

# Business Models of Reproduction Cycles for Digital Economy

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**Abstract.** The intensive use of non-renewable resources and torn technological cycles is the cause for the total destruction of the planet's ecosystems. The transition of production systems to renewable resources and closed circular cycles can ensure long-run sustainability of economic activities. Circular technologies as the basis of business processes guarantee sustainable transformation of the usual economy to digital one. The reproduction of economic activities in the closed integral cycle "production-interfacing-consumption-recycling-production" is the principal condition for the successful functioning of business processes. The scientific grounding, design and practical implementation of reproductive circular business processes create the platform for building a digital economy and ensures ecosystems sustainability.

The research focuses on the modeling, design and practical implementation (introduction, testing, refinement, and adaptation to specific conditions) of reproductive circular business processes. The research models economic activity and communication of the economic agents in the main areas of the digital economy.

**Keywords:** informational factors, networking, digitalization, reproduction, phase transition.

## 1 Digital Economy Production Features

### 1.1 Key Transformation Factors

The digital economy differs from the traditional one through a significant increase in the number of transactions. The last is due to the vanishing of geographical barriers in the information society. Trading with minimal transactional costs in real time situations is possible. The emergence of digital platforms like Amazon, Airbnb, Uber, eBay, and access to them through mobile smartphone applications made the exponential growth of world trade [1]. Globalization and open competition lead to an increase in the level of competition between producers of goods and services. In the digital environment, the higher survival rates could be achieved only with constant improvement/changes in business models (which is difficult for large enterprises).

Humanity has passed several decisive stages of development and organization. At the first stage, we lived in different nomadic tribes; on the second - we gathered in the settlement (villages and towns), engaged in agriculture; on the third (thanks to steam traction, industry, and transport) we increased human mobility and increased trade. Today, with the Internet, social networks and various digital trading platforms, everyone can be connected.

Several key factors mark the transition to the information society. First, the central element of production and consumption is information (hence, the primary economic system to which humanity is directed named "information economy"). Second, the material influence of a person on the planet ecosystem decreases with times (hence, the second name of the new economy is the "green economy"). Thirdly, there is a continuous network of production and public life (because of this the third name of the state is the "network economy").

With the transition to the informational economy, all three groups of system-forming factors are being changed: material-energy, informational, and synergetic. In particular, within the first group the most significant events are the transition to renewable energy ("green") and the formation of additive technologies based on 3D printers. In the second group, the decisive transformations are computerization and transition to digital forms of fixation of information, the creation of production cyber-physics systems, and cloud technologies. The third group of changes is represented by networking between production systems, virtual firms operation, the formation of horizontal production and consumer systems, and the formation of the Internet of things. Based on the transformations mentioned above we could state that the current economic system is possessing postindustrial, digital and cognitive features.

The global transformation of socio-economic processes demands a constant transformation of existing business models. In the digital economy, the laws of classical economics, based on limited physical resources cease to work. The main resource of the digital economy is data and information, the main capital of the digital economy is ideas and knowledge. In such circumstances, changes take place at a higher pace, changing the culture of business, approaches to management and organization of companies.

*The purpose of our work* is to formulate theoretical approaches to the transition of economics and society to new business models of reproduction cycles under the conditions of the digital economy. This transition is necessitated by intensification of global competition and technological companies that have arisen or adapted in a digital transformation have to switch to innovative business models.

## **1.2 Phase Transition to a New Economy**

Many empirical facts prove the movement of economic life to new realities. Thus, the share of energy produced from renewable sources reaches 25 percent [2], and in many countries (in some periods), it reaches 100 percent [3-5]. Currently, around 30 countries have achieved the level of energy efficiency when renewable energy costs are cheaper than traditional ones [5, 9-11].

By the end of the 1980s, only one percent of the information in the world was in digital form, by 2014, this share reached 99 percent [7].

In 1990, the Internet served only 0.05% for the Earth's population. In 2016, this number exceeded half the planet's population [7].

Broad access to the Internet, the development of social networks contributed to total access to data and information. Most markets have become virtual, business models have been built on ideas.

Under the business model of reproductive cycles in a digital economy, we understand such a model, which is a way of implementing business ideas on digital platforms and is based on the use of predominantly information resources with the purpose of reducing the cycles of reproduction (production, transportation, storage and sale of products, as well as its consumption and recycling). In a digital economy the competitive advantages are generated by intellectual capital (the combination of human capital and technology), the basis of reproductive cycles are business ideas, and the main resource is large amounts of Big Data and information.

The short review of this paper allows us to cover only some aspects of digital society problematic issues. The most urgent problem of the transition to the digital economy is the formation of a renewable mechanism for economic system operation.

## 2 Models of the Digital Economy

The specific feature of the digital economy model is customer-centricity. This foreseen not only the orientation of the business to meet demand by satisfying the needs of the client, but it includes the transformation of the business structure itself. Thus, customers are given the opportunity to create a digital and even business-friendly environment. The client can configure groups of trading partners, social environment, etc. and become a full member of the business environment. In the research literature [7, 8] the digital economy distinguishes the following business models:

- *Business models of joint participation*, based on joint use (lease, sale, exchange). Such models lead to a significant increase in social, economic and environmental efficiency. An example is the BlaBlaCar fellow travel companion service.
- *Business models based on technology and co-management*. These models lead to optimization of demand and supply. For example, mutual credit services.
- *Business models that focus on a set of a critical mass of users to analyze large data*. Such models are the most attractive for investing. An example can be the service for renting a private non-movable Airbnb.
- *Business models of sharing space and time*. The last one is based on the creation of the technological zones infrastructure for joint entertainment, creativity, project implementation. For example, the technical area of TalantGarden.
- *Business models are aimed at optimizing business processes*. For example, the logistics company LardiTrans has developed a convenient platform for combining the interests of carriers and cargo owners.

The above-mentioned business models create threats for traditional industries. Many of the traditional businesses are not ready for such rapid changes. For example,

traditional hostels or taxis could not understand the nature of digital transformation and offer no strategic responses to confront new threats. For example, we could analyze the post-soviet countries, when their products in the open digital environment are absent or presented with non-competitive commodities in comparison with its price. It must be recognized that the digital transformation of business must be based on constructive product changes, which is a source of value added increase. Such changes can only be achieved by creating a digital and creative staff, which could generate ideas for the quality of the goods being produced. To provide a digital flexibility, enterprises need to implement the total digitalization of production and marketing; that is, the creation of a digital foundation for business.

The speed of innovative changes implementation is on the edge of the digital economy. The last is necessary for the rapid conquest of the market sectors, which has become possible due to digital trading platforms. Today, you can win millions of users in a few days and create a threat to other companies.

### 3 The Model of Renewable Production Cycles

Considering the turbulent changes in economic development, it is necessary to guarantee the shift from traditional production and consumption of goods and services to constant reproduction of producer-consumer cycles based on information technologies.

Schematically, the scope of information factors in the reproduction cycle has the form: "production - interface sphere (technology transfer, transport, storage, trade) - consumption - postproduction sphere" (fig. 1).

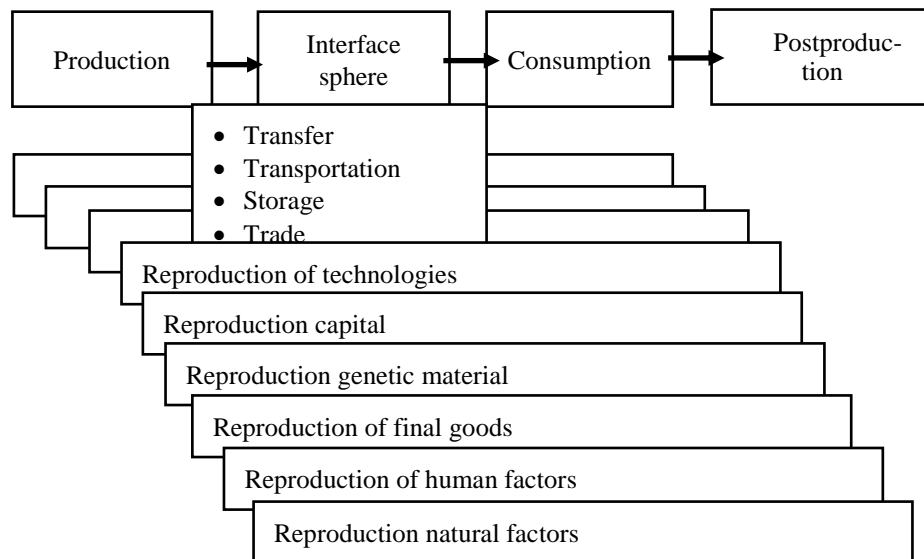


Fig. 1. The influence of informational factors activities

At the same time, this cycle may relate to the reproduction of a wide range of assets: technologies, means of production (including information), final products, human capital, consumer cycles, and natural factors.

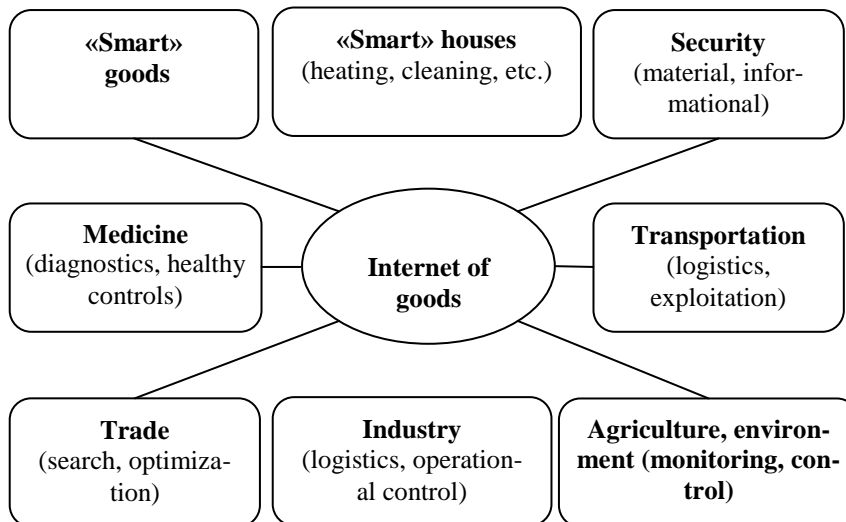
The process of modern production should be a system that reproduces the essential interconnected elements. The main components of the reproductive mechanism of production can be attributed to:

- reproduction of demand;
- reproduction of the production basis;
- reproduction of human factors;
- reproduction of motives.

The indicated reproduction mechanism can be realized only under the influence of the constant operation of organizational, economic and social instruments that will contribute to the digital transformation of the components of the economic system and the processes.

It should be emphasized that informational factors are the key ones in the production sphere forming, shaping its basic parameters (technology, product design, source materials, natural conditions, means of production, space and time parameters, communication, personal potential, motives of work, level of synergy, management potential, institutes, etc.).

A significant competitive advantage of modern products is its integration into the Internet of things (Fig. 2), which allows controlling individual stages of the reproduction cycles.



**Fig. 2.** Spheres of the Internet of thing applies

The participation of information factors in the functioning of a modern enterprise is related to the implementation of specific functions, in particular:

- Formation of information program (code) for operation in space and time;
- System adaptation of the changing internal and external environment;
- Implementation of operational activities;
- Integration of individual collaborators;
- Reproduction of physical and mental properties of performers;
- Innovative reproduction (product, technology, means of production, knowledge, skills).

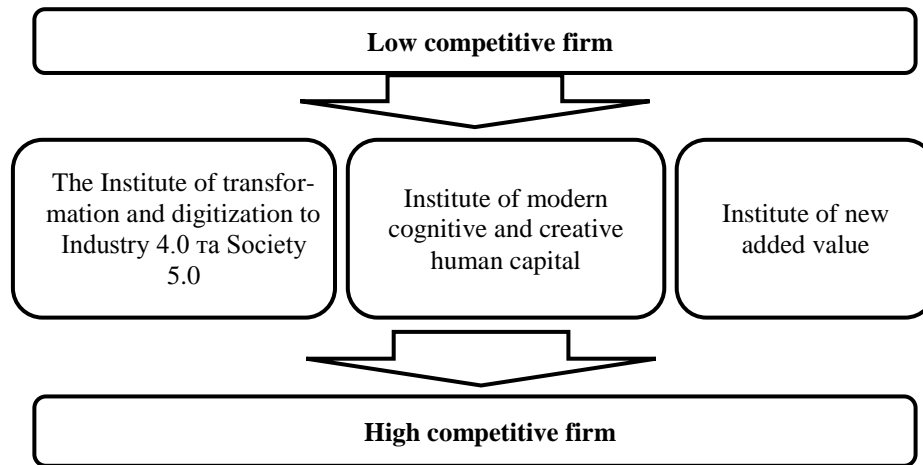
The critical role for digital technologies is given to human capital re-production and the formation of individual characteristics (social memory, horizons, professional competences, communication skills, self-learning skills, leadership skills, ability to self-reproduce, motives). Information factors are decisive at modern consumption pattern formation (knowledge, interests, needs, demand, skills, ethics, social responsibility, infrastructure, communication, solvency, institutions). The caring capacity of all information factors is digitization. In a digital economy, modern enterprises do need to digitize the production processes. Moreover, the digitization should achieve to the institutional level (Fig. 3), which is oriented to the standards of Industry4.0 and Society 5.0.

The digitization has to cover first of all the following:

- Interconnection with suppliers should be implemented on a competitive basis through digital tenders. The last creates the potential to influence the provider image through the ability to provide digital ratings and ratings.
- Means of production and communications in the production process. This will help to increase the quality of controlling to establish feedback between staff and means of production and predictive analyses of production processes in general.
- Sales channels. A modern enterprise can use platforms that allow access to potential buyers and customers. Today it is not enough to limit itself to advertising in social networks. It is necessary to create conditions for the deep interaction between the client and the enterprise.
- Management processes. Digitizing of production, marketing processes, and modern management are faced with Big Data. The demand for business intelligence and programmers in the field of Machine Learning is growing. Specialists who are capable of obtaining data and presenting it in a convenient perception form for decision making are urgently needed.
- Forecasting processes. Digital tracking of the market and focus on the best technologies is key to strategic planning.

The Institute for Transformation and Diversification of the Economy to the Levels of Industry 4.0 and Society 5.0 foresees:

- the development of innovative information technologies to create new value-added products, focusing on the development of the Internet of Things (IoT), artificial intelligence (AI) and robotics;
- creation of secure digital platforms for retail exportation;
- development of the local application of digital solutions;
- implementation of digital solutions in industry and society as a whole;
- digitization of socio-ecological and economic processes.



**Fig. 3.** Capacity building model for competitiveness improvement in conditions of the digital economy

The second institute of modern business is human capital - the main reproductive factor and generator of ideas and innovations. It is the human capital that creates competition between states. In this case, developed countries have created appropriate ecosystems to stimulate the development of the digital economy, which is aimed at attracting the best specialists in the world. The world's leading countries are taking advantage of the digital economy to manage human resources: The United States is building a global surveillance system; Israel creates a supervisory regime on the West Coast; The Russian Federation influences the opinion and choice of people around the world; China is strengthening the internal system of control over society by collecting data and building a network of internal ratings of citizens.

Therefore, the institution of a new cognitive-creative human capital should be oriented towards:

- New methods of training and preparation of cognitive-creative intellectual capital of human capital.
- Raising the welfare of human capital;
- Innovative methods of the positive motivation of human capital;
- Providing a high-quality, safe environment for the existence of human capital.

Finally, the Institute of new value-added includes:

- Deep processing of natural resources and agricultural products;
- Creation of high-intellectual goods and services;
- Business development;
- Creation of high-performance jobs;
- Support for a new product that meets modern quality standards.

Consequently, the main drivers for the development of a modern firm are the institutions aimed at digitization; ecosystems (forming the infrastructure for support and acceleration of innovations, development of digital entrepreneurship); motivational complex, aimed at introducing incentives for human capital and business to digitization; training and competency building (lifelong learning and digital competency development for better use of digital opportunities).

## 4 Conclusions

Modern production should be based on fast information reproduction, which is realized through the formula: information product production (by information technologies) for information consumer. 2. Modern economic systems are an incredibly dynamic reality. This is due to the constant reproduction of the production and consumption cycles and its components: consumer style, product, technology, means of production, competencies, and methods of nature use. 3. The most profitable sphere of modern production is the generation of such informational products like innovation. 4. Ukraine has (and partially implements) a powerful potential for production and export of innovations. An example is the organic agro-industrial complex, space sphere, IT technology, and creative economy.

## References

1. Nathan F., Jeff D., Clayton M. C.: *The Innovator's Method: Bringing the Lean Start-up into Your Organization*. Harvard Business Review Press (2014).
2. Hill, J.: Renewable Energy Now Accounts For 30% Of Global Power Generation Capacity. CleanTechnica, <https://cleantechnica.com/2016/09/20/renewable-energy-now-accounts-30-global-power-generation-capacity>, last accessed 2019/03/21.
3. Bolton, D.: People in Germany, are now being paid to consume electricity: The price of power in Germany briefly dropped to -€130 per MWh on 8 May. INDEPENDENT, <http://www.independent.co.uk/environment/renewable-energy-Germany-negative-prices-electricity-wind-solar-a7024716.html> last accessed 2019/03/21.
4. Johnston, A.: Portugal runs on 100% renewables for four days. Clean Technica, <https://cleantechnica.com/2016/05/21/100-renewable-electricity-portugal-4-days>, last accessed 2019/03/21.
5. Scotland Just Generated More Power Than It Needs From Wind Turbines Alone). Science alert, <http://www.sciencealert.com/scotland-just-generated-more-power-than-it-needs-from-wind-turbines-alone>, last accessed 2019/03/21.
6. Renewable energy has become cheaper than oil and gas already in 30 countries. DW. Made for minds / News / World, <https://p.dw.com/p/2Utev>, last accessed 2019/03/21.
7. Digital Revolution, [https://en.wikipedia.org/wiki/Digital\\_Revolution](https://en.wikipedia.org/wiki/Digital_Revolution), last accessed 2019/03/21.
8. Muñoz, P., Cohen, B.: Mapping out the sharing economy: A configurational approach to sharing business modeling. *Technological Forecasting and Social Change* (2017).
9. Melnyk L., Kubatko O.: The EU experience for economic systems adaptation to resource fluctuations through green industries innovations. *Actual Problems of Economics* 12, 36--42 (2013).
10. Sineviciene, L., Sotnyk, I., Kubatko, O. Determinants of energy efficiency and energy consumption of Eastern Europe post-communist economies. *Energy & Environment* 28 (8), 870--884 (2017).
11. Karintseva, O.I. Economic restructuring in Ukraine in view of destructive effect of enterprises on environment. *International Journal of Ecological Economics and Statistics*. 38 (4), 1--11 (2017).