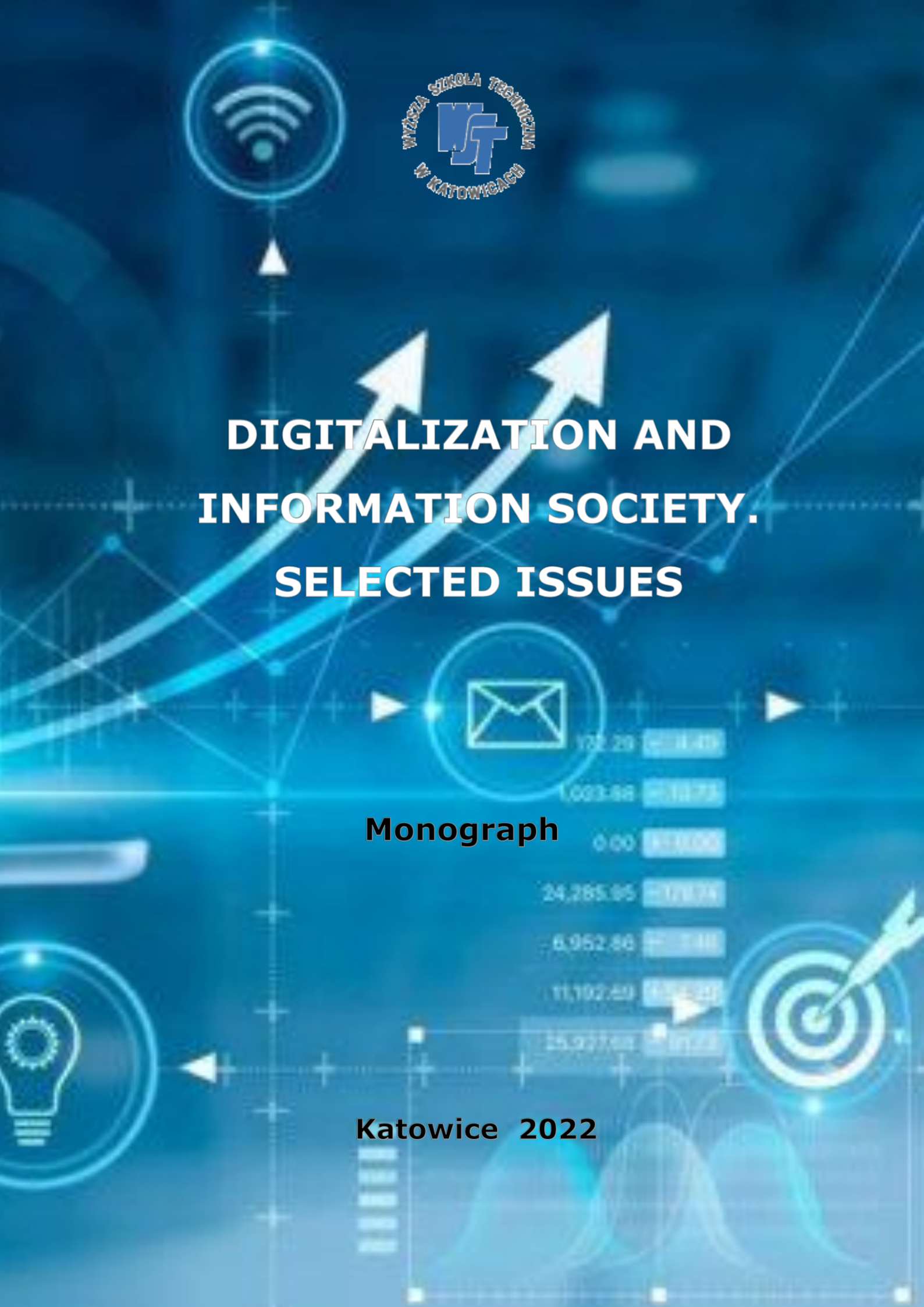

DIGITALIZATION AND INFORMATION SOCIETY. SELECTED ISSUES

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DIGITALIZATION AND INFORMATION SOCIETY. SELECTED ISSUES

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3.5. DYNAMICS OF ECONOMIC PROCESSES IN TRANSITION TO THE DIGITAL ECONOMY

Time can be considered another dimension except for the three spatial ones in which the system is formed. This dimension can be figuratively called the "timeline" or "lifeline". Each system has its past, present, and future. In unity and integrity, they form a particular systemic whole – a system of transformational reproduction of the process of the system's functioning.

Leibniz argued that space is an order of coexistence, and time is an order of sequence of phenomena[563].

Any economic system is based on a set of interconnected technological processes. Each technological process requires strict adherence in space and time to specific work processes in which there is a change in the size and properties of labor objects.

The reproduction of any system is based on the formula: "A whole that is greater than the sum of its parts." According to this formula, the system is formed in space and time. In space, it is built of individual interconnected elements (parts). In time, the reproduction cycle of the system is formed from separate interdependent operational processes.

The time factor is attracting the attention of modern economists in connection with the study of the problems of the manifestation of the time factor in the transition to the digital economy. In particular, the following issues are studied:[564]

- problems of saving time;
- time gain and risk;
- formation of time in trade;
- time factor in transport operations;
- short-term and long-term periods in marketing;
- time factor in examples of areas (health, education, communication, etc.);
- time factor in macro-and microeconomic modeling;
- evolutionary modeling;
- time factor in marginal theory;
- parameters of the time factor in dynamic economic processes, etc.

The phase transition to a new socio-economic formation, the digital economy, changes the basic structure of economic systems both in space and time.

Key parameters of economic dynamics during modern industrial revolutions. The fundamental changes that economic systems must undergo in space are the transition to alternative energy, additive technologies (3D-printing) in material production, and the transition from concentrated space large enterprises to distributed production and horizontal consumer networks small production units.

A radical change in the content of economic processes should also be noted. There is total informatization (digitalization) of key components of the economic system: production, communications, and consumption. The transition from human influence mainly on the material composition of objects of labor to the predominant influence on their information base is being realized. Dematerialization of these components significantly affects the dynamics of economic processes.

The dynamics of economic systems, i.e., their ability to change over time, are determined by time parameters.

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[563] Leibniz, G. W. (2021): Encyclopedia Britannica.

[564] Davis, J., Cot, A. L., Duarte, P. G., Hedoin, C. (2017): Time in Economics. Economic: History. Methodology. Philosophy. Open Edition Journal. 2017.

Rohatinski, Z. (2017): Time and economics: the concept of functional time.

Winston, G. C. (2008): The time of economic activities: firms, households and markets in time-specific analysis. Cambridge University Press, 2008.

James, A. (2012): Sprenger. Risk preferences are not time preferences. American Economic Review, Vol. 102, No. 7.

Time parameters are economic indicators that are directly or indirectly formed, taking into account time indicators. Time parameters reflect the quantitative and qualitative aspects of system reproduction implementation of individual processes (subprocesses). Among the main ones are:

- *sequence;*
- *duration;*
- *pace;*
- *speed;*
- *time density;*
- *the level of synchronicity of processes;*
- *switching time.*

All these factors are equally important for some reproduction processes. For others, only a few.

The sequence is the order of alternation of subprocesses (existence and changes in the state of elements). Depending on the nature of the overall reproduction process and its constituent subprocesses, we can speak of three sequence modes: cruel, relatively cruel, and accessible.

Duration is the period from the beginning to the end of a particular process; is formed from moments or time intervals that occur one after another and together constitute the entire period of existence of the system in a certain state - from its emergence to the transition to a qualitatively new state. During the process, the system undergoes quantitative and/or qualitative changes.

The following types of durations should be considered the most relevant for the economic system:

- *duration of the operation* is the time during which the production operation is carried out to change the shape or properties of the object of labor;
- *duration of the manufacturing process* is the time during which a set of operations for the production of a particular product (products, works, services); it includes phases of work operations and phases of necessary breaks (switching time);
- *duration of the sales process* is the time during which a set of operations for the sale of manufactured goods (products, services) from the moment of its transfer to the buyer to receive payment from him;
- *duration (period) of working capital turnover* is the time during which working capital undergoes a complete cycle of turnover, including phases: active payments, inventories, work in progress, ready for sale goods, shipped products, and funds received on the balance sheet of the manufacturer; depreciation duration (service life) of fixed assets - the time during which the system (or its component) completely loses its functional properties (for example, there is a complete loss of performance of a particular element of fixed assets);
- *duration of depreciation of fixed assets* is the time during which the return (depreciation) of funds spent on the purchase of a particular element of fixed assets;
- *duration (period) of cost recovery* is the time the return of capital is spent on a specific share (project, construction, business transaction, etc.) at the expense of income from its sale.

Pace is a value that characterizes the rate of change of the system's state or the intensity of its development. It is usually measured by the time a conditional unit of changes in the system's condition occurs (in particular, a unit amount of work is carried out; the unit of path length is overcome, etc.).

Speed of change of the system's state is a value inverse to the speed. It characterizes the magnitude of quantitative changes in the system’s state that occur per unit of time.

The system’s functioning and development process depend entirely on system memory speed, i.e., the system’s speed to accumulate, consolidate, and reproduce information.

There are two types of speed indicators: the speed of the system’s reproductive (creative) activities and the speed of destructive processes occurring in the system and its participation in the external environment.

The speed of reproductive activity characterizes the amount of creative work implemented per unit time in the system (i.e., the number of products produced by the company per day, month, year)

or in the environment (i.e., reproduction per unit time; renewable natural resources; environmental components)).

The speed of destructive processes characterizes the quantitative indicators of wear or loss of functional properties per unit time by the system itself or through its activities by environmental components (i.e., loss of nutrients in soils, increasing pollution of ecological components, etc.). It should be noted as an essential feature of this type of processes. Although it is possible to talk about the speed or rate of wear (and such processes occur in systems), the consequences of such processes can be manifested consistently (for example, in the form of increased fuel consumption per unit distance) and in the form of one-time (emergency) system failures after the accumulation of wear and tear.

Rhythm is the alternation of phenomena and processes that occur with a specific sequence and frequency.

The economic system is primarily about certain symbolic phenomena and processes that determine its final capacity. For example, in machine-building enterprises, such phenomena include the periods of beginning and end of the assembly of finished products. The activity of separate enterprise divisions and less significant private processes, for example, periods of manufacturing of individual details, are adjusted to these phenomena.

According to the degree of stability (stable repetition), rhythms are differentiated into two types:

periodic, in which the same kind of phases are repeated at approximately equal intervals (in the enterprise, such may be periods of release of any products, in nature – the change of seasons);

cyclic, when at a constant average duration of the cycle, the time interval between its identical phases has a variable period. Thus, in an enterprise with a serial type of production, while maintaining the average monthly production program, the intervals between two adjacent outputs at the beginning and end of the month may differ; in nature, periods (rhythms) of climate fluctuations are cyclical.

Time density is an indicator that characterizes the result of changes in the state of the system for a specific interval (unit) of the total period; including the time of purposeful (productive) system activities and the time the system needs for breaks, switching between operations, level transformation her homeostasis.

Synchronicity is the degree of simultaneity of processes from one to another when specific segments of processes (subprocesses) occur in parallel with the same time intervals (rhythm, beat), or with constant periods of advancement (lag) relative to each other.

The system functions the more efficiently, the more individual processes of its functioning are synchronized with each other, as well as with the general cycle of reproduction of the whole system and with the cycles of reproduction of the components of the external environment.

Switching time is the period of time required for the system to change: the parameters of its state, features of functions performed, quantitative indicators and/or qualitative nature of ongoing processes, and, accordingly, the above characteristics (sequence, duration, pace, level synchronicity). Switching time characterizes the adaptive capabilities of the system. The survival of the system and the success of its operation and development depend on how quickly the system can change the parameters of its state (including crucial time characteristics). It is no coincidence that one of the most critical parameters of the car is: first, the time during which it can accelerate to a speed of 100 km/h, and secondly, the time during which it can reduce this speed to zero. Both parameters are vital for the car and its passengers.

For economic systems, an essential feature of their work (especially in market conditions) is the ability to respond quickly to changes in economic conditions (including changes, if necessary, production volume, product profile, switch to new products, diversifying the order portfolio, etc.).

The success of economic systems depends not only on the speed but also on the resource intensity (quasi-energy intensity) of switching, i.e. costs of energy, materials, labor, financial

resources required for the implementation of the conditional unit of transformation processes. Ultimately, this determines the effectiveness of the system changing its state.

Factors changing the dynamics of economic systems in transition to the digital economy. There is no doubt that improving the efficiency of economic systems is mainly due to reducing the time of various economic processes. The transition of society to the digital economy creates opportunities to significantly reduce the duration of these processes at different stages of the economic cycle, from production to consumption. These changes all or most of the above time parameters. Table 1 provides an analysis of the factors that reduce the duration of economic processes in different transformational areas of the transition to the digital economy, which is based

Table 1. Factors that reduce the duration of economic processes

Transformation direction	Factors reducing the duration of economic processes
Additivization of production (3D printing)	Exclusion of production stages, which provide: technological preparation, production of primary models, tool preparation, and assembly finished products (partially).
Transition to alternative energy sources	Exclusion of stages: exploration, extraction of primary energy sources, creation of transport infrastructure, transportation, fuel storage, and elimination of relevant environmental consequences
Informatization of the economy	Reduction of a significant number of units for the production of relevant materials and manufacturing stages required for this means of production
Dematerialization of production and consumption processes	Acceleration of processes: promotion of objects of labor between production units, transportation, other types of logistics
Networking of the economy	Accelerate product promotion processes from production to consumers
Intellectualization ofeconomic processes	Accelerate decision-making processes, optimize the components of production cycles and logistics
Formation of circular economy	Reduction of resource playback cycles bases and waste disposal

Various economic factors influence time indicators. For example, due to scientific and technological progress, the quality of industrial and household appliances is increasing, increasing the time of physical wear and tear of equipment. The time of production operations is also steadily reduced, which increases overall productivity.

As we can see, the change in time parameters is the cause of changes in the economic system and vice versa. The value of time parameters, in turn, may be the result of various processes occurring in the system or the environment.

Different types of factors can act as reasons for influencing time parameters:

- *natural resources*; for example, the depletion of natural resources and deteriorating conditions of their extraction leads to an increase in the period of reproduction of certain types of natural resources;
- *environmental*; increasing the load on ecosystems leads to increased periods of reproduction of the quality of the environment;
- *technical*; scientific and technological progress contributes to the growth of social productivity and reduces the cost of time to perform a unit of work: production, movement of goods and passengers, processing and reproduction of information, etc.;
- *economic*; improving the mechanisms and tools for managing economic processes in combination with competition between enterprises reduces the time of transaction processes;
- *organizational*; improving the means of communication, the formation of economic and social networks reduces the time of movement of capital between different economic entities, in particular, producers and consumers of products;
- *social*; improving the quality of life of the population in developed countries contributes to increasing the period of the productive activity of the people; information complication of social life causes an increase in the period of reproduction of labor factors, etc.

The consequence of the influence of these factors is a change in time parameters. This, in turn, affects the cost, labor, and technical parameters of economic systems. Thus, there is a continuous process of mutual conversion of time parameters into the mentioned parameters

of the system's state and those, in turn, into the parameters of time in the steady process of development of economic systems. The progressive development of systems is necessarily accompanied by the improvement of time parameters (acceleration of the pace of individual operations, increasing the periods of productive work, increasing the synchronicity of unique production processes, etc.). The degradation of economic systems is inevitably associated with deteriorating time parameters.

Management of time parameters in the digital economy. Any process of improvement and self-improvement of systems is inextricably linked with the management of time parameters. Any increase in the efficiency of systems, any savings to one degree or another, is the cause or effect of saving time.

At the same time, time management is the most challenging process of constantly finding optimal solutions, where approaches based on the principles of linear thinking are inappropriate: "less is better" or "more is better". The optimization of time parameters management is objectively due to the contradictory nature of the system.

On the one hand, a high rate of metabolism is a tool to stay ahead of competitors in the fight for a source of free energy and a means of successfully solving the problem of natural selection.

On the other hand, all values of time parameters have their energy (quasi-energy) price. The steady-state, in which the importance of the system parameters is close to the level of its homeostasis, provides the system's most efficient (with minimum energy consumption) functioning. Any deviation in the system's parameters of its state of homeostasis is associated with additional costs: additional costs per unit of work, or the relative loss of free energy (loss of income, lost benefits) or system capabilities. So, overtaking the forced mode of accompanying cars, the car is compelled to increase specific (on 100 km of a way) fuel consumption. Gaining in speed (and position relative to its potential competitors), it loses in costs, affecting further movement.

Even higher energy (quasi-energy) costs in bifurcation transformations when the system, modernizing its structure, moves to a new level of homeostasis. In such changes, the system experiences a state of catastrophe from a physical point of view: the linear nature of the system is disrupted, its connections are severed, and productive activities to attract free energy to the system cease. In this state, the system can consume only previously accumulated energy without receiving free energy from the outside.

However, there are reasons for economic systems to abandon the comfortable and sustainable mode of *stationary*. It is the physical and moral wear and tear of the system, as a result of which the system's parameters begin to deteriorate in absolute and relative terms. As a result of physical wear and tear, the system experiences a deterioration of its parameters relative to its parameters in the past. Due to moral wear and tear, the system's parameters deteriorate concerning the natural state of other systems (primarily – competitors). In both cases, the result is a reduction in the flow of free energy to the point of complete cessation.

Thus, bifurcation transformations of the system can be considered a forced measure in its desire to maintain a sufficient level of *competitiveness*. However, such changes can be justified only if the system's operation after its modernization will be able to cover the losses caused by forced downtime during development due to the expected increase in inefficiency.

In the digital economy, new production and management technologies are creating new opportunities to significantly improve time management efficiency and reduce the specific time cost per unit of output. The main directions of this are shown in Figure 1.

Strategic plans of economic systems (enterprises, regions, national economies), aimed at improving their efficiency and related attempts to steadily intensify the parameters of time, should be harmoniously linked with *tactical* tasks to maintain its *stationary* state, which actually "feeds" system as a source of *free energy* (quasi-energy). The reality is that there is always a need to choose between:

- future benefits and current needs;
- strategic and tactical goals;
- efficiency and stability;

- risk and reliability;
- "crane in the sky" and "tit in hand".

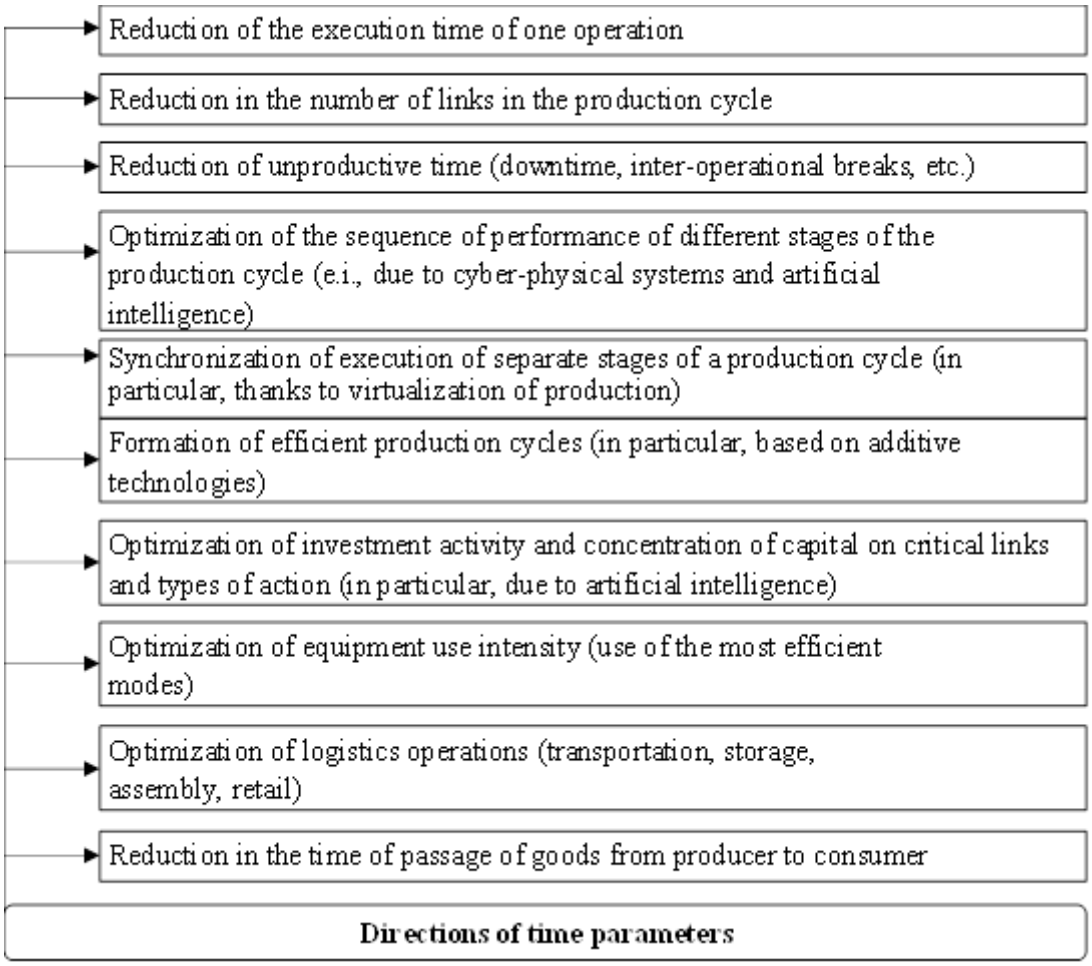

Fig. 1. Directions of time parameters management in the digital economy

Managing time parameters is inevitably associated with finding a compromise between strategic goals and tactical objectives, trying to balance two groups of factors: the consolidation of time and ensuring stationary. The third group of factors that determine the period and rate of wear of individual subsystems and the system as a whole must be taken into account.

There are significant opportunities to consolidate the time of modernization transformations. The most promising areas are related to full virtualization and instrumentalization of transformation processes. The first is the maximum transfer of work related to the system's justification, preparation, and transformation to the virtual, i.e., computer level. The second direction involves the ultimate unification (according to the “transformer principle”).

Conclusions. The time factor is a highly important category closely related to economic factors. On the one hand, the time factor affects economic indicators (productivity, product quality, production costs, etc.). On the other hand, the economic system's state and its functioning indicators determine the time spent on production and consumption per output unit. The critical factors of time that affect the state of the economic system include the sequence of phases of production processes, their duration, pace, speed, time density, the level of synchronicity of cycles, and switching time.

The transition of society to the digital economy significantly accelerates the course of economic processes and improves their quality. It is facilitated by the transition to alternative energy and additive technologies, cyberization of the economic space, dematerialization of production means, networking of economic relations, artificial intelligence, and “cloud” technologies.

Acknowledgment

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References

1. Davis, J., Cot, A. L., Duarte, P. G., Hedoin, C. (2017): Time in Economics. Economic: History. Methodology. Philosophy. Open Edition Journal. 2017. [online]. [Cited 7. 04. 2022.] Available online: https://journals.openedition.org/oeconomia/1891.

2. Hassanzabeh, R., Ebadi, A. G. (2007): Measure the share of the effective factors and time management. World Applied Sciences Journal, 2007, Vol. 2, No. 3.

3. James, A. (2012): Sprenger. Risk preferences are not time preferences. American Economic Review, Vol. 102, No. 7.

4. Jarrow, R. A., Protter, P. (2012): A dysfunctional role of high frequency trading in electronic markets. International Journal of Theoretical and Applied Finance, Vol. 15, No. 3, DOI: 10.1142/S0219024912500227.

5. Leibniz, G. W. (2021): Encyclopedia Britannica. [online]. [Cited 6. 10. 2021.] Available online: https://www.britannica.com/biography/Gottfried-Wilhelm-Leibniz.

6. ResearchGate. 2017. DOI: 10.1007/978-3-319-61705-3.

7. Rohatinski, Z. (2017): Time and economics: the concept of functional time.

8. Winston, G. C. (2008): The time of economic activities: firms, households and markets in time-specific analysis. Cambridge University Press, 2008.

3.4. Olena Martseniuk. TRENDS IN DIGITALIZATION IN THE INSURANCE MARKET OF UKRAINE

Theoretical and practical principles of using digital technologies to revive the development of insurance business and optimize insurance risk management in today's challenges are summarized. It is noted that the digital transformation changes the depth of the basis of interaction between insurers and policyholders. Positive trends in the digitalization of business processes in insurance have been identified and its relevance during the COVID-19 pandemic has been determined. Maintaining the stability of insurance companies, especially in times of crisis and economic instability, requires the development of new sales channels for insurance products.

The article is devoted to the study of the use of digital and Internet technologies in the insurance industry, which provide new opportunities in insurance for both policyholders and insurers.

Given the economic importance of digital technologies in the insurance business in today's challenges, it is justified that the continuation of the digital transformation of the insurance industry is the main direction of development of the insurance market of Ukraine in the near future.

3.5. Leonid Melnyk, Yuriy Derev'yanko, Oleksandr Kubatko, Bohdan Kovalov, Iryna Dehtyarova, Oleksandr Matsenko. DYNAMICS OF ECONOMIC PROCESSES IN TRANSITION TO THE DIGITAL ECONOMY

The paper analyzes the dynamics of economic processes in the transition to the digital economy. It defines the key parameters of economic dynamics during modern industrial revolutions. The research describes factors changing the dynamics of economic systems in transition to a digital economy. It proves that the time factor is a highly malicious category closely related to economic factors. The paper explains how the economic system undergoes quantitative and/or qualitative changes in the transition to the digital economy. It shows how economic systems respond to changes in economic conditions (including changes, if necessary, production volume, product profile, switch to new products, diversifying the order portfolio, etc.) in transition to the digital economy.

3.6. Mariia Nazarkevych, Hanna Nazarkevych, Volodymyr Hrytsyk, Ivan Tsmots. DEVELOPMENT OF MULTIMEDIA PRINTING DOCUMENTS PROTECTED ON THE BASIS OF THE MOIR EFFECT

A new method of protection based on hidden elements is considered, for the construction of which the moire effect is used. This method will be able to provide a high level of protection of information in printed or electronic form, leaving no opportunity for falsification even on the best modern copying devices. The possibility of using the proposed method to protect information is analyzed. Latent elements contain micrographic images; vector curves that are difficult to reproduce, atypical rasters. We build latent elements by means of fine raster, vector and fractal graphics, based on the software developed by the authors. These latent elements are printed by offset printing, which we consider to be the original document. Copies were made from each original on a typical photocopier, which will be considered copies or forgery. With the help of densitometric measurements, it is highly probable that the impression belongs to the original or the forgery.

3.7. Olena Polova. DEVELOPMENT OF THE DIGITAL INDUSTRY IN THE FIELD OF HOTEL AND RESTAURANT AND TOURISM BUSINESS

The article discusses the basics of the digital economy, its characteristic features and scope. An analysis was made of the state of development of the digital economy in the world, reflecting the growth of its share in the gross domestic product, for which a characteristic feature is the state initiative to promote and develop digital processes, rather than business structures. An analysis of the level of digital technologies involved in the development of the tourism industry indicates

Part 3. CURRENT PROBLEMS OF DIGITAL ECONOMY DEVELOPMENT

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