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The digital revolution influence on development of the network economy¹

Abstract. The system of public production is now undergoing a profound transformation triggered by the development of information and communications technologies. Until recently, the research in this field has principally focused on studying the role of technical and technological factors, whereas the changes' socioeconomic analysis was mostly left outside scholars' attention. As a result, it is now at early stages of its formation. The current paper explores the impact of information and communications technologies on such fundamental parts of socioeconomic relations as division of labour, coordination mechanisms of economic activities, institutions of ownership and power. Historical analysis and the tools of institutional economics were used as main research methods. The paper shows that at present, market as a universal way of interaction between independent commodity producers is being gradually replaced by network structures. New opportunities created by modern information and communications technologies help to overcome the problem of alienation and information asymmetry, and to return to collective forms of cooperation. The authors conclude that there is a spiral trajectory in development of the dominating coordination methods of economic activities, forms of ownership and foundations of power.

JEL classification: D02, D85, O14, O33

Keywords: digital economy; information and communications technology; division of labour; coordination; network economy; ownership; power.

Introduction

The world is now going through a radical transformation of the public production system, and the main drivers behind it are information and communications technologies (ICT). The changes are referred to as the digital revolution, and the emerging type of economy as the digital economy. However, both concepts lack accurate definitions. Existing treatments are largely of technical-technological nature and concentrate on changes in technologies of

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production, distribution, exchange, and consumption. The socioeconomic analysis of the occurring transformations is still at its infancy.

The paper studies the impact of information and communications technologies on such socioeconomic relations as division of labour and coordination mechanisms of economic activities, as well as analyses the transformation problems of institutions of ownership and power.

The digital economy and the digital revolution as research subjects

The term “digital economy” is traditionally linked with the name of Nicholas Negroponte, a specialist in information technologies of the Massachusetts Institute of Technology (the USA). As early as in 1995 he pointed to a fundamental shift in the foundations of public production, a transition from “managing atoms to managing bits” and identified basic characteristics of the new economic model: virtual reality, weak dependence on raw materials, and instant global transportation [32, p. 238].

Determining primacy in using the second term is rather difficult, however we can reveal the names of those scientists who investigated this phenomenon. These include G. G. Parker, M. W. van Alstyne, S. P. Choudary [14], R. Gläss, B. Leukert [3], D. L. Rogers [16], E. Schmidt [24], K. Schwab [23] and others.

In the works of these researchers, technical-technological approach dominates. In line with it, ICT mark a new stage in technological development, which received various names depending on the periodisation: the new (fourth) industrial revolution (K. Schwab [23]), the new (sixth) technological order (C. Perez [15], D. S. Lvov, S. Yu. Glazyev [9]), the third industrial revolution (Ya. P. Silin, E.G. Animitsa [18]), etc.

The concept of technological waves developed by C. Perez [15], D. S. Lvov, S. Yu. Glazyev [9], etc. supposes that the history of industrial development is a succession of technological waves generated by technological revolutions. At present, the world economy is at the sixth technological wave, which, in particular includes the digital economy.

Klaus Schwab terms the digital revolution “the fourth industrial revolution”, which relies on new information technologies: ‘Digital technologies based on hardware and software and networks are not new, but every year they move farther and farther from the third industrial revolution, improved and integrated, causing the transformation of society and the global economy’ [24, p. 4].

This transformation, according to K. Schwab, goes in three directions: physical (unmanned vehicles, 3D printing, advanced robotics, new materials), digital (interaction between things and people through various platforms) and biological (project “human genome”).

Other researchers confine themselves to considering only one of these three areas (the digital one), and focus precisely on the role of the digital platforms. More specifically, this approach is found in the work of G. Parker, M. van Alstine, and S. Choudary [14]. According to them, the digital platforms cause a fundamental change in the global economy: ‘the whole thing is in the power of the platform as a new business model that uses technologies to bring people, organisations and resources together in an interactive ecosystem, within which a remarkable amount of value for users is created and distributed. The platform is simple in appearance, but a revolutionary concept that radically changes business, the economy and society as a whole. Virtually any industry in which information is an important component of business, is a candidate for a platform revolution today’ [14, p. 19].

J. Cohen and E. Schmidt also recognize the dominating influence of platforms on the economy and society transformation. They argue that due to the effect of economies of scales produced by the digital platforms, all phenomena will accelerate in the new digital era, and this will certainly affect society as a whole [24, p. 18]. Similar viewpoints are expressed in the works of other scholars (for instance, by R. Gläss and B. Leukert [3], D. L. Rogers [16]).

A large body of research is devoted to the issue of the mid- and long-term effects of the digital revolution both on individual economic agents and on humanity generally, starting

with the analysis of the impact of information technologies on the labour market in the works of C. B. Frey, M. A. Osborn [28], U. Huws [31], P. Viljakainen, M. Mueller-Eberstein [12] and ending with the political and spiritual spheres in the studies of D. Tapscott [20, p. 54], V. Mayer-Schönberger, K. Cukier, [10], A. Ross [17], M. Betancourt [25], E. Brynjolfsson [26].

In Russian science, the problems of the digital economy are at the centre of attention of many researchers. We can specify the works of Ye. Dvoryadkina [5], V. Dementieva [6; 7], A. Kozyrev [8], A. Maltsev [11], N. Goridko, R. Nizhegorodtsev [4], S. Parinov [13], V. Tambovtsev [21], Ye. Ustyuzhanina [7; 22] and others.

The transformation of socioeconomic relations under information and communications technologies

The history of the world economy suggests that the division of labour as an engine of economic progress can take three main forms.

Intra-household division of labour emerged within households and initially was based on the gender and age differences between household members. Later, as the natural economy evolved into commodity economy, the specialisation based on gender and age differences changed to technological specialisation.

Intra-community division of labour was conditioned by the need for specialisation and use of economies of scale to perform different functions and service all members of the community, e.g. the specialisation of labour of shepherds, blacksmiths, potters, etc.

Inter-community division of labour originated as a form of commodity exchange between communities that were engaged in various activities and was the basis for the emergence of a system of modern markets.

With the collapse of the institution of community, two forms of division of labour (intra-household and inter-community) were gradually strengthening, whereas intra-community form was displaced to the periphery of economic life. At the same time, the emergence of new forms of business organisations (enterprises that use hired labour and are profit-oriented) provoked the replacement of the intra-household division of labour based on gender and age differences with the technological division of labour by dividing the production process into elementary operations performed by various workers. Simultaneously, interactions between communities acquired the character of regular monetary exchange, and formed the institution of market as stable system of economic relations.

In line with the neoclassical approach, which has been prevalent for a long time, economists viewed community-based forms of interaction as an archaic phenomenon that can only be studied in terms of interest in history. Though recently an increasing number of researchers have pointed to the obvious revival of many features of this type of economic interaction in the new round of economic development, which manifested in the emergence of the network economy. This particularly refers to the network forms of economic interaction between economic entities, which emerge from trust relationships and stable cooperation and information ties.

As noted by S.I. Parinov, 'it is logical to assume that market and hierarchical forms have arisen in response to the inability of the communal form of government to ensure effective maintenance of the division of labour when it began to go beyond the community. The reason behind this was the limitations of communication and information exchange systems of that time, which did not provide a wider circle of people with the level of information exchange that is necessary for the normal operation of the community economy' [13, p. 24]. The development of ICT makes it possible to solve the problem of the direct exchange of information, and, consequently, establish direct links and trust relations between a very wide range of people.

Therefore, today we can talk about the rebirth of intra-community form of division of labour. To prove this statement, we need to juxtapose the forms of division of labour and coordination mechanisms of economic interactions. Four pure (ideal) ways of coordinating

interactions can be distinguished: administration in the form of direct control over activities; prices (the interaction of supply and demand, regulated by the price mechanism); mutual coordination (deliberative coordination) and standardisation [6, p. 93]. The latter can manifest in various forms: from traditions and routines to conventional and formal norms.

The main coordination mechanism for *intra-household division of labour* is administration, supported by standardisation. The first one is connected with the planning and regulation of the production of specific batches of goods, whereas the second one is linked with the adjustment of technological processes (technological standardisation) and bureaucratisation (formalisation) of intra-household interaction.

Inter-community division of labour is coordinated not only by prices, which harmonise both the economic interests of the parties, and supply and demand, but also by standardisation, which strengthens the role of formal norms governing relations between relatively autonomous economic entities.

Intra-community division of labour used such coordination mechanism of economic activities as standardisation, but in a slightly different form of maintaining traditional ties and well-established interaction routines. At the same time, the leading coordination mechanism was mutual agreement (deliberative coordination).

Thus, the key types of transactions for intra-household interaction are management transactions; for intra-community relations these are transactions of reciprocity, and for inter-community interaction – trade transactions.

As already noted, at present there is an important trend related to overcoming the problem of alienation and returning to collective forms of cooperation based on the new opportunities offered by ICT. A new type of economy arising on this basis can be called a network economy, which combines the features of market and community ways of organising economic life.

Let us give a working definition to this phenomenon: “*The network economy is an economic system in which the interaction between economic agents takes place on the basis of direct long-term cooperation and information links mediated by trust relationships*”. The main difference between the network economy and community economy is the replacement of reciprocity transactions with trade transactions and redistribution transactions. The basic difference between the network economy and market economy is a change in the dominating coordination mechanism: interaction of supply and demand, regulated by the price mechanism, is increasingly giving way to mutual agreement.

The regularity we discovered can be interpreted as a development spiral. First, the era of communality is taken over by the era of alienation, the leading coordination mechanisms of which are hierarchy and market. Then, thanks to the revolution in communications, the era of alienation is gradually being replaced by the era of new forms of collective activities. Deliberative coordination takes on.

The table presents the dominating types of transactions and coordination mechanisms of economic activities that correspond to different types of economies.

Types of economies and dominating coordination mechanisms

Economy type	Main transactions	Coordination mechanism
Community	Reciprocity	Mutual agreement + traditions and routines
Hierarchy	Management	Administration + norms
Market	Trade	Prices + legal regulation
Network	Redistribution	Mutual agreement + conventional norms

Let us consider the revealed regularity at the examples of transformation of ownership and power institutions.

Transformation of the ownership institution¹

Historically, communal property is known to be the first form of ownership, the object of which was, first of all, land. The communal ownership of natural resources was principally characterised by a combination of a public form of disposition (distribution and redistribution of land) with a private form of ownership; the right of a producer (a household) to the results of its activities and insignificant property differentiation, ensured both by regular redistributions of the main factor of production (land) and by underdevelopment of the credit institution in the intra-community relations. The reciprocal exchange was the dominant type of inter-community interaction.

With the development of productive forces and social division of labour, the community began to gradually disintegrate and individual households began to separate from it. The ownership of one or another plot started to be linked with the family living on it. However, the ownership itself was based on the idea that the distribution of land among households rests on the will of the whole people. The right of individual ownership arose initially in relation to movable things, including results of production. Simultaneously, commodity exchange started to crowd out the reciprocal exchange.

The development of state institution led to the etatization of economic relations. Institutions of hierarchical and estate ownership emerged. The head of state became the formal (supreme) owner of the annexed lands and took decisions on their transfer to the indefinite inherited or lifelong possession of his subjects. The method of reproduction of working conditions was lands' assignment to economic entities (granting the right of access, using for holders' purposes and earning income). This fulfilled two tasks: satisfying the needs of economic entities (landholders) and forcing them to reproduce the resource used.

Nonetheless, state monopoly on land started to conflict with the developing exchange and emerging market for factors of production, which resulted in another round of transformation. The land began to progressively move from state ownership to the ownership of its holders. The elimination of personal and collective dependence, as well as the elimination of class barriers and privileges contributed to the formation of the institution of private property. According to A.A. Maltsev, the pledge of economic development became the "respectful attitude of society to the key determinant of economic progress – to the inviolability of private property" [11, p. 10]. At that moment, another very important transformation took place. The ownership of the manufactured product passed to the owner of the working conditions.

Further historical development proves the dialectical law of the negation of the negation. Every new milestone in the transformation of the institution of ownership proceeded from the unity of continuity and novelty, the repetition of the old at a new level of development. This way, at present we are witnessing the revival of elements of the institute of communal property in the form of sharing resources, which are formally privately owned (sharing economy). Moreover, this joint use is occupying more and more space and takes not only the form of joint household consumption (e.g. Skype, Torrent, Landshare, etc.), but also the form of subsystems of household involvement in the supply of goods and services (e.g. Airbnb, Avito, Profi.ru), as well as integrates complementary or homogeneous resources of commercial organisations (e.g. sharing vehicles by shipping companies; combining dedicated routes by airlines; sharing radio frequencies by mobile operators; Uber platform, Alibaba).

The observed revival of network forms of cooperation, which incorporated elements of the communal ownership regime, reciprocal exchange and agreement on joint activities, is associated both with the exacerbation of the problem of limited resources and with digital technologies:

¹ In this study, the authors deliberately avoid examining the whole variety of forms of ownership (estate, corporate, municipal and others) in order to focus on the study of leading institutions characteristic of specific historical eras.

- ICT allowed expanding the number of participants of collective interaction up to a global scale;
- access to information reduced the problem of its asymmetry, the risk of participants' opportunistic behaviour;
- digital reputation has become one of the key assets in the resource sharing markets.

Thus, as in the case with the dominating coordination mechanism, we can observe a certain spiral in the development of property relations: communal property – hierarchical property – private property – sharing resources.

A similar spiral trajectory of development can be seen in the transformation of the institution of power.

Transformation of the power institution

The power (the dominance of one agent over others) may be based on various sources: status (position in the hierarchy); the right to manage resources (including regulation of access to resources); violence (both legitimate and illegitimate); monopoly (natural or artificial); economic coercion; personality strength [7, p. 93].

For every epoch of economic development we can specify its own foundation of economic power. A simplified approach limits the problem of power to the property rights to the main factor of production. According to the prevailing opinion, in feudalism (agrarian economy) such factor is land (natural resources), in conditions of capitalism (industrial economy), it is a means of production (capital), and in the new economy it is knowledge (information).

We believe that this approach simplifies the issue of economic power too much. Such formulation of the problem seems to be explained by the temptation to study past and future institutions using analogies of the present and even past days. This way, many researchers while describing feudalism attach supreme importance to the relationships of ownership of land. Indeed, access to land as the main factor of production played an influential role at that time, but we are unlikely to understand the relationships concerning land ownership existed at that time relying on contemporary understanding of the property rights. As T. Veblen notes, '...in the Middle Ages, customary authority served as the direct source of rights, powers, and privileges. There was a clear idea that the rights of a person to property were established insofar as the ruler authorised the transfer of this property, and any claims that were not based on such explicit or implicit sanction were perceived as unfounded' [2, p. 107]. In other words, in a constantly reproducing power–property dilemma, the advantage was not on the side of ownership, but on the side of power. And this power was based not so much on coercion, as on a hierarchical system of legitimisation, leading from God himself.

In such conditions property right to land was only an attendant condition for a person's position in the social hierarchy. Its role in the redistribution was secondary, since the withdrawal of a part of the product of a dependent peasant (serf) was based primarily on the so-called feudal contract (a restriction of rights and freedoms in exchange for protection). The power of the feudal lord consisted of three components: landlord power (land tenure), economic power (serfdom) and political, including judicial, power.

The basis of the status-power is the position of an economic agent in the social hierarchy. The status relies on both formal norms and tradition. In addition, the power of status is usually supported by the right to manage resources, as well as the right to use violence.

In the era of the capitalist mode of production (industrial economy), private ownership of the means of production based on the separation of workers from their working conditions and the formation of a wage labour market, became the leading source of power. Ownership of the means of production (capital) determined the right to control the actions of employees, the right to dispose of the products produced and the right to residual income.

Another source of economic power in the space of market interaction is the monopoly position of one of the agents, which changes the bargaining power of the parties. Monopoly

can result both from control over a unique resource, including intellectual property, a natural resource or an infrastructure object, and the economies of scale that cause the economic inefficiency of having two suppliers of a product or service (natural monopoly).

Though the most important, from the viewpoint of our research, is such a source of power as economic coercion, which is based on the current profitability of cooperation, further resulting in narrowing of the space of choice (mousetrap effect) [7, p. 95]. This is a typical social dilemma, a problem situation arising from the contradiction between the short-term goals of agents and the possibility of achieving “deferred remuneration”.

A vivid example of the relations of domination (the flip side of which is the relationship of dependence) is the hierarchy of agents in various fields of interaction, which include company, market and networks.

We should stress that if the hierarchical nature of the firm is generally recognised, then the idea of the market hierarchy is relatively new. It goes back to the works of P. Bourdieu [1], G. Hamilton [29], J. Hodgson [30], and N. Fligsten [27]. The neoclassical economics, in particular, the theory of industrial markets, employs such a concept as market or monopoly power of the firm, but connects it exclusively with the structure of the market and barriers to entry. Meanwhile, representatives of economic sociology and traditional institutionalism believe that mature markets have their own rules of the game, allowing market leaders to impose their conditions of interaction on all other participants. Economic entities differ not only in economic, but also in cultural, social and symbolic capital.

The hierarchy of statuses proceeding from a possibility to impose the rules of the game on other participants in the interaction develops within value networks. The main reasons behind the domination of an economic agent in the value network include:

- knowledge and competencies protected by their uniqueness or patents;
- control of entry into the market, which may be based on administrative barriers, accumulated reputation and / or the long time required for the development of technologies;
- fundamental transformation resulting from investments of dependent participants in specific assets;
- a possibility of receiving, processing and transmitting large amounts of information.

Companies attracted by immediate benefits have to voluntarily agree to a dependent position, giving up freedom in favour of participation in the network, while the network provides them with an opportunity to realise the effect of scales and significantly reduce transaction costs. For example, under conditions of severe dependence economic agents offer their services through digital platforms such as Booking, Uber, Airbnb, and others.

Platforms exercise strict control over network participants throughout all stages of market interaction. They rigorously select participants, create information profiles for potential customers; organise legal support for transactions; control the fulfilment of obligations and, if necessary, force the participants to do that. Platforms exert strong impact on the prices and quality of products and services. For instance, Booking.com places hotels under considerable price pressure (the company has more than 1 billion accommodation facilities in more than 220 countries) and forces them to promote the most lucrative offers for tourists.

On the whole, with a certain degree of conditionality, the spiral trajectory is traced in the development of the institution of power as well: a position in the social hierarchy – private property – a monopoly – a position in the hierarchy of the field of interaction.

Conclusion

The study gives grounds to conclude that currently, under the influence of the information and communications technologies, institutional foundations of economic development are being significantly modified. Market as a universal means of interaction between firms is being replaced by network forms of cooperation. At this, we observe a spiral regularity, when every new milestone in transformation is a result of the unity of continuity and novelty, the

repetition of the old at a new level of development. The regularity is observed at the level of both subsequent change of the dominating coordination mechanisms (mutual agreement – administration – prices – mutual agreement) and transformation of institutions of ownership and power. The obvious fact is also the rebirth of certain elements of communal property in the form of economy of shared use of resources, products, and services (sharing economy). Simultaneously, the hierarchy of such seemingly democratic institutions as market and value network is being established. Voluntary participation of economic agents in the corresponding fields of interaction, conditioned by immediate profit of cooperation, then results in a hard dependence on the operators (leading participants) of these fields.

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Влияние цифровой революции на развитие сетевой экономики¹

Аннотация. Статья посвящена исследованию влияния информационно-коммуникационных технологий на социально-экономические процессы, в том числе на изменение характера разделения труда, способы координации хозяйственной деятельности, институты собственности и власти. В качестве методов исследования использованы исторический анализ и инструментарий институциональной теории экономики. В работе показано, что сетевые структуры постепенно вытесняют рынок как универсальный способ межхозяйственного взаимодействия. Утверждается, что новые возможности, открываемые современными информационно-коммуникационными технологиями, способствуют преодолению проблем отчуждения и асимметрии информации, возвращению к коллективным формам сотрудничества. Анализируется влияние информационных технологий на трансформацию институтов собственности и власти. По результатам исследования делается вывод о том, что в изменении ведущих способов координации хозяйственной деятельности, форм собственности и оснований власти наблюдается спиралевидная траектория развития.

Ключевые слова: цифровая экономика; информационно-коммуникационные технологии; разделение труда; координация взаимодействия; сетевая экономика; собственность; власть.

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