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Theoretical and methodological knowledge of the information economy under the prism of innovation and digitization

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***Abstract* — This electronic document is a "live" template and already defines the components Features of theoretical and methodological knowledge of the informational economy are researched and generalized in the article. The content of the dialectical system "information-knowledge" is revealed. It is established that the effectiveness of "information-knowledge" system depends on the joint activity of the individual and social environment. It is argued that the cloud business transformation through innovation on the basis of Microsoft Azure can be presented qualitatively: adaptive logistics, strategy for developing cloud solutions, smart cities and buildings, artificial intelligence and machine learning, industry 4.0, smart office, smart parking, implementation of solutions for business process automation and data management, rapid migration from outdated systems on modern information technologies, automation of testing processes, etc. The content of the nucleus of VI and VII technological processes through the prism of innovation and digitalization is revealed. It is concluded that information infrastructure services and digitalization security should be carried out in the following areas: personal data management; backup/restore data; configuration management; cyber security services; monitoring. Therefore, for a successful business, information and digital transformation is a vital necessity. And to do it, you need the right IT tools, verified by time and great data, with excellent user feedback and a diligent professional support service.**

Keywords — cinformational economy, smart offices, digitalisation, digital technologies, innovation, latest cloud technologie.

I. INTRODUCTION

The era of information economics, which manifested itself in the transition to the third millennium, influenced on all aspects of economic and public life of man, including social and spiritual. The global development of innovation-information economy can be seen as the expansion of the base of post-industrial society. This allows us to quite confidently characterize the processes taking place in global economy and in world society, as a manifestation of a "paradigm shift".

In an institutional sense, the complexity of the construction of innovation-informational economies related to the birth of a new method of coordination of communications and harmonization of interests. Thus, in the industrial era (industrial paradigm), the world community was based on two methods of coordination: the hierarchical order with the system of vertical subordination and the center of administrative management (a rigid model of coordination); a market system with price signals, as some deviation from a rigid and clear hierarchy (flexible, but rather atomic).

Post-industrial paradigm is characterized by a non-hierarchical order or the so-called network coordination mechanism. Gobal economy and all its subsystems are stratified in cluster-network structures with horizontal links and a collaborative mechanism (a hybrid model is flexible and simultaneously integrated). As for Ukraine, the transition to an innovation-information model of development on principles of digitalisation is modern, conscious of its choice. In addition, this is required by globalization process, which involves all the countries of the world and which did not escape Ukraine.

II. RESULTS

A. The analysis of recent researches and publications, which initiated the solution of this problem and which is based on the author, the allocation of previously unsettled parts of general problem, to which this article is devoted.

Recently, a number of scientific works were published, including the highest leadership of the country, which raised the issue of the need to transition to the path of structural changes in innovation-information and digital character. Valuable in the scientific sense of research the problems of the formation of innovation-informational economy are scientific works and practical researches and development of such famous scientists and inventors such as V. Aizekson [1], D. Bell [2], J. Weilz, B. Heits, B. Elbrekht, Zh. Elliul [3], M. Kastels [4], J. Fon Neiman, F. Fukuiama [5].

Ukrainian scholars-economists are also actively involved in the creation of conceptual apparatus of the institutional palette of systemic studies of information, innovation and digital economics. Among them, the names of V. Hroisman, V. Heitsia, A. Hritsenko, Yu. Zaitsev [6], V. Zavadovskyi [7], S. Kubiv, P. Krasnoshchokova [8], O. Kryvoruchko [9], O. Parkhomenko [10; 11], K. Peleshchenko [12], N. Riabtseva [13]. But at the same time, a significant number of issues, such as: benefits of digital workplaces; internal communication of the company in one program; advantages of cloud technologies for key information systems in production; possibilities of modern information technologies for the security of business environment and many others remain insufficiently open.

B. Formulating the goals of the article (statement of the task)

The purpose of the article is to reveal theoretical understanding of such a phenomenon of the XXI century as the information economy through the prism of innovation. Research of directions, problems solved during digitization of economy and possible variants of realization of products of VI-th and VII-th technological methods, which determine the further development of information economy. Finding out the content of information infrastructure services and security that produced on the basis of digitization. Substantiation and disclosure of cloud business transformation through innovation on the basis of Microsoft Azure.

C. Presentation of the main research material with full justification of scientific results obtained.

With the advent of new technologies there have been significant changes in all spheres of economic life of society. This refers to changes in the mechanism and trajectory of economic progress, based on an increase in the share of innovation and information sector, which has become a powerful source of socio-economic development, its dynamics and growth. Information has become an independent resource with a peculiar value.

It should also be noted that it is the American scientist-economist R. Solou, who is one of the founders of the theory of technological change, in his model of growth proved that the influence of technological progress is manifested in marginal indicators of capital and labor productivity, which are the parameters of the efficiency of national production, and the main factor of economic growth, in the long run, is the development of technology.

Somewhat similar were the studies of French sociologists J. Elliul. The basis of the concept of "technological society" scientist considered the technique which prevails over society and man, develops in accordance with its own laws and is not subordinate to man. It is autonomous with respect to the economy and politics. The technique, in its understanding, is not limited to machines and technologies, but covers all spheres of human activity.

The sociologist distinguished the following types of technology: economic technology (related to production); engineering organization (includes commercial and industrial activities, state, police, military affairs); human technology (covering medicine, propaganda) [3, p. 265, 271, 276].

The concept of the post-industrial society of American sociologist D. Bell gives an idea of the impact of technological progress on social change. "A post-industrial society is based on a "game between people", in which, based on machine technology is raised intellectual technology based on information... The methodological basis of each society is different and, importantly, there are qualitatively different axial principles, around which the institutional and organizational attributes of one or another society are concentrated" [2, p. 223].

According to the American sociologist M. Castells, "the information and technological revolution will reveal its transformational potential. XXI century will be marked by completion of global information superhighways, mobile telecommunications... For the first time, person will be able to make significant manipulations with living matter... However, new genetic technologies are permeable, their mutational effects are under-controlled, and institutional control over them is largely decentralized... The way we go depends on social institutions, on human values... The share of wealth that goes to individuals will depend on their access to education, and society as a whole – from its innovation system" [4, p. 600-601].

We can already see the actual confirmation of M. Castells forecasts today by revealing the directions and problems what are solved and possible variants of sales products of VI and VII technological processes in Table 1 and Table 2.

TABLE I. THE CORE OF VI-TH TECHNOLOGICAL DEVELOPMENTS THROUGH THE PRISM OF INNOVATION AND DIGITALIZATION

Direction	Solved problems	Possible implementation options
Unconventional power engineering	Reducing the burden on the environment, saving natural resources	Hydrogen power, synthetic fuel, solar energy converters, AES with a closed cycle, fast reactors, vortex heat generators
Information systems	Globalization of the world economy on the basis of partnership	Bioenergetics, optics, quantum-vacuum computers, artificial intelligence, torsion communication systems
Biotechnology	New level of well-being	Water purification, desalination of sea mode, modified agro culture, treatment of diseases, cloning
Transport	Environmental safety, speed, efficiency	Underwater superliners, string transport, electric vehicles, aerospace transport systems
Ecology	Sustainable development	Non-waste and locking technological "circuits"
Materials	Durability, safety, reliability, efficiency	Nanotechnologies, amorphous metals, memory materials, high-temperature superconductivity, torsion technology of materials processing

Compiled from source 8, p. 57 and own developments

TABLE II. THE CORE OF VII-TH TECHNOLOGICAL DEVELOPMENTS THROUGH THE PRISM OF INNOVATION AND DIGITALIZATION

Direction	Solved problems	Possible implementation options
Cognitive and socio-humanitarian technologies. Main productive factor is creative intelligence	"Global vacuum capture". New forms of life on the planet. Constructing a new social reality	Technologies of "thermonuclear fusion", psi-technologies (, bioenergy, technology related to morality and responsibility. This method is implemented by means of hyperintellectual, hyper-knowledge, hyperinformation, hypercommunication. "Games with the subconscious mind". The availability of 5 cognitive technologies is projected: neuroimaging, cognotropic drugs, cognitive assistants, Brain-Machine interfaces, artificial sensory organs.

Compiled from source 8, p. 57 and own developments

American futurists F. Fukuyama and A. Toffler emphasized that "with the technical development of communication tools, reliable information would supplant the unreliable... the information revolution will lead to widespread changes... but the era of large hierarchical organizations has not yet ended... even in telecommunication, fiber optic technology is better able to work when its exploitation is dealt with by one giant and geographically dispersed company" [5, p. 49-50]. In Table 3 and 4, we provided information infrastructure services and security and cloud-based business transformation based on Microsoft Azure through deep digitization, which today are in demand by medium and large Ukrainian businesses.

TABLE III. INFORMATION INFRASTRUCTURE SERVICES AND DIGITAL BASED SECURITY

Areas of activity	Features of application and/or content of activities
Personal data management	User account control. The only point of the system authorization. Formation of user identification within an organization, in all LOB applications, workflows and data repositories. Managing role-based access.
Backup/Data recovery	Back up for all applications, workloads and data. Independent service and data retrieval on request based on reliable SLA. Restore the work of critically important SLA-based applications with the most effective RPO and RTO.
Configuration management	Manage PCs and servers. Software update. Configuration settings and security policy. Patching, installing updates, password rotation. Verification of service quality, optimization of resources.
Cyber security services	Security audit. Protection testing, vulnerability assessment. Operational safety center (SOC). Business continuity planning. Information risk management. Infopulse Standards Compliance Manager
Monitoring	Round-the-clock support for infrastructure and applications at the levels L1, L2 and L3. Infopulse Service Management: - Cloud Service Desk; - Monitoring solution; - Report management tools.

Developed by authors

It should also be noted that solutions for modern business are: departmental interaction, document flow, analytics and reporting (BI), customer service management (CRM), resource planning (ERP), data security, support service, corporate content management, virtualization and data storage, mobility.

For innovation-digital development, first of all, expansion of intellectual space is necessary, which provides a "technological corridor" for promoting innovation. The basis of the mechanism of its expansion is fundamental interaction of knowledge flows and information, which determine the ultimate result of the expansion. If the mass of information in society manages to "crystallize" in the knowledge necessary for an innovative breakthrough, the above mechanism works. "Crystallization" is provided by the formation of so-called "content attractors", the core of which is investment.

The construction of such mechanisms, the formation of new content (in which "packed" knowledge) laid the foundation for post-industrial modernization of society. The development of such mechanisms and an understanding of the philosophy of their action, gives a chance "to escape from the impasse of overcoming development" [12, p. 37].

TABLE IV. CLOUD TRANSFORMATION OF BUSINESS THROUGH INNOVATION ON THE BASIS OF MICROSOFT AZURE

Solutions based on Azure IoT Suite	*Migrate to Azure*	*Solutions based on Azure Cognitive Services*
- Smart cities of homes; - Adaptive logistics; - Agriculture; - Industry 4.0; - Health care: diagnosis and monitoring of vital indicators; - Smart office, convenience and safety; - Automotive industry: smart parking, traffic monitoring, vehicle tracking.	- Strategy for the development of cloud solutions; - Transformation of architecture: public, private or hybrid cloud solution; - Assessment of migration process into the cloud; - Transfer of existing infrastructure to the cloud; - Migrate solutions to Microsoft and other providers.	- Development of chat rooms on Azure; - Artificial intelligence (AI) and self-learning machine (ML); - Decision Computer Vision and Face Recognition; - NLP and language understanding (LUIS); - Development of products based on Cortana; - Data-driven marketing; - Detection of anomalies, forecasting.
Office 365, BI, Dynamics 365, SharePoint Online	*DevOps on Azure*	*SAP on Azure*
- Implementation of solutions for business process automation and data management (CRM, ERP, CMS, business applications, etc.); - Ensuring compliance with requirements with on-line, local and hybrid implementation; - Integration from any BI platform; - Fast migration from outdated systems to modern technology.	- Continuous Integration (CI), Delivery (CD) and Release Management (RM) in Azure Repository: improve quality and reduce deployment time; - Automation of testing processes; - Optimization of the development process.	- Deployment SAP on Azure; - SAP implementation of dev-test and development scenarios; - Assessment of migration in SAP; - SAP Architecture for Azure, including SAP HANA, SAP S / 4HANA, SAP SCP and SAP Activate; - Determining the optimal size and consumption of Azure SAP; - Consultancy, licensing, and support from the official supplier of SAP in Ukraine.

Developed by authors

Today the problem of correlation of social and intellectual spaces is traced, which is closely connected with the underestimation of innovative practice of using resource opportunities in the "information – knowledge" dichotomy. Precisely because of the lack of cognitive tools, such opportunities are practically not used to create the new content essential for the development of society as the most important products of the knowledge economy.

According to the Ukrainian scientist O. Parkhomenko, the dialectic system of innovation economy "information – knowledge", in which the role of "creative practice" of knowledge production is performed by a person (transforming information into knowledge), built on the application of natural principle of "unification of opportunities", is manageable, and information and knowledge in it operate in an inextricable interconnection.

This principle is based on the innovation-informational economy, because in the process of human creativity, using the dialectical system "information – knowledge", there is a stage of scientific knowledge and it is possible to compare it with "the creative factory of creation of new knowledge and product, the properties of which are larger than the sum of components" [10, p. 8, 10], as the "takes out, is born" new idea. Appropriate from the position of the studied system will be consideration and synergistic effect. After all, the connection existing between parts of the whole, in itself, is part of the whole. The synergetic nature of innovation activity is due to the complex nature of innovation needs.

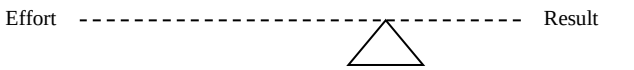
First, they are not primary, that is, in the multilevel system, the need arises directly for the necessity of solving a set of contradictions between the needs and the possibilities of their satisfaction, and secondly, they are of an integrative nature. According to Ukrainian scientists N. Ryabtseva and O. Alsufeva, innovative needs integrate creative-cognitive and economic needs. The dialectical unity of these types of needs can be systematically represented by means of the "double helix" model, when the satisfaction of one kind of needs causes an actualization of another kind, but at a higher level of satisfaction. Innovative needs have an objective basis, but they are subjective in their own way [13, p. 4-5].

In our opinion, the growing expectations of consumer-clients in the XXI century as a result of the formation of information economy in the course of accelerated innovation and digitalisation include:

- instant access to information and options;
- a new rate of innovation;
- channel change (transition to mobile and video technologies);
- democratization of communications (simple and understandable);
- rethinking the notion of trust (the crisis of confidence in institutions and the need for a guarantee of confidentiality);
- "death" complicated (simplicity of advanced products and services);
- consumer power (consumers form and define rules of the game on market).

Consumers demand high-quality services – fast, simple, understandable – that always meet expectations, demonstrate honesty and authenticity, provide solutions to problems, are empathic and, above all, personalized.

We agree with O. Parkhomenko, which compares synergy with the rule of "leverage" that operates between efforts and the result of creative work of the subject of the innovation process. The change in consciousness at the expense of synergy shifts the point of resistance of the system closer to the result of labor. The greater the synergy, the easier it is to achieve a better result (Fig. 1). The effectiveness of the system "information – knowledge" depends on the joint activities of the individual and social environment.



Compiled from source 10, p. 10; 11 and own developments

Fig. 1. Model of synergistic influence on the efficiency of creative work of the subject of innovation-information process by O. Parkhomenko

There are two key issues in innovation process: what should a person do (produce)? and as? The first question answers philosophy, on the second – methodology. Philosophy is the foundation of the methodology of innovation and related processes and systems. Innovations are born as a result of virtual mental conclusions about objects that do not exist. The more radical innovation, the more it is more virtual, and the stronger its philosophical foundation. On the other hand, philosophy of innovation is an accelerator of the development of society, which seeks to successfully solve economic, social and political problems [7, p. 69].

Essentially important for understanding the mechanism of functioning of a single innovation field is that all three components (intellectual, informational and material production) of the chain of innovation process do not exist without one. Their development is interdependent. Taken together, these types of production form a single technological chain of production and use of knowledge gained in the process of knowledge.

The production of innovation begins with intellectual production, namely the creation of perfect individual and collective knowledge that gives birth to the idea. The next step is the production of information. It takes place by encoding and distributing innovative ideas. The final stage is the reduction of ideas received in innovative product. A deeper and more understandable innovation field in which company is transformed into an innovation through using of digital technologies is presented in Figure 2.

We agree with Yu. Zaitsev's opinion that "the rapid development of scientific and technological revolution, which covers all spheres of economic and social activity of an individual, a separate state, humanity as a whole and leads to the emergence of "informational", "innovative" and "communicative" rights" [6]. Information and society are the environment in which a person functions. It is a creative organizational and unifying element in combination of the information environment with society [11, p. 4].

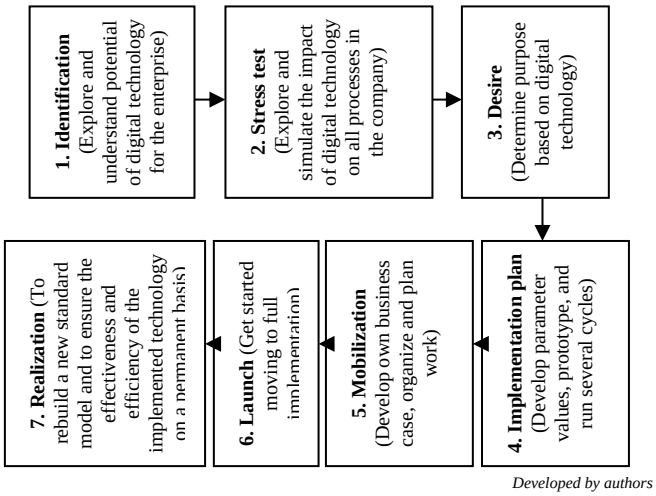


Fig. 2. Enterprise transformation into innovation through using of digital technologies

Economic and institutional contours play an important role in innovation processes. They are based on the system "people – information – knowledge – idea – innovation", in which the transformation of information into an innovative product. The antagonistic tasks of man and society combine to achieve economic benefits. Creating the conditions for the dialectical unity of economic contradictions of man and society is a key point in building an innovation-informational economy [11, p. 5]. Innovative and digital activities need to organize and stimulate, while human behavior is motivated not only by the incentives for maximum personal well-being, but also by psychological and cultural factors. Quality and aimed at a positive result targeted system of information and knowledge preparation of individuals for life and work in an innovative economy and society is needed. Society should be characterized by susceptibility to innovations. This acceptability can be developed in two directions: reduction of barriers (forces) of exclusion, rejection and increase of forces for perception, introduction of innovations.

III. Conclusions

In the end, it should be noted that the transformational processes under the influence of information and technological revolution embraced all aspects of society, transforming it from industrial to post-industrial, innovation-informational, and digital. Already, "young" companies with innovative solutions and approaches easily compete with powerful and long-term corporations. The audience almost completely turned the attention of the TV screens on the display of personal devices. Money transactions and circulation of goods completely lost their borders.

Company that is not represented on Web is not able to locate its customers. If it does not have a single business analysis system, it will not be able to build an effective strategy for competition and development. There is no automation of production – there is no cost savings and product quality improvement. Therefore, for successful business digital transformation is a vital necessity. To do it, you need the right IT tools, verified by time and great data, with excellent user feedback and a diligent professional support service. In spite of the scale of scientific achievements that are already available, it is still important, in future, to conduct research aimed at disclosing an understanding of information and knowledge in the theory of a "new wave" of growth with endogenous technological progress. It is useful in practice to analyze the dynamic theory of the creation and management of organizational knowledge.

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