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## **STUDY OF DEFINITIONS FOR CATEGORICAL TOOL OF EXPERT FINANCIAL AND ECONOMIC TRAINING SYSTEMS**

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Study of Definitions for Categorical Tool of Expert Financial and Economic Training Systems

The article formalizes base conceptual construct of expert financial and economic training systems. It applies the following definitions: pedagogical principles; cybernetic principles and expert training system. This provides scientific background for developing main functions, structures and mathematical models of expert financial and economic training systems and for their program implementation.

*Key words:* expert training system, pedagogical principles, cybernetic principles, formalisation.

**1. Problem statement.** Social and economic changes in the world, including the ones in Ukraine (globalization, intensive IT development, etc.) have significantly expanded the requires to specialist training that is reflected in the basic principles and social and pedagogical development points of higher education system of Ukraine.

This is particularly true for the financial and economic experts that is conditional upon information scope increase, complexity of its processing and, in some cases, its undercoverage and occurrence of new types and systems of E-business, etc.

This requires developing modern powerful pedagogical solutions, systems and information training tools for future financial experts that would teach future expert to find solutions in complex situations with different uncertainty level of economic information.

One of the main directions in creating powerful pedagogical tools when teaching professional subjects is applying expert training systems (ETS) but as of

today, development of such systems and tools is poorly studied [1 – 12]. Arguably, there is an objective pedagogical problem related to creation of powerful pedagogical tools for professional training of future financial and economic experts based on expert training systems to solve complex economic cases (with different uncertainty level). This actualizes research of this problem.

**2. Analysis of recent research studies and publications.** Pedagogical problem of improving professional training of future financial and economic experts including professional competency development is covered in many monographs, publications and thesis of both international and domestic scientists [1 – 8].

In particular, problems of implementing modern pedagogical tools to financial and economic education have been considered in the works of I. V. Ivannykova [3], different aspects of theoretical and methodological foundations for forming professional competency of future economists have been studied by M. V. Vachevskyi, L. M. Dybkova, N. V. Uisimbaieva, informative competencies of future economists – by O. M. Honcharova [1; 6 – 8] and P. S. Klimushyn and his colleagues have studied different aspects of electronic commerce [2].

But these works have not considered a problem of financial and economic expert training to solve complex economic cases with different uncertainty level and pedagogical means for such tasks.

A number of study guides by leading scientists (Ye. A. Smyrnov, R. A. Fatkhutdinov, etc) aimed to teach economic student making management solutions [9; 10] provides theoretical and practical points and technologies of developing and implementing managerial decision-making mechanism by applying different methods including the expert ones. They focus on organizational, social and psychological approaches and do not consider the usage of ETS, development tools for expert systems and pedagogical approaches, principles and methods of their applying to study course that makes professional training of future financial and economic experts.

As illustrated in series of works, current trend in future specialists training, including the financial and economic ones, is applying information technologies and

IT-based creation of new type of means – intelligent training system, intelligent simulator, expert training systems, etc [4; 5; 11; 12].

These works employ different approaches to define conceptual construct of expert training systems. Problem of creation of powerful pedagogical tools for professional training of future financial and economic experts when teaching professional subjects has not been a research subject that does not allow estimating their efficiency in education process that proves the necessity of conducting research in the specified field.

Publication analysis has not found researches on problems of categorical tool of expert training systems including the ones for financial and economic expert training.

So, conducted analysis on pedagogical problem of creating powerful tools for future financial and economic expert training shows that researchers give consideration to different aspects of this problem (professional competency development, decision-making, information technologies usage, creation of expert training systems, situational teaching methods, etc.) in English and Ukrainian publications. But they are poorly studied, conceptual construct of ETS is not formalized, there are no concrete developments on ETS, their efficiency is uncertain, etc.

This shows the importance and relevance of research to solve a problem of creating powerful pedagogical tools for professional training of future financial and economic experts when teaching professional disciplines.

**3. Defining unsolved aspects of the problem.** Study of a problem of improving professional training process of future financial and economic experts solves relevant objective: formalization of conceptual construct of expert training systems.

**4. Objective statement (goal setting).** Article objective is analysis and formalization of conceptual construct of expert training systems for professional training of future financial and economic experts.

## **5. Basic material presentation. Theoretical and methodological justification, analysis and formalization of conceptual construct of expert training systems for professional training of financial and economic experts.**

As it appears from conducted analysis, current trend in financial and economic experts training is applying new type of information technologies – expert and expert training systems.

These systems, opposed to different data-processing systems, use symbol (nonnumeric) methods of data presentation and input, they do not have predefined operating algorithm. That is why they have a set of features: 1) applied to solve only complicated practical tasks that are not formalized or poorly formalized [4; 5; 11; 12]; 2) these systems are as good as human-expert by criterion of quality and efficiency of problem solution; 3) allow explaining obtained solution to trainable person; 4) able to increase knowledge in the course of interaction between them and experts. In addition, expert systems are characterized by extreme complexity, big time-consumption for development, training, etc. As a rule, training process for such systems is interactive.

A term *knowledge-based systems (KBS)* is used as synonym for *expert systems (ES)* [11].

There are a lot of definitions for expert and expert training systems [4; 5; 11; 12] for today. It follows from the analysis that these definitions are based on: 1) functions performed (ES and ETS); 2) construct (ES and ETS); 3) combination of construct and functions performed.

Analysis of definitions for “expert system” and “expert training system” displays that definitions of conceptual construct of ES and ETS are very general and do not fully reflect pedagogical features and principles of information technologies construction, in particular ETS.

Relying on research objective, ETS definitions by V. A. Petrushyn [5, p. 45] and D. Yu. Yanushko [12] can be considered as the most complete. According to them, ETS is a program that accomplishes one or another pedagogical objective. It is to be noted that any objective including the pedagogical one can be achieved due to

many methods and including non-pedagogical as well. This requires clarification of ETS conceptual construct and consideration of pedagogical, psychological and cybernetic principles for ETS design and development.

That is why description and systematization of principles is an original starting point for creating powerful pedagogical technologies and systems, including the ones with applying information teaching technologies [13 – 15].

Some works (for instance, [13]) mention a concept “cybernetic principles” and describe these cybernetic principles used for ES and ETS but there is no its formalized definition in literature.

Analysis of literature sources shows that concept “pedagogical principles” is widely used in pedagogy as well. There are several definitions for it, for example [14; 15].

Definitions for “pedagogical principles” are very general and reflect subjective opinion of their authors [1 – 3; 14]. These definitions are debatable and stand at the current stage of pedagogy development. Their common disadvantage is ignoring principles in pedagogy that reflect design specifics of pedagogical training system based on information technologies, in particular, expert training systems [5; 11; 12].

The article [15] presents definition “psychological principles”. According to it, “principles of psychology” are background that defines the core and origin of human psychology, specifics of its formation, development, functioning mechanisms and presenting forms, approaches to its study and change.

Such definition of psychological principles completely reflects the psychological approaches used in pedagogy, in particular in didactics, including the ones with applying information technologies. That is why this work is based upon it.

In view of foregoing, it is advisable to clarify research conceptual construct and formalize basic concepts: “pedagogical principles”, “cybernetic principles” and “expert training systems”. This will allow detailing system of principles that should be used as a base for expert training systems for financial and economic experts training.

**Definition 1.** *Pedagogical principles* are the most general postulates that define the leading forms of pedagogue's activity and initial requirements to educational process regarding development of training information technologies and systems, organization and implementation of training process including in information educational environment.

**Definition 2.** *Cybernetic principles* are the most general postulates of theory, facts and laws of cybernetics that are the base for design and development of wide type of systems for management, storage, transfer and transformation of information.

**Definition 3.** *Expert training system* is information system based on a set of pedagogical, psychological and cybernetic principles, expert knowledge in certain field that solves class of complex, practically valuable, training tasks in this field poorly formalized. If it is necessary, it includes pupils' knowledge estimation, education management and demonstration of behavior at the level of experts.

As it follows from definition 3, ETS should be based on the mentioned above principles: pedagogical, psychological and cybernetic. ETS design and development should comply with the priority of pedagogical principles.

So, conducted analysis has allowed formalizing conceptual construct of new pedagogical technologies and systems based on expert training system. ETS design and development for future financial and economic experts training should be carried out on the base of it.

This construct allows scientifically grounded design and development of main functions, structures and mathematical models of ETS for future financial and economic experts training and performing their program implementation.

## **6. Research findings and further research in this field.**

1. Analysis of basic works on the problems of professional training of future financial and economic experts showed that information technologies and expert training systems based on them were being constantly developed and changed. That is why there is an objective problem related to clarifying definitions of conceptual construct of expert training systems. This makes the research important.

2. Basic conceptual construct of expert training systems of financial and economic expert professional training is formalized on the base of system analysis. The article presents the following definitions: *pedagogical principles* (general postulates that define the leading forms of pedagogue's activity regarding development of training information technologies and systems, organization and implementation of training process including in information educational environment); *cybernetic principles* (the most general postulates of theory, facts and laws of cybernetics that are the base for design and development of wide type of systems for management, storage, transfer and transformation of information); *expert training system* (information system based on a set of pedagogical, psychological and cybernetic principles, expert knowledge in certain field that solves class of complex, practically valuable, training tasks in this field poorly formalized. If it is necessary, it includes pupils' knowledge estimation, education management and demonstration of behavior at the level of experts).

3. It is shown that formalized conceptual construct allows scientifically grounded developing main functions, structures and mathematical models of ETS for future financial and economic experts training and performing its program implementation.

4. Promising research direction is defining system of pedagogical principles that should be used as a base for developing didactic component of expert training systems for financial and economic expert professional training.

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Шевчук О. Б.

Дослідження проблеми дефініцій категоріального апарату експертних навчальних систем з підготовки фахівців фінансово-економічного напрямку

Формалізовано базовий понятійний апарат експертних навчальних систем з професійної підготовки фахівців фінансово-економічного напрямку. Введено дефініції: педагогічні принципи; кібернетичні принципи та експертна навчальна система. Показано, що це дозволяє науково обґрунтовано розробляти основні функції, структури і математичні моделі експертних навчальних систем для підготовки майбутніх спеціалістів фінансово-економічного профілю, а також здійснювати їхню програмну реалізацію.

*Ключові слова:* експертна навчальна система, педагогічні принципи, кібернетичні принципи, формалізація.

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Исследование проблемы дефиниций категориального аппарата экспертных обучающих систем по подготовке специалистов финансово-экономического направления

Формализовано базовый понятийный аппарат экспертных обучающих систем по профессиональной подготовке специалистов финансово-экономического направления. Введено дефиниции: педагогические принципы, кибернетические принципы и экспертная обучающая система. Показано, что это позволяет научно обоснованно разрабатывать основные функции, структуры и математические модели экспертных обучающих систем для подготовки будущих специалистов финансово-экономического профиля, а также осуществлять их программную реализацию.

*Ключевые слова:* экспертная обучающая система, педагогические принципы, кибернетические принципы, формализация.

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