AUTOMATED WORKING PLACE OF FUTURE TEACHERS OF ECONOMICS IN DISTANCE LEARNING

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Abstract: *The proposed article explores some aspects of learning information systems and technologies (ISaT) by future teachers of economics using the distance technologies and Web 2.0 technologies which include systems of processing economic data in the form of specialized information systems and pedagogical software in the unified environment. The appropriate usage of automated working place (AWP) by future teachers of economics provides effective learning of theoretical foundations and practical skills in using specialized automated information systems in the different economic sectors.*

Keywords: distance learning, future teachers of economics, information systems and technologies, economic data processing systems, automated working place

INTRODUCTION

The issue of quality of training students of economic specialties in pedagogical universities related to the information and communication technology (ICT) is especially necessary; because an ability to effectively use knowledge in the field of information systems and technology (ISaT) in economics and possession of a modern training method allows to improve the quality of learning process and productivity of the future teachers of economics.

At the basis of the formation of such professional qualities, an important place belongs to the creation, learning and effective use of automated working place (AWP) of the future teachers of economics. This will ensure the effective learning of theoretical foundations and practical skills in using of specialized automated information systems in different economic sectors, forming of skills in using of methods and means for decision-making on the basis of the data obtained through such systems (Kuzmina, Strutynska 2011).

1. AUTOMATED WORKING PLACE OF FUTURE TEACHERS OF ECONOMICS

1.1. Analysis of the concept of "AUTOMATED WORKING PLACE"

According to the generally accepted definition, AWP is a software-hardware complex assigned to automate professional activity of the worker (user) with the focus on resolving of well-defined type of tasks that correspond to the functional orientation of his/her professional activity (Fetisov 2008).

Automated working places are classified according to the following criteria: user type, type of task, form of users work organization, functional orientation and so on. Separate classification of AWP of enterprises is shown in Figure 1:
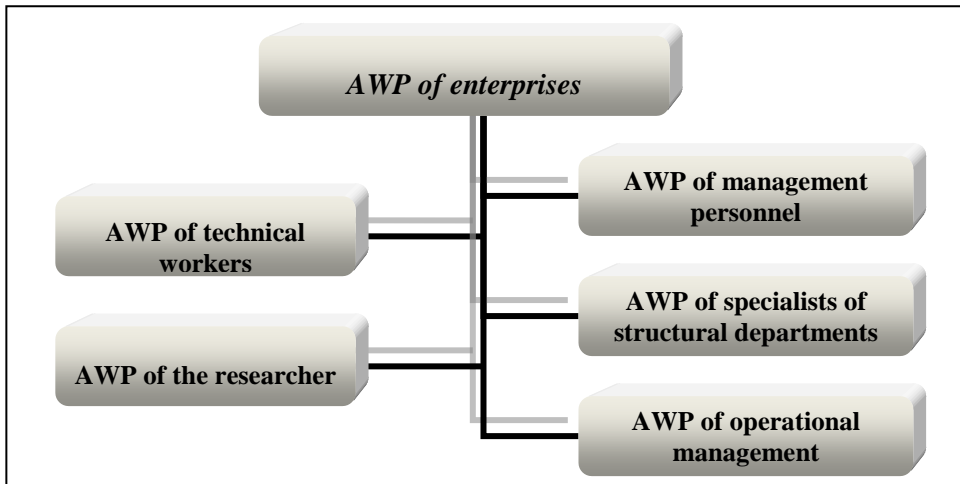

Figure 1. Classification of AWP of enterprises
Source: Own elaboration based on (Sytnyk 2001)

AWP of personnel management implement functions of making decisions. AWP of management personnel are designed for managers at all levels. AWP of specialists of structural departments (HR department, Accounting department, etc.) help to solve functional tasks for specialists of a specific direction. AWP of operational management are used to collect primary data directly at workplaces of controllers, dispatchers and others. AWP of technical workers are focused on conducting records and designed for secretaries, assistants, office managers, etc. AWP of researchers are appointed for employees whose work is related to the creation of new industrial-scientific elaboration and products, designing and creation of new technologies, etc. (Sytnyk 2001).

AWP, broadly defined, is a set of technical, software, advanced information systems and ICT. They are used for creating favorable conditions for performing of the employee's duties. At the same time, AWP mean to implement information and communication technologies in the different fields. AWP of the economist, AWP of

the manager, AWP of the accountant, AWP of the bank worker, etc. are used in organizational management of economic processes in accordance with the abovementioned classifications (Hisamudinov, Kovaleva 2009).

1.2. Functional and supporting subsystems of APW of the future teacher of economics

We (Kuzmina, Strutynska 2011) defined the concept of AWP for students of economic specialties in pedagogical universities of full-time education (future teachers of economics). AWP of the future teachers of economics is the software and hardware complex for learning. It is designed for computer support for training of appropriate economics, informatics, and mathematics courses, etc. that indicated in the passport of the specialty or specialization.

This AWP, besides the above-mentioned components, should contain electronic learning materials (thematic plan, a set of lecture materials and laboratory tasks, means of control and self-control in the form of tests, examinations and other questions, reference materials, etc.).

For example, the purpose of creation of AWP of the future teacher of economics for the discipline "Information Systems and Technology in the Economics" is the formation of students' (of economic specialties of pedagogical universities) theoretical knowledge and practical skills in using of modern information systems and technologies in the different fields of economic activity.

We consider supporting and functional subsystems of AWP of the future teacher of economics.

Supporting subsystems of AWP correspond to the types of resources that are necessary for the AWP functioning. Functional subsystem of AWP is a relatively independent component of AWP, which is allocated according to the certain characteristics and corresponded to specific functions and objectives of the learning process.

The components of the supporting and functional subsystems of AWP of the future teachers of economics are shown in Figure 2.

For example, we defined supporting and functional subsystems of AWP of the future teachers of economics for the discipline "Information Systems and Technology in the Economics" by Kuzmina and Strutynska (2011). Distance course "Information Systems and Technology in the Economics" (http://www.moodle.ii.npu.edu.ua/course/view.php?id=25) is a component of the learning and methodical support of this course. Our pedagogical software (PS) "Financial Analysis and Optimization" for solving problems of financial analysis and optimization is a functional subsystem of corresponding AWP.
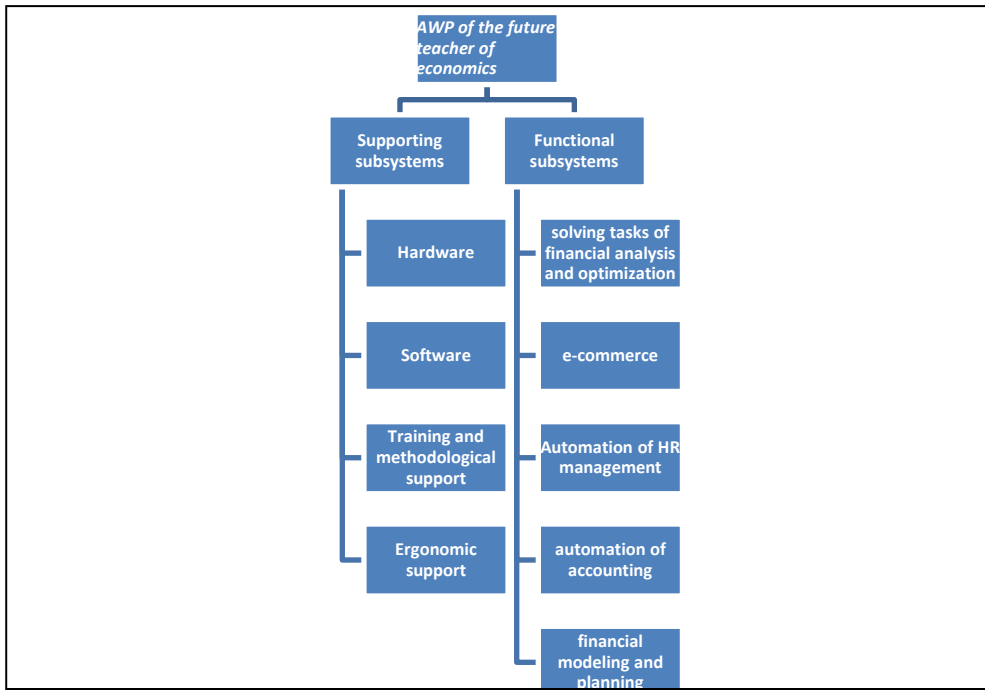
Figure 2. Supporting and functional subsystems of AWP of the future teachers of economics
Source: Own elaboration

Thus, we consider APW of the future teacher of economics for training support of course "Information Systems and Technology in the Economics" as:

− technical support that combines hardware complex (a computer, a modem, equipment for network communications with the server of the Institute of Informatics and with the Internet, and multimedia training means, etc.);

− distance course "Information Systems and Technology in the Economics" with the appropriate content;

− PS "Financial Analysis and Optimization";

− specialized information systems for solving of some economic problems, such as e-commerce, HR management, business management, financial modeling and business planning, installation files of which are located on the server of the Institute of Informatics.

1.3. General description of the distance course *INFORMATION SYSTEMS AND TECHNOLOGY IN THE ECONOMICS*

We will describe the distance course *Information Systems and Technology in Economics* as a component of AWP of the future teacher of economics. The distance

course is elaborated in the Moodle distance learning system. It complies with the curriculum of the discipline. The purposes of the distance course creation is:

- gaining skills (by the future teachers of economics, mathematics and computer science) in using modern distance learning technologies;

- formation of skills in working with distance learning systems and the Internet services;

- development of qualities of the individual self-dependent activity of the students;

- improving of the general economic and informative culture of the students.

The distance course is constructed according to the modular approach. Its main components are:

- general information about the course (including purpose and objectives of training course, work program, schedule of training, methodical guidelines for working with the course, grading scale, recommended literature, inquiring, glossary, etc.);

- training modules that are consistent of theoretical material; practical, laboratory, and seminar works (which depend from the discipline); tasks for self-dependent work; current, thematic and modular control);

- final certification (test questions, final test control form).

Using of the distance learning course *Information Systems and Technology in the Economics* as component of AWP of the future teacher of economics provides students with the learning material to the discipline; enables organizing of their individual / self-dependent work; conducting of the current, intermediate and final test control form; empowers students concerning learning of materials, gaining practical skills and skills in using of ISaT in the different sectors of the economics; and allows to implement the blended learning, and promotes getting of competences of future teachers of economics in the field of ICT.

1.4. General description of the pedagogical software *FINANCIAL ANALYSIS AND OPTIMIZATION*

PS "Financial Analysis and Optimization", which is a functional subsystem of AWP of future teachers of economics, is elaborated to support the learning course *ISaT in the Economics* and designed for solving of some financial and management objectives and optimization problems. The reasonability of elaborating of this PS is considered by Kuzmina and Strutynska (2010).

This PS is used for computer support of the training course *ISaT in the Economics* as a separate PS for performing of financial and economic calculations, solving of linear programming problems, computer modeling of economic processes and so on.

Elaborated PS is consistent of four modules (see Figure 3):

−   *Financial calculations ;*
−   *Depreciation ;*
−   *The optimal tax rate ;*
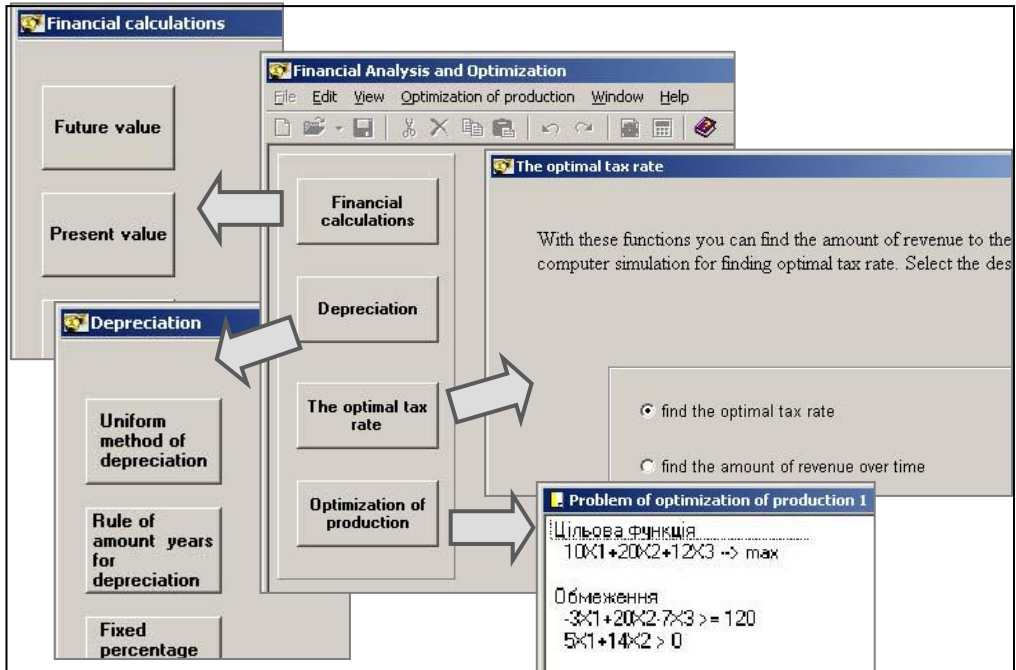−   *Optimization of production .*

Figure 3. Main modules PS *Financial Analysis and Optimization*
Source: Own elaboration

We have elaborated PS *Financial Analysis and Optimization* built in the distance course *ISaT in the Economics* and assigned to form students' skills and abilities:

−   using of modern ISaT and models that are used in the different sectors of economics;

−   solving of the financial and management problems;

−   using of specific software of automated solving of financial analysis and optimization tasks.

2. AUTOMATED WORKING PLACE OF THE FUTURE TEACHER OF ECONOMICS VIA NETWORK TECHNOLOGIES

Due to the intensive development of networking technologies, including the Internet-technologies, there is an urgent need for their use in learning. Recently, the Internet-technologies have played a key role not only in business, information and

analysis, but also in education. Their active use within the training is now possible owing to the appearance and intensification of Web 2.0 (Strutynska 2011).

Web 2.0 is the second generation of network services that operate on the Internet. In contrast to the first generation of services, using of Web 2.0 enables users to work with services, create data and share data.

Web 2.0 is the network software that provides for group collaboration and activity (Balyk, Shmyger 2010). The most common services based on Web 2.0 include the following: blogs, wikis, multimedia services, geoservice, social bookmark, cloud services of Google, including Google documents, social networks, and knowledge maps.

The development of Web 2.0 contributes to their intensive use in the learning process, as it is important to teach students to efficiently use the network technologies not only in the learning process, but also in their future professional activity. For creating the AWP of the future teacher of the economics, it is also necessary to consider the use of the network technologies by the students. The networking technologies, that are part of AWP of the future teacher of economics, include:

- communication services (e-mail, video conferencing);

- knowledge maps;

- blogs;

- wikis;

- cloud services;

- geoservice;

- web-based software for processing economic data (e.g., Google spreadsheets).

Here is an example of Google Docs using during the training of the future teachers of economics.

Docs Google (http://docs.google.com) is shareware services of Google used for work with word processing, spreadsheets, forms and presentations that allow effective organizing of collaboration activities of users. Using these tools allows for allocating of documents on the Internet, simultaneous editing of files, on-line reviewing of the changes, and publishing of them on the Internet for sharing (Balyk, Shmyger 2010).

Figure 4 shows an example of solving the problem of finding the optimal tax rate by simulation modeling using Google spreadsheets, which are also used by students as alternative web-oriented software for the solution of economic problems within the course *ISaT in Economics*. Learners have access (via the distance learning course) to the letters of the spreadsheets.

The problem is to find the optimal tax rate and to justify it.

The following hypothesis is made: the budget revenues are not the highest if the tax rate is maximum, but the budget revenues are the highest if the tax rate is optimum over a particular period of time. That is, the increase of the rate of the tax revenues to the budget will first increase and then decrease (if tax rate is not optimum).

At first, the educator and learners discuss the descriptive model of this problem and make some necessary assumptions and specifications.

Further, students discuss and construct the mathematical model of this problem, i.e., they define the initial data set, independent and dependent variables, and finally, mathematical formulas that connect them.

The initial data: **TR** (%) – tax rate; **P** (%) – profitability, **InCap** (mln. uah) – initial capital; **Nper** – number of periods.

$$Inc_i = C_i * P$$

$$C_i = InCap, i = 0,$$

$$C_i = \sum_{i=0}^{Nper} Inc_i * (1 - TR)$$

$$B_i = \sum_{i=0}^{Nper} Inc_i * TR$$

$$B_{Nper} = \sum_{i=0}^{Nper} B_i$$

Inc$_i$ – profit of enterprise for the i-th time;

C$_i$ – capital of enterprise, that remains after tax;

B$_i$ – tax revenue for the i-th time;

B$_{Nper}$ – revenues to the budget for the **Nper** period.

The following is needed: 1) to find the value **Inc$_i$**, **C$_i$**, **B$_i$** for the i-th period and the final budget revenues **B$_{Nper}$**; 2) to test the abovementioned hypothesis by establishing of the different tax rates and the value of profitability.

Students can quickly receive and analyze the results of solving of this problem for the different values of the tax rates, initial capital and the number of periods by implementing of mathematical model by way of Google spreadsheets for the specific initial data. The research results are analyzed by means of the numerical and graphical presentation.

Appropriate tables and graphs build on the results of calculations when revenue is dependent on the value of the tax rate, taking into account the different levels of profitability. Figure 4 shows some results of these calculations.

A	B	C	D	E	F	G	H	I	J
tax rate =	80%								
profitability =	120 %								
number of periods =	3								
number of periods	0	1	2	3	4	5	6	7	8
capital balance	100	124	154	191	236	293	364	451	559
income / year	0	120	149	185	229	284	352	436	541
income - remainder / year	0	24	30	37	46	57	70	87	108
taxes / year	0	96	119	148	183	227	281	349	433
taxes in budget	0	96	215	363	546	773	1054	1403	1836
tax rate	10%	20%	30%	40%	50%	60%	70%	80%	
government revenue (prof. 20%)	31	57	79	98	114	128	139	147	
government revenue (prof. 120%)	3882	5420	5588	5040	4195	3303	2497	1836	

Figure 4. Example of using Google spreadsheets within the course
ISaT in Economics
Source: Own elaboration

Students draw the following conclusions based on the obtained results:

1) in the case of increasing of the tax rate, first the budget revenues increases and then they decreases;

2) the definite maximum is just optimal for the budget – 30 % (see Fig. 5);

3) simulation confirms and clarifies the logical model which is as follows: if today's entrepreneurs have high taxes, the business remains without development, and tomorrow the state will receive less money to the budget or will receive nothing.

Thus, AWP of the future teacher of economics for supporting of the training course "Information Systems and Technology in the Economics" can be expanded with the use of the network technologies, including the technologies based on Web 2.0. The AWP will consist of:

- hardware;

- network technologies;

- distance course "Information Systems and Technology in Economics" with the appropriate content;

- PS "Financial Analysis and Optimization";

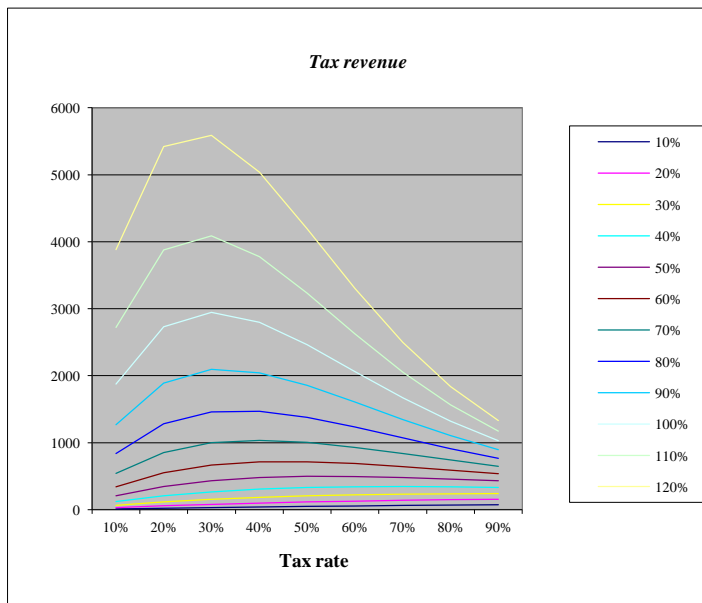− specialized information systems for solving of some economic problems.

Figure 5. Graphical presentation of the results of the research with the use of Google spreadsheets
Source: Own elaboration

CONCLUSION

Using the above described AWP of the future teacher of economics for supporting the training course "Information Systems and Technology in Economics" provides:

− intensification of the learning process;

− development of students' knowledge of modern educational technologies;

− improving knowledge and skills in working with the distance learning systems and specialized software for economic data processing;

− formation of motivational factors for learning information systems and technologies in economics as a discipline, and for the continuous learning of new information systems and technologies in general;

− formation of the skills of self-dependent learning of new information systems and technologies for economic data processing;

− development of the competences of the future teachers of economics in the field of the information systems and technologies;

− improving the general economic and informative culture of the students.

For further research we will learn national and foreign experience in the creating and using of AWP within the training of the future teachers of economics, and supplement the AWP subsystems with modern technologies.

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