations emerged as tools trying to respond to the problems and contradictions between workers and capitalists, regulating these contradictions. Mass multiparty liberal democracy and Keynesian regulation of the economy became an adequate politico-economic system, enabling the development of economies of mass production and mass consumption, mass parties and mass culture. The development of the welfare state, which redistributes the generated national income through the tax system and actively participates in the stimulation of aggregate consumption, became possible.

This was also the time when countries developed strategies and plans to achieve certain economic and social goals within fixed time periods. The crucial part is that a

race unfolded among countries to achieve certain economic and technological goals. Developed countries created strategies to accelerate development and to surpass the global hegemon. Developing countries tried to imitate the developed countries or to create their own socio-economic and political systems to catch up with those ahead of them. It is no coincidence that the slogan "to reach and surpass" rose to prominence in the USSR in the 1930s. Similarly, Bulgaria after 1944 was trying to compress within several decades the path that the developed Western countries had taken centuries to complete.

During the **Third Industrial Revolution** and globalization, the state appeared increasingly incapable to respond to the accelerated changes, and this gave rise to the idea of transferring its powers to the market. This brought the dominance of neo-classical economics and neoliberal policies, as well the rise of global corporations and the deployment of global value chains. Parliaments face increasing difficulties in trying to cope with the speed needed to change legislation. In order to improve manageability, new supranational structures were created – the number of international institutions like the EU, NAFTA, ASEAN, WTO, and many others was increasing. At the same time networks of NGOs and think tanks, expert centers, advisory structures, analytical units of state institutions and business organizations were emerging and expanding to gather information and respond to the changes. An increasing number of indicators were generated by transnational organizations, consultant companies, brain centers, research institutes, credit agencies, forecast centers, and strategic units that generated information and used it to respond more quickly to the changes.

Around the 1970s criticism emerged about the way the state and its institutions were

dealing with the rapidly changing realities, and the need for rapid decision making emerged. In the United States, Ronald Reagan became president in 1981, criticizing the so-called "taxing and spending government". In the USSR and the former socialist countries critical voices about the bureaucracy sounded louder. Parliaments in countries like Bulgaria, which gathered twice a year, failed to respond to the need for rapid changes in different regulations, and therefore we had a huge increase in the so-called auxiliary legislation created by different institutions within the executive branch of government. Developed countries were moving towards the neoliberal state, which transferred its powers to the market, civil organizations, business, and transnational organizations. In China, an experiment was conducted, trying to combine the centralized single-party system with market development and integration into the global economy, and it was very successful in many respects.

As the **Fourth Industrial Revolution** gathered momentum following the 2008 crisis, the speed of changes increased and this led to accelerated imbalances and contradictions of all kinds, but primarily in socio-economic and geo-economic terms – redistribution of economic power, and hence of other forms of power among different social groups, territories, national states and coalitions. That in turn caused a growing number of conflicts and it became difficult for traditional liberal democracy to adapt to the speed and to the expertise needed to respond to those growing imbalances and contradictions. A typical example is the Bulgarian Parliament since 1989, which operates all year round, changing over and over the newly adopted laws, often within a very short time, and yet they are in many cases inadequate or difficult to apply. A similar tendency is observed in other parliaments, and this leads to a general



loss of confidence in politics. The speed of change is problematic for the institutions of states and inter-state organizations that fail to respond effectively and since the 1980s this is one of the reasons for the growing criticism toward state institutions and politicians, for the constant changes in laws and normative acts, for the frequent calls for reform of one or another system. When it comes to companies, the need for rapid decision making and strategic vision also increases, especially with the gigantic amount of data and information that they accumulate and must process. Thus, the decision-making time, the risks of these decisions, the need to learn and change rapidly are becoming the main factors that determine the growth of managerial wages.

Decision making at all levels – from government institutions and transnational companies to small innovative companies – is becoming a more significant problem with the increasing speed of change. For example, a product can increase GDP, because there is a demand for it, but just one sudden innovation can cause the entire supply chain to break down and be replaced with something more competitive. This is the case in many other areas where the institutions are not in sync with the changes happening around them. A year before the beginning of the global financial crisis, Alvin Toffler gave as a typical example in this respect "the inability of the US Securities and Exchange Commission to adapt to the furious speed and complexity of financial institutions in the private sector whose business it must regulate" (Toffler, Alvin and Heidi, 2006: 58). Exponential changes create and will increasingly create institutional crises and with them the need for new institutions that are synchronized with the process of change. So we should combat exponential changes with the help of exponential technologies. Technologies like Artificial Intelligence, drones and autonomous

machines, Internet of Things, 3D printers, and advances in genomics promise radically new approaches and solutions to challenges like climate change, hunger, food waste, water supply, health, loss of jobs, security, peace and war, but taking the right decisions depends on all of mankind.

## Conclusion

For now, contemporary state seems to respond inadequately to the emerging contradictions related to accelerated time, and this causes severe conflicts, wars, social unrest, breakdowns, emergence of new unions and a global redistribution of power. The economy is changing rapidly and society and state should also change dramatically in response. Thus, it is not a coincidence that the present study uses a historical and politico-economic approach, trying to show the philosophy of development. It attempts to capture the bigger picture of the change during the past few centuries and tries to provide an explanation of the magnitude of the ongoing transformation. The exponential world we are entering must be analyzed and understood if we are to respond adequately and survive the biggest and fastest technological, economic, political and social developments in human history. Tendencies are unfolding that force the state to evolve and I suggest four dimensions of this evolution.

This is an **algorithmic state** that responds to the speed of change and the gigantic amount of information generated from everywhere to avoid uncertainty and risks, by developing Internet of Things and processing big data with the help of artificial intelligence, enabling real decisions to be made quickly in real time. The algorithmic state is a higher stage in the deployment of the current e-governments.

This is an **innovative state** that focuses on stimulating innovations by attracting and developing human capital,

by actively encouraging and participating in the development of new technologies, by creating a comprehensive system of start-up companies, by supporting education and science, knowledge management and changes.

This is an **exponential state** in which the main economic structures – firms, companies, corporations have the characteristics of exponential organizations, whose essence is related to the need for adequate response to the exponential nature of technology, the economy and the changes in all other social spheres.

This is a state with a **collaborative and participatory digital democracy** in which every individual and social group can react to one process or other, to provide feedback, to respond to the risks, and to avoid the dangers.

Given the giant acceleration of all the processes, this transition will not be easy at all and further research will be necessary in order to find the right path and mechanisms to create new balances in the politico-economic systems, based on the assumption that if the way people work and interact is changing, if the economy and social structure are transforming exponentially, new and exponential institutions are needed to respond to those challenges. Still, while that would give us a new perspective and new understanding of the ongoing change, we still would not know where exactly it will lead us. And given that this is dependent on a growing number of unpredictable factors, the future is not as predictable as it was in the past. Companies, institutions, and the entire socio-economic system are facing disruptive effects, blurring the future. If companies are to survive, they must incorporate new business models, based on innovation, speed and creativity. Every aspect of business must be reshaped with new technologies no matter the cost. Institutions must create new mechanisms

and balances to provide feedback to citizens and protect those bound to lose from the change. Societies all over the world are disintegrating and the state should find a way to integrate them once again around new and sustainable shared values and identities. The state should carry out deep reforms in all its systems from healthcare and education to political institutions. The economic system is at the start of a new revolution that will change everything and we still do not know how politics, society and the economy will adapt to the exponential changes. There are multiple possible futures, with varying mix of technologies and features, each accompanied by uncertainty in assigning a probability to its actual occurrence. These possible futures are raising many questions that are pressing enough but need further research. What we now know with certainty is that the exponential change is transforming economics and politics and with this our everyday lives, the ways we think, work, and all human relations. Most probably this will have a disruptive effect on the existing politico-economic system that needs a deep reform to overcome the growing contradictions, to minimize the negative and to maximize the positive impacts of the challenges that the world faces today.

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