

Digital economy in the transition conditions to "Quick Response Manufacturing" model

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Abstract—The article deals with the problem of using digital technologies in the agrarian economy of the Russian Federation in the context of solving the problem of its new modernization. It has been suggested that its main prerequisites are, firstly, the growing importance of the intellectual assets (capital) of firms and, secondly, the development of the creative nature of modern fundamental and applied science. The key direction of the new modernization of the economy is the transition from the previous model of a "Lean" to a new model of "Quick Response Manufacturing". In this regard, special attention is paid to the main characteristics of the new production model and the possibility of its provision with digital technologies. The main problems of the development of the digital economy associated with the state of the agrarian sector of the national economy of Russia are revealed. The role of digitalization of economic processes in management in the transition from the innovative type of economy to the creative type is shown. The strengths and weaknesses of the digital economy and the risks associated with its further development.

Keywords—*digital revolution, digital technologies, analog technologies, quick response manufacturing.*

I. INTRODUCTION

At the beginning of the XXI century in the world even more often began to speak about need of new economy upgrade. It is connected with transition to new technological way. This way, unlike the period of mechanization, automation and an initial computerization assumes already absolutely new level production and management organization. Issues of mass and "advanced" informatization are put in the forefront (the high density of a covering, high quality of Internet connection, replacement of communication nodes with router, etc.). And also robotizations, creations and uses artificially intelligence, active use of biogenous engineering technologies and other latest developments of modern science. Becomes obvious that their implementation in production almost everywhere is a factor of improving the enterprises competitiveness. If in the middle of the XX century terms between development and deployment of a know-how were 15-25 years, and at the end of the XX century – 5-15 years, then at the beginning of the XXI century we observe almost instant implementation process of the latest science in production developments.

It demonstrates the growing value the companies intellectual capital and temporary parameters compression

in the main phases of the innovation process: generation periods, conceptualization, optimization and execution [1, p. 230].

Besides, in recent years many economists even more often use the term "creative economy" instead of a phrase "the innovation economy". One of the reasons of this "milestones change" can be considered different concepts wide circulation of creativity in modern science and diversification of creative processes in the production and management [2].

II. OVERVIEW OF SOURCES

One of the first concepts of creativity can be considered views of the American scientist Graham Wallace (1858 – 1932). He, in particular, defined the main stages of process of creativity (preparation, an incubation, inspiration and check) what many modern scientists agree on. The book "Human Behaviour in Policy" (1908) became his most known work. Many researchers consider G. Wallace one of the founders of the behavioural approach and in the economic analysis (behavioral economics).

At the same time, other researchers contribution to development digital economy questions should be noted which is connected with development of mathematical methods of the economic analysis and mathematical modeling (A. Alchian, G. Becker, J. Bell, R. Dorfman, G.A. Simon, J. Stigler, E. Toffler, A.A. Walters, E.H. Chamberlin, etc.).

The digital economy is defined by modern researchers as economy which accumulates different types of economic activity in which use of digital data plays a key role in the effective organization of production and improvement of its structure and information networks serve for data exchange [3]. Its even more specific definition is given in the project of "Strategic development of information society in the Russian Federation for 2017 – 2030" where it is told that the digital economy is characterized as activity in which key factors of production are the data provided in a digital form [4].

Synonyms of the term "digital economy" are "API – economy" (Application Programming Interface – the interface for programming of applications); "Gartner" – programmable economy; "economy of applications";

"electronic (transitive) economy" [5; 6]. Despite separate etymological differences in interpretation of the term "digital economy", between them the unity is obvious [7, p. 112].

III. METHODS

In article dialectic approach, structurally functional, program and target, historical and retrospective and hermeneutical methods of a research are used. A subject of studying is the modern digital economy. An object of a research is the character and the main trends digital economy development in conditions a record to new technological way and new model of economy – to "Quick Response Manufacturing".

IV. RESULTS

The modern komparativny analysis of trends digital economy development allows to reveal the different strategy of such development in the different countries [8]. But one is obvious: such development is based on informatization process as mass use of digital technologies in production and management [9].

Thus, acceleration of the innovation cycle and creativity development became the emergence main factors of the fact that today "the digital economy" is called. At the same time it is necessary to emphasize one very important circumstance: "digits in economy steadily happen result of attempts to measure concepts which definitions are often extremely disputable or are at least disputed" [10, p. 294-295]. "The competitiveness of the enterprise", "competitive advantage", "quality of products", "cost", etc. belong to such concepts. Effective digitization of these concepts is possible only on the basis of the unified approach. While normal language (alphabet) the different people different, digits, have them Roman or Arab, are clear to all.

The important direction in upgrade of the modern Russian economy in general, and its agrarian sphere in particular, is digital revolution, i.e. development in all spheres of digital culture. Digital revolution represents active junction from analog technologies – to digital which began in the world as early as in the mid-eighties. Premises of digital revolution are:

- exponential growth of information volumes (by 2020, as expected, this volume will be 44 trillion gigabytes);
- expansion and reduction in cost of computing power and capacities for information storage;
- progress in technologies of machine learning in the analysis of computer data.

The main manifestations of modern digital revolution are:

- automation the increasing number of processes;
- large volume accumulation specific users data;
- growth of access for users to data arrays in external sources;
- new methods and processing algorithms of considerable data volumes.

It is possible to judge about rates and scales of modern digital revolution by the following data. If there were 12.4 million users of mobile phones and 2.8 million Internet users, in 1990 in the world then 4.6 billion and 4.1 billion users are expected, by 2020 respectively.

In May, 2017. The decree of the President V.V. Putin approved "The development strategy of information society in the Russian Federation for 2017 – 2030". In June, 2017 the State Program "Digital economy of the Russian Federation" was published.

In the Message to Federal Assembly on March 1, 2018 V.V. Putin noted that in the world new technological revolution which opens great opportunities before us is evolving. For anybody not a secret that to make breakthrough in improvement people quality life, in economy upgrade, its infrastructure and public administration we need economy with growth rates above world, i.e. not lower than 5% a year [11].

On August 1, 2018 the first meeting of "Council for development of digital economy" at the Federation Council of Federal Assembly of the Russian Federation took place "the Technopolis – GS". At this meeting to train not less than 75 million specialists in the different industries of economy with knowledge of digital technologies in the next years was emphasized.

Digital technologies development is a basis for digital economy development that assumes creation of qualitatively new and more perfect models of business capable to change the format, to react quickly to change of the external environment and to strengthen communications between people and the whole countries. It is expected that transition to digital economy will allow to increase the gross internal product (GIP) of the Russian Federation by 2025 by 8.9 trillion rub, i.e. for 34% of its general gain.

Russia, as well as the whole world, is on the threshold of the fourth industrial revolution which will integrate physical, biological and digital systems [12]. In this regard before our country there are essentially new tasks.

For the agrarian sphere of economy these tasks are connected with a number of problems.

Firstly, with use of digital technologies in providing country agricultural regions with information communications. Digital technologies, unlike analog, are connected with work with discrete, but not line signals. Therefore IT use – technologies becomes a development condition of the communication environment and increase in its information security on huge spaces of our country. The matter is that to provide a continuous and reliable line signal is significantly more difficult and more expensive, than to use discrete.

Secondly, digitalization allows to overcome lag of agriculture from the industry and services sector in more short time and by that to provide more effective interaction of all structural elements of agro-industrial complex.

Thirdly, statistics digitization in the field of agriculture development allows to create more reliable and long-term models of its development taking into account climate

change on the planet, the growing risks and uncertainty in different segments of national economies in the certain countries and even in the context of essential regional differences in the most Russian Federation.

Fourthly, digitalization of production, management, marketing processes and logistic activity in the agrarian sphere of economy can promote growth information determinancy degree of on the most organizational and economic system, in particular, the system of agro-industrial complex.

The opinion that full determinancy of information is not represented possible even in ideal conditions is fair [13, p. 19]. But improvement of processing and providing speed parameters and obtained information reliability, its clarity, completeness and value, certainly, is connected with the latest digital technologies.

At last, fifthly, processes digitalization in the organizational and economic systems structure (including agro-industrial complex) will promote increase in its safety (stability growth, decrease in entropy, etc.) as digital technologies in much smaller degree are subject to the hacker attacks, than analog. The matter is that within analog technologies there is a certain recurrence which raises degree of risks (the so-called cyclic sequence). In digital technologies the combinations number of digital parameters of grows in geometrical, and, perhaps, even in a trigonometrical progression that does unreal "binary" (repeated) digital combinations. For example, during barcodes creation or product prescription parameters, the components designated by digits become more reliable for a fake to such extent wich the number of these components grows to. Then, as in analog systems decoding is carried out rather simply (an example of the Enigma).

All this allows to save competitive advantages of producers, to fight against counterfeiting and kompilyativny actions (especially characteristic of economy of China where they learned to forge different goods at the highest level, but officially call them copies).

Especially actively production digitalization questions began to be considered in the 1990s of the XX century when the concept of quick response manufacturing was developed (Quick Response Manufacturing – QRM). Unlike the traditional approach oriented to cost saving, this concept is oriented to reduction of interoperational temporary losses and a total temporary cycle product removal on the market. And here digital technologies became an acceleration factor as allowed to process much bigger considerable data volumes in rather smaller temporary terms.

Quick response manufacturing is the strategy the runtime order reduction which is the enterprise development philosophy. The purpose of QRM consists in goods or services production time reduction of due to all operations of the company, both internal, and external.

The strategy QRM " is based on four key principles: a) recognition of the importance (force) of a factor of time; b) company structure organization improvement; c) a systematic dynamics and d) the concept application of the

accelerated development on the enterprise scale [14, p. 185-187].

Really, cost avoidance (known as the competitive strategy of focusing on expenses) in the conditions of the modern competition does not give a success guarantee. It, naturally, does not mean that economy of resources is not necessary. It is necessary. But in the conditions of high risks and the growing uncertainty of modern economy the main resource is time. "Time is money" – once said one of the "founding fathers" of the USA B. Franklin. Developing this idea, the concept of quick-response production is constructed on the idea of the maximum saving of time.

The first principle – time force – is defined at the expense of the focused attention by the time order execution at which the concept of the critical production path (CPP) – calendar time is used from the moment the order forming before transfer of a product to the customer. The check point covers not only time of production, but also storage time and implementations. Thereby it includes production and logistic chains of production and deliveries.

The second principle of QRM – an organization structure of the quick response enterprise – is defined by reconstruction as mesh structure. Unlike the traditional organization of production providing centralized operation, the quick response enterprises represent the system of the cells possessing high autonomy of the commands working in them. The cell of QRM is set independent (separated from the main company) the multifunction resources combined with each other capable to carry out the sequence of operations for all works referred to the specific focused target market segment (FTMS – Focus Target Market Segment).

The third principle the quick response enterprise – the systems dynamics – represents interrelation the resources use and free production capacities. Contrary to traditional approach the enterprise organization, suggesting full (absolute) utilization of capacity, the organization quick response enterprise is under construction on incomplete (at the level up to 80%) utilization of capacity. It is done so that it would always be possible to react to changes in the internal and external environment of the enterprise.

At last, the fourth principle of QRM means implementation of the concept within all enterprise, and even an exit for them: the interaction with suppliers and consumers oriented to reduction of the CPP.

This concept belongs to Rajan Suri, professor of Harvard University (USA), the author of the famous book "It's About Time. The Competitive Advantage of Quick Response Manufacturing" [15, p. 447-448]. It is devoted to issues of improving the modern enterprises competitiveness due to their fast reaction to changes of market conditions.

V. CONCLUSION

Transition to new model of the accelerated production on the basis of new digital technologies is extremely important for agricultural producers. First of all, because it allows to accelerate processes of production and product sales. In conditions when communication nodes, characteristic the previous stage informatization, on the

wide information networks are replaced with the router providing an automatic exit of users in network and their access to a uniform address space (on the basis of the standard IP protocol), the possibility of practical transition to model of quick-response production appears.

But the matter is that digital technologies bear in themselves not only pluses, but also risks, threats to the traditional industries of national economy. The Russian President V.V. Putin paid attention to this circumstance. Of course, not everyone even large producers of agricultural products in the changing conditions will be able to become market-places, but it is just necessary to provide them with elementary access to Wi-Fi. As the most part of products of agriculture has quite limited expiration date, and the modern market of food demonstrates constantly growing demand for fresh products, a speed factor in its production and delivery to the end user is determinative.

It is natural that there is no need to insert Bluetooth chips or other "authentication" digital indicators into each packaging of cutlets or a bottle of milk at differentiation and structural change of cumulative demand for agriculture products. It is only necessary to create such database which gives in to almost instant processing for the purpose of increase in production efficiency and quality of life.

At the same time modern digital technologies (a blockchain, a geolocation, 3D-printing, the mode of distant work, GPS, DIY-biology, etc.) just also serve a solution of the called problem and allow to lower significantly temporary and, finally, financial costs of production and management.

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