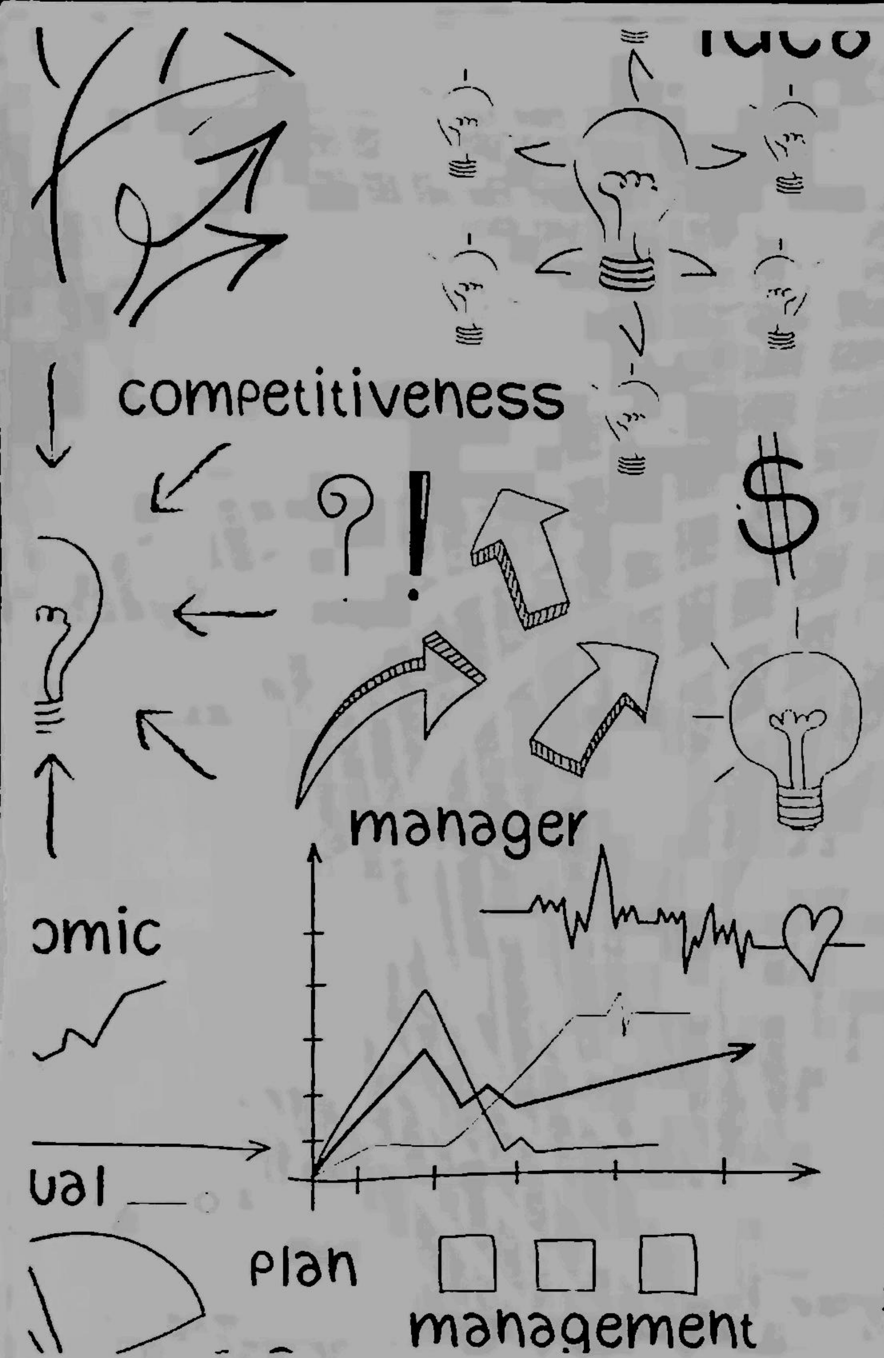


Conceptual aspects management of competitiveness the economic entities

2019


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Collective monograph edited by M. Bezpartochnyi, I. Britchenko

Higher School of Social and Economic in Przeworsk, Poland | 2019

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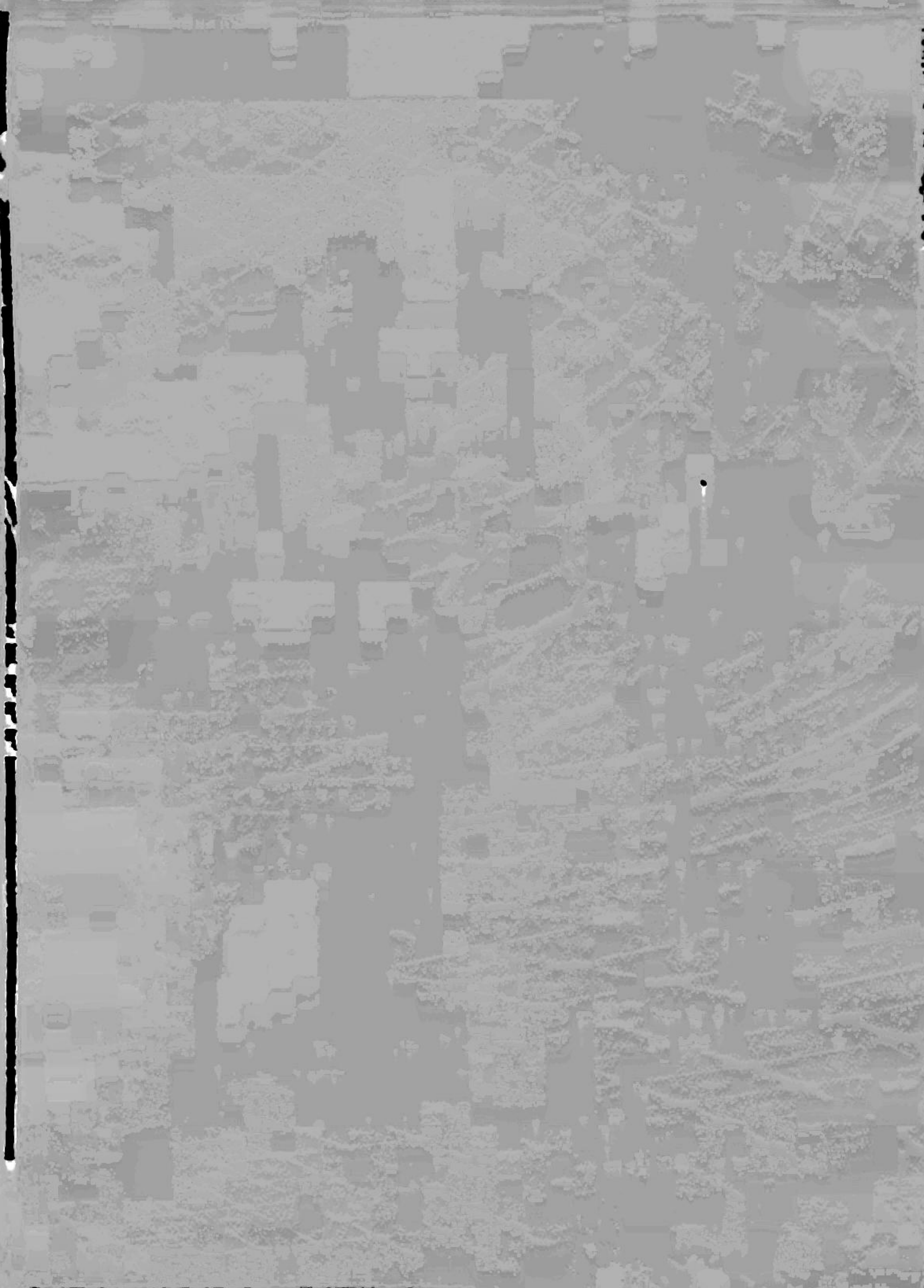

# Koncepcyjne aspekty zarządzania konkurencyjnością podmiotów gospodarczych

Monografia zbiorowa
pod redakcją naukową
M. Bezpartochnogo, I. Britchenko

Wyższa Szkoła Społeczno-Gospodarcza
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The authors of the book have come to the conclusion that it is necessary to effectively use modern approaches the management of competitiveness the economic entities in order to increase the efficiency of using the resource potential, formation of competitive advantages and development strategies. Basic research focuses on assessing the system innovative entrepreneurship, analyzing competitiveness of products, assessing marketing potential and logistics processes, marketing personnel. The research results have been implemented in the different models management of infrastructure, innovation, information systems, social partnership, reengineering business processes, formation the concept management competitiveness of economic entities. The results of the study can be used in decision-making at the level the economic entities in different areas of activity and organizational-legal forms of ownership ministries and departments that promote of development the economic entities and increase their competitiveness. The results can also be used by students and young scientists in modern concepts and mechanisms for management of competitiveness the economic entities in the context of efficient use the resource potential and introduction of modern innovations.



The collective monograph is approved for publication at the meeting of the Scientific Council of the Higher School of Social and Economic in Przeworsk of *09th January 2019, Minutes No. 02*



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# Contents

# INTRODUCTION

Ensuring sustainable competitiveness of economic entities is an important component of economic security enterprises at the present stage of development. Solving this problem requires the creation of an effective competitiveness management system at enterprises. In the conditions of toughening competition on the commodity markets increasing competitiveness becomes the main strategic goal of effective function the economic entities. There is an objective need to create a mechanism for management competitiveness at the enterprise level providing for the search for new ways and methods for the formation of competitiveness in accordance with the conditions of competitive environment. In this regard, of particular interest is the application of concept competitiveness management in solving the problem of creating strategic competitive advantages of the economic entities. The effective use of resources potential as an instrument of optimization management the economic entities opens up broad opportunities for acquiring unique competencies and the formation on this basis of sustainable competitiveness.

The purpose of writing this collective monograph is to substantiate the theoretical-methodological foundations and develop a systems for management the competitiveness of economic entities in a change market environment, taking into account the current state of resources potential and economic conditions, as well as the degree of globalization and international economic relations the economic entities.

The object of the author's research is the processes of management the competitiveness of economic entities in the context of resource constraints, the specifics and development trends of economic entities under the influence of factors the internal and external environment, a synthesis of world experience in management the competitiveness of economic entities in order to increase the efficiency of formation and use the resources potential and innovation activities of economic entities in various spheres of national economy in terms of change market conditions.

The subject of research was the various processes of formation and ensuring the competitiveness of economic entities, organizational-economic mechanisms for formation of competitive advantages of economic entities, directions of ensuring the competitiveness of resources potential the economic entities, consideration the practical aspects of management the competitiveness of economic entities in various sectors of the economy, formation and implementation of strategies to ensure effective management of competitiveness the economic entities.

$$R_{ij} = \sqrt{\sum_{i=1}^{m} K_i (1 - X_{ij})^2}\ . \qquad (4.8)$$

where Rji is the rating number (value of the integral criterion) of the i-th indicator of the j-th enterprise, $K_i$ is the weighting factor of the importance of the criterion, which is determined expertly, $X_{ij}$ is the standardized i-th index of j-th enterprise.

And also the calculation of distance is not from the reference enterprise, but from the origin of coordinates [88, p. 10].

$$R_j = \sqrt{\sum_{i=1}^{m} K_i X_{ij}^{\ 2}}\ . \qquad (4.9)$$

where Rj is the rating number of the j-th enterprise, $K_i$ is the weighting factor of the importance of the expert-defined criterion, $X_{ij}$ is the standardized i-th factor of the j-th enterprise.

In the fourth stage, on the basis of the calculated values of the rating estimation, the enterprises are ranked according to the level of competitiveness. Depending on the chosen method of calculating the rating, the enterprise is organized either by decreasing the Rj index, or by increasing it.

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**Kopishynska Olena**
*PhD in Physics and Mathematics*
*Associate Professor, Chair of the Information Systems and Technologies*
*Poltava State Agrarian Academy*
**Uthin Yrii**
*PhD in Technical Sciences, Associate Professor, Chair of the Information Systems and Technologies*
*Poltava State Agrarian Academy*
**Marenych Mykola**
*PhD in Agricultural Sciences, Associate Professor, Chair of the Plant Breeding, Seed Growing and Genetics*
*Poltava State Agrarian Academy*
**Kondratiuk Mykola**
*Director of Perspective Development and Marketing, Quart Soft Company*
**Yurchenko Svitlana**
*PhD in Agricultural Sciences, Associate Professor, Chair of the Plant Breeding, Seed Growing and Genetics*
*Poltava State Agrarian Academy*
*(Poltava, Kramatorsk, Ukraine)*


## INTEGRATING ROLE OF MANAGING INFORMATION SYSTEMS UDER IMPLEMENTATION OF PRECISION FARMING TECHNOLOGIES

Information and development of communications on the basis of network technologies have become one of the main productive resources at the epoch of post industrialism, which replaced the previous agrarian and industrial waves of the civilization development.

The most developed third-wave countries sell information and innovation, management, culture, new technologies, software, education, pedagogy, medical and financial services to the world [1]. A few common themes, including the ones below have begun to emerge:

- The service sector prevails in the structure of the economy over industrial and agricultural production.
- Science becomes the main productive force and defines the foundations of public life and state policy.

Living standards of the population, markets of labor, goods and finance, management systems depend on the level of use of information technologies, the development of appropriate infrastructure.

As a result, the Japanese and American researchers analyzed the role of information in the economic development of post-industrial countries it began to be considered as a specific resource, which does not have most of the characteristics inherent in traditional factors of production [2].

At the same time, under the influence of innovative information processes, traditional sectors of the economy, such as industry and agriculture, experience tremendous changes and move to a qualitatively new, digital level of many manufacturing units.

The value and importance to the economy of blue-collar worker, unionized work, including manual labor decline, and those of professional workers (e.g., scientists, creative industry professionals, and IT professionals) grow in value and prevalence. Agrarian production is the most conservative industry, and its informatization takes place unevenly, especially in countries that did not attain a level of post-industrialism. However, numerous factors that are characterized by a sufficient degree of uncertainty (climate change, cost growth, soil depletion, high exploitation of natural resources, redistribution of traditional markets, etc.) stimulate this sector to find innovative methods for managing agrarian production with increasing use of information technologies and systems.

Precision farming has the greatest potential, creates a new economic direction and can radically change agribusiness, significantly increase agricultural productivity and reduce the level of environmental, material and other costs for growing crop production. When a new scientific direction is forming, quite often there is no single exact definition of the subject of study, and researchers use several interpretations of the same concept at once. This is the case with the very concept of information, as well as ambiguously interpreted the term precision farming.

For example, from the technological point of view, precision farming is defined as the concept of technology introduction in agriculture based on soil mapping units, the use of accurate remote data – satellite images or drones, as well as the use of technologies for processing these data. From the point of view of management, precision farming is a management strategy in agricultural production, based on modern information technologies to obtain accurate data from various sources of information, for the preparation and adoption of effective solutions for



maximizing profits.

The purpose of implementing precision farming is to determine the decision support system (DSS) for managing the entire economy in order to optimize profits with maximum conservation of resources [3]. At the heart of the scientific concept of precise farming there is an idea of the existence of heterogeneities within a single field, i.e. the field is being considered not as a entire object, but a set of individual sections that have specific characteristics or features. The latest technologies such as global positioning systems (GPS), special sensors, aerial photographs and satellite images as well as special programs for agrarian management based on geographic information systems (GIS) are used for their evaluation and detection. Precision agriculture has also been enabled by unmanned aerial vehicles like the DJI Phantom which are relatively inexpensive and can be operated by novice pilots. These agricultural drones can be equipped with hyperspectral or RGB cameras to capture many images of a field that can be processed photogrammetric using methods to create orthophotos and NDVI maps [4].

In some publications precise agriculture is named as the key component of the third wave of modern agricultural revolutions [5]. The first agricultural revolution consisted in increasing of mechanization in agriculture from 1900's to 1930's. Each farmer could produce enough amount of products to feed about 26 people during certain time [5]. The 1990's pushed a "green revolution" towards new methods of genetic modification, what led to the fact that each farmer increased production based on the number of 155 people [5].

It is expected that by 2050 the world population will reach about 9.6 billion while the production of food should actually double from the current level. Thanks to new technological achievements in the agricultural revolution of precise agriculture each farmer will be able to feed 265 people on the same land. Although the first two agricultural revolutions - mechanization and biotechnology - had a serious impact on farmers and the selection of agricultural enterprises, digital agriculture fundamentally transforms every part of the value chain of agribusiness [5].

Precise farming methods were first used in the 1990s in the most developed economies and information spaces - the United States, Canada, Japan and Western Europe. However, thanks to the achieved economic benefits, they began spreading in Asia, South America and even Africa. In Ukraine these methods began to be applied in the late

2000s, and by the end of 2017 it is possible to talk about their mass implementation.

The first companies which were able to make the transition to new technologies of precise agriculture were large enterprises or holdings which invested funds in the purchase of technical and digital equipment and software. At the beginning of the 2000's there was still no established concept of precise farming, so many algorithms had to be developed independently and for the first time. This formed the set of necessary preparatory stages and directly the steps of introduction of this method of agribusiness. Most enterprises as an initial step carried out a detailed agrochemical analysis of soils studying a sufficient number of samples in agrochemical laboratories [6]. Having the ready results of agrochemical monitoring on each field, fields history of a few years, data on crop yields at different sites, companies started thinking about how to systematize all information and make it accessible to all interested employees of the corporation. Some enterprises came to the idea of creating a so-called geoportal enterprise with its own base of accumulated data [6].

The field outlines of each region of activity, the results of agrochemical analysis, history of fields indicating crop yields over the past few years, data from satellite monitoring were contributed to the base. On the basis of the initial processing of the obtained data, an analysis of the influence of various factors on the process of crop formation, calculations of optimal fertilizer application rates was carried out. In some cases, an analytical center was created where they developed schemes for differentiated fertilization, calculated the potential yields for each field, determined the list of necessary operations to achieve the desired result. During the calculation process there was taken into account information on the influence of weather conditions, technology of cultivating crops, characteristics of soils and so on. On the basis of those calculations, they made mapping, which was then loaded into on-board computers of machinery.

The main stages of the introduction of precise farming technology are shown on Figure 4.1.

The experience gained by the first enterprises is quite valuable, on the basis of which methods and ways of introducing precise farming technologies by many enterprises with a different bank of land, characteristics of soils, climatic conditions and other features are being developed. At the same time, technical and technological capabilities are also changing, progressing. Today, Ukrainian agro enterprises which



actively introduce innovations already have computer maps of crops, spraying, agrochemical analysis of soils, aero photography data captured with drones, yield maps. Now for many agrarians a tablet or smartphone becomes an indispensable attribute of work either in the office or in the fields. At the same time, agromachinery becomes more intelligent, getting an autopilot, GPS navigation, automation for precise ground processing on the basis of electronic maps of cultivated fields.

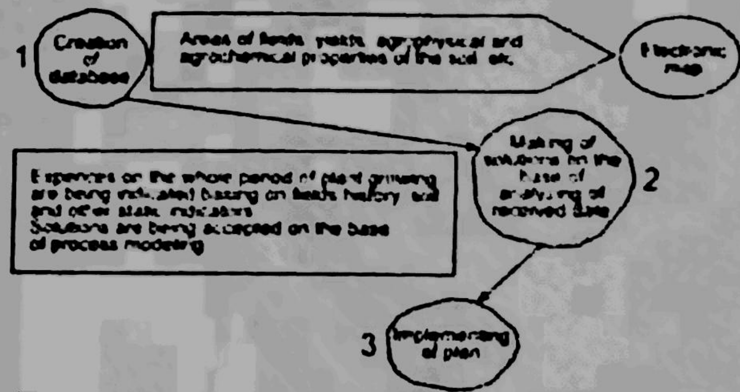


**Figure 4.1 The main stages of the introduction of precision farming technology**

Despite of the existing experience, the percentage of application of precise agriculture systems in agrarian enterprises in Ukraine remains low. There is a number of objective and subjective reasons. Unlike large corporations, small and medium sized farms can not afford full featured equipment, do not have skilled staff or simply prefer to continue farming with traditional methods.

On the basis of the conducted analysis we can give a summary of the main factors that prevent the implementation of precision farming systems and formulate recommendations about their change towards transition to innovative methods in plant growing.

At first, the management zone. Traditionally, agronomists consider all their fields as a whole one farm, so they continue to use unified application of fertilizers and other resources for the entire economy or a large array of fields, which leads to a suboptimal result. Such an approach is far from the effectiveness of the application of elements of precise agriculture in farming.

Instead, agronomists need to consider the land / fields in several smaller "management zones". The zones should be divided according to a system analysis of data: soil sampling requirements (different zones have different soil qualities and potential), field characteristics, topographical data, water supply and requirements for the use of fertilizers, seeds, etc. "Area of management" is a part of the field that reflects a relatively homogeneous combination of factors limiting profitability for a specific culture or crop rotation [7].

Secondly, the data collection. In recent years, technologies of data collection – soil analysis, unmanned aerial vehicles, satellite images, meteorological stations, various controllers and sensors for measuring of properties in soil and plants, etc. are being developed and introduced on the market. These technologies are capable of collecting a large amount of data that can be further analyzed and used for better decision-making. Also many companies develope software applications for information gathering and solutions support. But there are dificulties in data collecting, since enterprises, especially small and medium ones, lack of the technological infrastructure and sufficient expertise to consolidate and analyze data.

Thirdly, there are different standards. More and more developers release new tools, individual software applications and platforms and interoperability quickly becomes an issue. Various available tools and technologies often do not meet the same technology standards, which requires explanation in the final analysis of end-users. The challenge is to transform intelligent stand-alone devices and gateways into holistic, farm-based platforms.

The fourth factor is an availability and quality of Internet connection. Many remote rural settlements and fields do not have a secure Internet connection. This, in turn, prevents attempts of using qualitatively precise farming systems. If network performance and bandwidth speed are not significantly improved, an implementation of digital farming will remain problematic.

Fifth factor is the understanding of bulk data. Digital agriculture is increasing a global approach to data usage, but this technology is useful only when users can "understand" the available information and use it. Progressive farmers, who use modern tools for data collection, have hundreds of thousands of data points on the fields. However it is impossible to monitor and manage each data point and look over it daily/weekly during the whole growing season. The problem is particularly acute in large, long-term agricultural surveys, when there is



a need of monitoring over several years of crop cultivation. Applications that simply provide information on heterogeneous zones or the general state of plant development on the fields are not useful enough as there is a need for more systematic analysis and forecasting tools which can prevent and help agronomists to avoid losses. An analysis of historical data such as yields, weather, soil trends, inputs and so on together with an analysis of real-time factual data can provide an agronomist with powerful tools for reasonable decision-making and risk management.

The sixth factor is teaching. Precise farming provides an implementation of new technologies and tools to improve an efficiency of crop production. For engineers and agronomists, especially in small agricultural companies, an installation and exploitation of the necessary software, the network of sensors for fields, special machinery and other precise farming systems can be very difficult. It must be kept in mind that the error tolerance is minimal in the technical high-tech "smart farming", and poor management can be catastrophic. For example, if technology of locally-ribbon fertilization with subsequent seeding of corn seeds onto the corresponding lines was launched incorrectly with a significant deviation from the exact line of sowing, that would lead to a negative result. A deep acquaintance of agrarians with the concept of "smart farming" and the tools / devices involved in it is an extremely important prerequisite for its implementation. Lack of knowledge and high-quality support along the way can be dangerous.

Finally – the lack of economic analysis from technologists and agronomists. Deepened economic analysis should complete using of tools or precise farming elements to provide yields with optimal use of resources and high levels of profitability of the field.

The analysis of global trends and experience of implementation of precise farming systems at Ukrainian enterprises as well as the individual factors described above allow us to formulate a basic recommendation which, in case of its implementation, will create a possibility to simplify the processes of management with various software and hardware devices that provide a system of precise farming at the enterprise in general.

For the placement of the primary data, their processing and further finishing for decision-making, it is extremely important to use the enterprise's only software platform, which would make possible to receive and process data from systems with different software and hardware solutions. For example, data obtained from a GPS-monitoring system of agricultural machinery should be provided not only in the form of MS Excel tables or be able to export to the software for financial calculations, but also be used in a system that can simulate a particular agricultural technology operation or creation of the production plan of the enterprise itself.

At the same time such a highly specialized platform should contain a well-developed database for general purpose, be flexible, scalable and provide users with sufficient convenient access.

As an example it's logically to consider the online information system Soft.Farm as one of the most advanced at the software market in Ukraine. The system is designed for agrarians and contains many free modules, especially at the stage of collecting and input of all primary information. The registration and management of the system resources by the developers is organized simply through the Internet and immediately you can begin setting up for a specific company [8]. System has already included dictionaries containing wealth of valuable information about all types of soils, fertilizer marks and ZZR, agricultural and energy machinery. All dictionaries can be supplemented with new data relevant to a particular enterprise.

Nowadays system developers have logically expanded its functionality with connecting to GPS-monitoring systems of agricultural machinery of different manufacturers, collecting information on the chemical status of soils and weather data. With a simple set of tools and friendly interface, the system allows to use satellite images and indexes NDVI, to plan works and technique optimally, to adjust the calculation of performed work on the fields and to control fuel using GPS monitoring, to save the results of analysis of soil and create cartograms, to develop task cards for the differential application, to set up an accounting of the land bank and lease agreements on the shared ares of the enterprise, to carry out the automatic generation of the specialized forms of primary documents of inventory accounting of agricultural holdings.

At the next stages of the implementation of the concept of precision agriculture such an information system serves as the integration center for analysis, information processing and decision-making.

Regarding the qualification of staff, it is important to take into account opportunities of teaching for practicing agronomists and other specialists on short training as well as the introduction of new training courses at universities in the frames of higher education reforming and harmonizing relations with the needs of the modern labor market. Such programs are already being implemented in some Ukrainian educational



institutions. In particular, Poltava State Agrarian Academy together with Quart Soft – a software developer for Soft.Farm – have launched a large-scale cooperation project which has the purpose of preparing modern agronomists with the latest information technologies in agriculture since 2016.

In addition, lecturers and company representatives hold regular seminars, trainings for agronomists from agrarian enterprises not only in the region, but also in the nearest regions. The experience was presented in numerous reports at scientific conferences and publications [9]. Forms of work on integrated implementation of precise farming systems and consulting of enterprise representatives are being improved. Work is underway to create the so-called "school of precise agriculture" to which Monsanto representatives in Ukraine, the Smart Farming and others have already expressed their desire to join.

To conclude, using of the achievements of innovative information technologies in all spheres of the agro-industrial complex is complicated and multifaceted. Data collection, processing, management and technology of agricultural activities contribute to increasing of its efficiency, product quality, rational use of plant and fertilizer protection saving energy resources and protecting the environment. This perspective direction of development of agricultural enterprises creates a favorable environment for the effective use of resource potential and the formation of competitiveness. The state needs to promote the implementation of more environmentally-friendly technologies for all players in the agrarian sector, focusing primarily on the needs of medium-sized enterprises and farmers organizing targeted financial support as well as developing advisory services.

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**Kozlovskyi Yevhen**
*PhD in Public Administration,*
*Associate Professor, Chair of Hotel, Restaurant and Tourism Business*
*Kyiv National University of Culture and Arts*
*(Kyiv, Ukraine)*

## AUGMENTED REALITY AS AN INNOVATIVE TECHNOLOGY FOR PROVIDING THE COMPETITIVENESS OF TRAVEL AGENCY

Augmented reality is the term emerging in the field of information technology, which initially denoted the technology of overlaying virtual information on the out world in real time. However, it soon becomes apparent that such an interpretation of this definition is too narrow. Augmented reality is a reality, where any definite object is "supplemented" by virtual elements, where artificial information is superimposed on the physical world, expanding and changing it with the



help of mobile devices as well as software to them.

Augmented reality – this is a modern technology, which is now in a stage of growth, in recent years, it is alive in the mainstream zone. The high speed of dissemination this technology allows us to assert that in the near future it will be considered dominant and turn into a phenomenon of this century. The social effects of the augmented reality are beginning to appear today, and their scale, according to expert forecasts, will be enormous and surpass the effects of the emergence of a global network Internet.

At the end of last century, the scientific community was surprised at the emergence and rapid spread of the phenomenon of virtualization, which in turn caused the need for appropriate reflection and publication of various scientific works devoted to research of this phenomenon. The problems of increasing the role of computer technology in everyday life, the transfer of many forms social interaction from the real world to created by the Internet the virtual world, were actively debated and analyzed by philosophers, sociologists, political scientists, art historians and culturologists [11].

Authorship of the term "augmented reality" belongs to the researcher of the American corporation Boeing T. Codell, who in 1990 grounded the necessity of expanding conceptual models of relations between the physical and digital worlds, the impossibility of their limitation of the dichotomy "real-virtual". The scientist suggested using the term "augmented reality" as opposed to the term "virtual reality" in order to differentiate the phenomena of immersion into the virtual environment and the introduction of virtual elements in real life. He also tried to prove that augmented reality and virtual reality are definitions that are not interchangeable, and marked by them the phenomena are completely different [6].

In 1994, scientists P. Milgram and F. Kishino expanded the term "augmented reality" by publishing the article "A Taxonomy of Mixed Reality Visual Displays". The authors of article describe the space between real and virtual world (calling it a combined reality), in which the added reality is closer to the real (unmodulated) world, and augmented virtuality – to the virtual (fully modeled) world [8].

Well-known scientist N. Jurgenson, analyzing in his scientific works the expansion of technology of augmented reality, argues that it has become a factor of revolutionary changes in social life, and also led to the organic unification of the physical and digital worlds. He believes that the supplemented reality should be considered in the broadest sense

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M. Bezpartochnogo, I. Britchenko

**Wyższa Szkoła Społeczno Gospodarcza w Przeworsku**
Gimnazjalna 35, 37-200 Przeworsk, Polska
tel.: +48 721 207 300, +48 16 733 41 36
e-mail: wssg@vp.pl

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