STRATEGIC COMPANY MANAGEMENT IN THE CONDITIONS OF INDUSTRY 4.0

Larysa Dzhulii, Khmelnytskiy National University
Nadya Mironova, University of National and World Economy
Iryna Stankevych, O.S. Popov Odessa National Academy of Telecommunications
Marin Paunov, University of National and World Economy
Oksana Syvak, Mariupol State University

ABSTRACT

Megatrends have a significant impact on the economy, strategic company management, forming clusters of new threats in relation to each object. This applies to such important new megatrends as "Industry 4.0" (cloud computing, Internet of things, smart businesses, products, and services, Big Date, cyber-physical systems) that is developing at a rapid pace and can be identified as one of the most important modern megatrends. The analysis of directions of development of the "Industry 4.0" concept is conducted, and the basic tendencies which change technological, innovative, and economic development in the conditions of the 4th industrial revolution are highlighted, one of them is the paradigm of cloud computing. The analysis of the development trends of the "Industry 4.0" concept and the current trends in the digital transformation of the economy shows that the cloud computing paradigm is one of the main trends that are changing technological, innovative, and economic development in the conditions of the 4th industrial revolution. The institutional structure of the information economy is being transformed: new forms and methods of economic activity are emerging. Cloud technologies are becoming dominant in the business-oriented segment of the information market, enabling companies to gain significant competitive advantages. However, such innovations are characterized by a high degree of technological and market uncertainty, and changes occur outside traditional socio-economic institutions.

Keywords: Strategic Management, Industry 4.0, Cloud Technologies, Megatrends, IT Sector, Digital Technologies.

JEL Classifications: M5, Q2

INTRODUCTION

The emergence of completely new growth factors, new drivers of economic development, the rapid pace of technological change, the high degree of uncertainty caused by the high rate of change and the emergence of new megatrends, new threats require the formation of a new philosophy of substantiation of management decisions, new approaches to the formation of strategies and programs for economic development. Therefore, only fundamentally different approaches will turn new threats into new opportunities.

Technological changes that are taking place in the area of the merging of telecommunications and information and computer technologies have led to the introduction of

the concepts of *"digital technologies"* and *"information economy"* into the scientific circulation. The latter is a type of economy, characterized by the active introduction and use of digital technologies for storing, processing, and transmitting information in all spheres of human activity, which lead to the transformation of relations between participants in economic activity in such areas as energy, construction, banking, transportation, retail, education and healthcare, mass media, etc.

The main directions of development of megatrends, which are determined by various researchers, are quite close. It should be noted that the *"transition from an industrial society to an information society"*, *"the redistribution of forces in the global economy" and the "formation of a knowledge economy"* create the conditions for the development of the *"Industry 4.0"* concept, which is also called the fourth industrial revolution.

Megatrends have a significant impact on nature, society, and the economy, forming clusters of new threats in relation to each object. This applies to such an important new megatrend as Industry 4.0, which is developing rapidly and which can be singled out as one of the most important modern megatrends.

The purpose of the study is to theoretically substantiate the impact of Industry 4.0 on strategic company management.

REVIEW OF PREVIOUS STUDIES

Updating the potential of economic development in the current conditions cannot occur without the use of IKT for the reasonable formation of promising areas of economic development, and timely and qualified support for promising scientific research and production. The new economy, which was associated primarily with the commercialization of the Internet, is not limited to the information aspect, and it is a qualitatively new level of the world economy, including the existing productive forces of society (Weking et al., 2018).

The information economy usually includes (Drobyazko et al., 2019a & b) the information and communication sector (communication and data transmission systems, electronic commerce; stock market of high-tech securities); advertising and mass media market; banking and financial sectors; health and education sectors.

The core of a new type of economy is formed in the process of converting information products and services into a mass production and consumption object (Ibarra et al., 2018; Kwilinski et al., 2019). Information resources are becoming an increasingly significant source of wealth for the nation, and the transition to a new economy is causing significant structural changes.

We focus on the objective prerequisites for the emergence of the information economy as an aspect of the information society (Hilorme et al., 2019; Tarkhanova, 2018). Despite the rapid spread, the information economy is not a random phenomenon, it is a natural result of scientific, technical, and social progress.

Investments in Industry 4.0 are already significant and studies show that global industrial companies plan to invest $ 907 billion per year up to 2020 (de Man & Strandhagen, 2017). The focus of this investment will be on digital technologies such as sensors or communications devices as well as software and applications such as production executive systems (MES).

In addition, companies are also investing in employee training and leading organizational changes. More than half of respondents expect investments in Industry 4.0 to be profitable in two years or less if they invest about 5% per annum (Strange & Zucchella, 2017; Tkachenko et al., 2019).

METHODOLOGY

Both general scientific and special methods used in the work. In particular, the systematic approach allowed critically examining the structural transformation of the economy and the development of cloud computing, as well as analyzing the international experience of institutionalizing the digital economy.

The main thing that defines a system is the interconnection and interaction of parts within the whole. If such an interaction exists, then we can talk about a system, although the degree of interaction of its parts may be different. It is also worth noting that each individual object, thing or phenomenon can be regarded as certain integrity that consists of parts and is explored as a system.

The concept of the system, as well as the system method as a whole, was formed gradually, as science and practice mastered different types, types and forms of holistic associations of objects and phenomena. Now we need to become more familiar with the various attempts to clarify both the concept of the system and the formation of the system method.

RESULTS AND DISCUSSIONS

Analysis and evaluation of research on the development directions of the Industry 4.0 concept allow singling out the following main trends that change technological, innovative, and economic development in the context of the 4th industrial revolution:

1) Digitalization - the development of digital technologies, the unification of the real and virtual worlds (everything is digitized, everything is networked)
2) The return of branches of enterprises and companies that were transferred by technological leaders to other countries, due to the cheapness of the workforce, again to developed countries as a result of the development and advantages of digitalization (wages, new educational competencies)
3) The possibility of creating joint innovations, new forms of organization of production; changing the structure of supply and demand, the emergence of new products and services.

We can highlight the main components of the Industry 4.0 concept by setting for each of them the coefficient of influence on the concept as a whole (Table 1).

Table 1
THE MAIN COMPONENTS OF THE *"INDUSTRY 4.0"* FRAMEWORK RANKED BY THE IMPACT ON THE CONCEPT

No	Components of the Industry 4.0 framework	Rank
1	Cyber-Physical Systems-CPS	1
2	Cloud	2
3	Internet Of Things - IoT	3
4	Великі дані - Big Date	4
5	Smart Factory	5
6	Internet of Services	6
7	Smart Product	7
8	Machine to Machine - M2M	8

Note: Developed by the author based on Kiel et al. (2017)

Work in the Industry 4.0 industry requires significant shifts in organizational practice and enterprise structures. These changes include new forms of IT architecture and data management,

new approaches to regulatory and tax legislation, new organizational structures and, most importantly, a new information-oriented culture, which should embrace data analytics as the main ability of the enterprise.

M2M technology (Machine-to-Machine) consists of various wired and wireless technologies that allow connecting different computers of the same type to each other; M2M can also be defined as the ability of assets, devices, and machines to remotely control, perform actions, and exchange information with each other through leading or wireless environments and without human assistance; M2M has wide industrial applications and is widely used in the utilities sector for the intelligent management of electricity distribution, in the automotive sector – through the use of telemetry technology in automobiles, and in the healthcare sector – for telemedicine and remote patient monitoring.

The key trends in the digital transformation of the economy and the development of the information economy are supported by four criteria and are shown in Table 2.

Table 2
SUMMARY ANALYSIS OF THE DIGITAL TRANSFORMATION OF THE ECONOMY

Criteria	Economic Transformation Trends
Events	Current trends and new technologies in the IT sector help to optimize the collection, storage, processing, and analysis of large data sources. Clients are increasingly demanding additional information from information services in order to better understand the processes associated with them. Information flows between different enterprises are becoming increasingly important for a successful partnership.
IT/IC	Mobile highly intelligent devices, 3D printing, sensors/controllers, cloud computing, distributed data computing/processing, big data analysis, machine learning, digital platforms, digital ecosystems.
Areas of application	Level 1. Equipping physical infrastructure and products with sensors, controllers, and software applications. Level 2. Real-time integration of data sources, actuators, and external information services. Level 3. Strengthening the operation of available data sources (in real time) for quick response and decision-making during production processes. Level 4. Realization of constant interaction with involved actors and IT infrastructure of enterprises. Level 5. IT-business expands its traditional sphere, fulfilling the duties of an integrator and service provider.
Impact	Changing the management process from individual actors to central authorities (for example, cloud providers, digital platforms) requires actors to partially transfer control functions. The widespread introduction of 3D printing, printed electronics, the use of distributed registries (blockchain) leads to a change in logistics processes. Cyber-physical systems create virtual copies of objects in the physical world, control sensors, integrate equipment and information systems throughout the entire value chain.

Note: Developed by the author

These components of the information (digital) economy, generating an increasing part of the total global product, can lead to significant changes in the areas of business and finance. The main factor behind the changes is that the current costs of network communications (in particular, the Internet) are insignificant, as a result of which global markets are becoming affordable for small and medium-sized businesses, competition is growing, and the range of goods and services on world markets is growing.

All of the above suggests that the information economy focuses on three areas of modern science and practice: the study of information asymmetry (the problem of accessibility of information); digital product economics and information technology economics.

Marketing research claims that in the information (digital) economy, only companies that have a monopoly position in the market can make a profit above the average level in the industry. As soon as the company loses its monopoly position in the market, it also loses the possibility of obtaining super profits.

If the products are digital, then their value is determined not by the sum of production costs (which may be minimal) and not by the cost of securities but by the advantages and opportunities that the consumer receives from its use. The loss of monopoly position occurs not so much because of the actions of potential competitors but because of the pressure of the consumer market itself. The only possible strategy under such conditions is an initial increase in prices for digital goods and then a phased decrease over time, spreading to new market segments.

The life cycle of information technology as a product is several times smaller than the cycle of their use. For example, the range of models of personal computers is completely updated about once every one and a half to two years, while their average life is about five years. Therefore, the growth of sales of new technologies in the distribution of the market does not guarantee the preservation of a high level of sales, even in a monopolistic market position.

For the information economy, it is necessary to develop new methods for calculating the economic efficiency of innovative projects. For this, it is possible to completely or partially ignore the parameters of the technical infrastructure when accounting is carried out on the basis of weighted average indicators, which are specific to a particular model range of equipment.

We can conclude that the seller's ability to offer just such a competitive product that can solve a specific problem of customers acts as the main factor in pricing in the information (digital) economy. This aspect is more viable for digital commerce than the basic parameters of a digital product.

Figure 1 shows the transformation of the priorities of the entities of the information economy as a result of the spread of innovative cloud technologies.

This approach is aimed at creating a global network outsourcing system, or a global cross-border system of resource support. Due to the fundamentally unregulated possibility of international communications regarding the attraction of resources between providers and consumers of intellectual, digital, and in some cases material resources and capital, integration arises on an international scale.

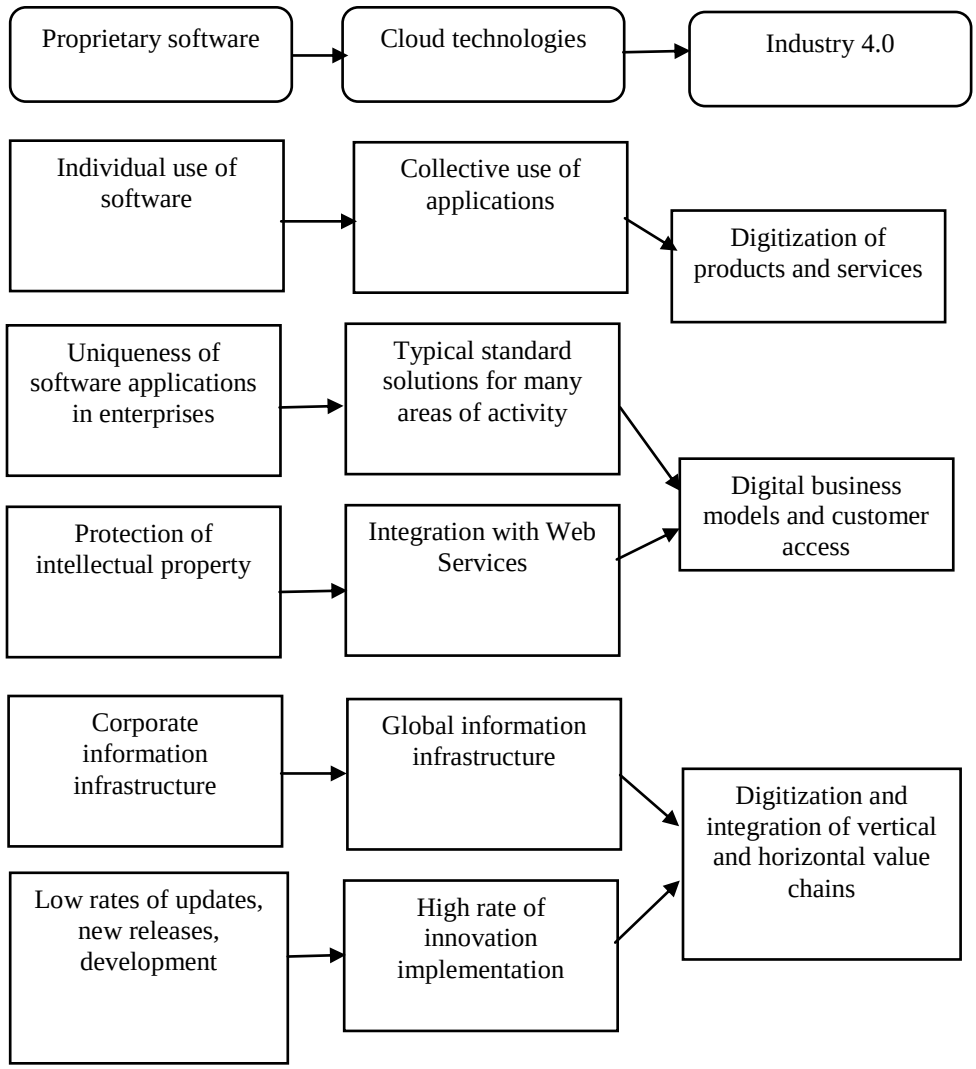
Under the influence of technological transformations of the infrastructural elements of the information economy, opportunities for the active development of service technologies open up: market entities positively assess the prospects for the transition to models of information and technological outsourcing, and are ready to purchase services and provide access to information resources and technologies.

The savings in cloud computing, including server cost, fault tolerance, scalability, and the lifetime of cloud services, as well as improved cloud security systems, facilitate the migration of workloads and instance computing on servers both inside the data processing center and in data processing centers (even in data processing centers in different geographical areas). Often, the end-user application can be supported by multiple working virtual machine instances distributed across servers.

The institutional essence of cloud computing is to save on the transaction costs associated with the infrastructure of information technology. Services implemented in the cloud computing paradigm, while retaining the basic properties of information services, but have specific properties:

1. The external nature. Typically, such a service is provided by a third party.

2. The availability using standard protocols. This attribute does not exclude offers of value-added services (for example, guarantees of the level of security and quality of services).
3. The minimum level of requirements for information technology skills of consumers that are necessary to use the service.
4. Provision of self-service mode.
5. Fast deployment.
6. Scaling, including dynamic one.
7. Payment based on the volume of services consumed. In a number of projects, for the convenience of customers, prices based on the volume of services consumed can be replaced (for long-term projects) with a fixed monthly payment.
8. Multi-platform access.
9. Provision of a software interface for users, partners, and others who want to improve existing cloud services.
10. The presence of some limited options for adapting services that are shared.



Note: Developed by the author

FIGURE 1
CHANGING PRIORITIES IN THE INFORMATION ECONOMY: FROM PROPRIETARY SOFTWARE TO THE INDUSTRY 4.0 CONCEPT

The cloud paradigm is turning not only into one of the main factors of the transition to the *"Industry 4.0"* concept but also becomes the cause of the global transformation of the structure of the information economy. Many scientific studies define the emergence and development of cloud technology as *"a turning point in history similar to the industrial revolution".*

The combined capabilities of cloud computing allow companies to abandon their own cumbersome capital-intensive IT infrastructure that is prone to rapid physical and moral deterioration, significantly reducing the specific share of IT costs in the company's budget. It is a direct relationship between the indicators of management quality and the stable functioning of the IT infrastructure of enterprises, the degree of its virtualization and the share of costs for information technologies in the total costs of companies in the future that will contribute to the active development of a new cloud innovation, bringing additional competitive advantages to the entities of the information economy.

Cloud technology, which dominates the business-oriented segment of the information market, allows companies to obtain significant competitive advantages. However, having high potential, such innovations are characterized by a high degree of technological and market uncertainty for market entities.

RECOMMENDATIONS

Real-time systems, comprehensive planning, and horizontal collaboration are now possible with the help of cloud technologies. Companies that use cloud technology to better integrate with horizontal supply chain partners, including suppliers and key customers, can significantly increase efficiency and reduce inventory.

According to the author, further perspectives for the development of the information economy, the *"Industry 4.0"* concept are inextricably linked with the expansion of the use of the cloud computing paradigm and network business technologies caused by it. In the author's opinion, the most important innovative transformations of the information economy are associated with the gradual transition from its *"product"* to the *"service"* (cloud) functioning model.

The product model of the information economy is based on the dissemination of proprietary software. Proprietary software is technologies that are currently owned by a separate company, that is, the developer retains property rights to them. This model is characterized by a focus on corporate information environments/systems of market entities: as a result, all information technology (IT) processes occur within the company. At the same time, a certain configuration is set for the infrastructure in accordance with the individual needs of the enterprise. The scale and functionality of IT infrastructure is limited by the size and capabilities of the company itself.

In the information economy, ownership of proprietary software creates additional, very substantial costs for companies. The content of a unique information infrastructure requires a thorough analysis of the volume and structure of expenses, a review of the principles of managing IT assets and personnel, and constant work on protecting intellectual property.

With the development of global networking technologies, an increasing number of web applications have become part of the overall business infrastructure: the world's information databases, electronic payment systems, e-commerce systems in B2B and B2C models, electronic government procurement, communications services, and the online community have evolved. In today's context, information business entities cannot help but be guided by accessible and

attractive infrastructure technologies. Infrastructural technologies are of the highest value, provided they are not for individual use but for collective one.

CONCLUSIONS

With the increasing number of cloud providers offering migration to cloud infrastructure, there is a lack of a general classification in the scientific community, which is accompanied by a clear definition of the main economic elements of the cloud paradigm: business models of providers, cloud service deployment models and development models. We have come to the conclusion that cloud pricing models, adherence to the Quality of service level when developing cloud services and achieving stable ROIs for cloud infrastructures are the three elements that are most in need of further research.

The analysis shows that the main benefit of cloud technology is the ability to allocate resources more efficiently. In other words, the main impetus for the deployment of cloud computing should not be the cost savings but the ability to quickly adapt and dynamically scale, which will increase the speed of implementation of new services and the development of innovative technologies.

The model reflects and explains the motives behind the emergence of the cloud computing paradigm and its implications. It also reflects the contextual conditions that influence decision-making processes. In addition, the model identifies risks and strategies that an organization must consider in order to mitigate the impact of interference on implementation processes.

The effects of lowering the cost of information technology will significantly lower the barrier to entry in non-ICT sectors; this will increase competition, lower prices, and stimulate innovation.

Using the methods of macroeconomic analysis, the author analyzes the impact of cloud technologies on the growth of gross national product, reduction of the barrier for entry of enterprises into the market, industrial concentration, inflation, cost of public services and tax revenues, as well as on international competition.

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