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APPLICATION IN PRACTICE AND OPTIMIZATION OF INDUSTRIAL INFORMATION SYSTEMS

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ABSTRACT

The article is concerned with the research of the issues of the optimization and practical application of industrial information systems in the management of complex organizational systems. The article contains an example of the application of the developed methods for the training of experts in the application of industrial information systems for automated bookkeeping and management accounting, calculation of salaries and personnel inventory, implemented at the St. Petersburg State University.

Keywords: *Industrial Information Systems, Manufacturing Execution Systems, Enterprise Resource Planning, Enterprise Resource Planning, On-Line Analytic Processing, "1C:Enterprise 8".*

1. INTRODUCTION

The modern world is characterized by the rapid development of information technologies, penetrating into various spheres of human activity. The development of industrial enterprises and the success in business, related to the creation and implementation of products and services, on the one hand, stimulates this development, on the other hand, becomes impossible at the present time without the use of these technologies [1]. The description of information systems in industrial processes will be provided for sign models of dynamic systems in a hierarchical view, without dividing them into mechanical and organizational [2]. The problem of the adequacy of the constructed models to real dynamical systems and the equivalence of different models of the same dynamical system in different ways is outside the scope of this article; these problems are described in more detail in [3].

2. METHODS

Modeling has an important place among the methods of cognition, representing academic and practical interest. It is used in all major life spheres, in industrial production and technological processes, scientific research and information complexes, management processes and learning processes. The development of modeling has largely determined the use of mathematics and information technology for optimization and control in complex organizational systems, including educational.

Examples of the perfect sign models used in the description of a wide range of dynamical systems, including mathematical expression of dependence of physical quantities, are models with the following applications:

1. Stabilization of dynamical systems [4-7];

2. Different types of measures of dynamical systems and their definition [8-10];

3. Stability of dynamical systems [5; 11-14];

4. Optimization of dynamic systems [15-18];

5. Oscillations and waves in dynamical systems [19-22];

The hierarchy of industrial information systems: Hierarchical information and control structure of manufacturing enterprises, in representation of the International Association of manufacturers of production control systems – MESA International (Manufacturing Enterprise Solutions Association), is a four-level pyramid with the following levels:

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- at the first (lower) level there are process control systems;
- at the second level – MES systems;
- at the third level – ERP systems;
- at the top level – OLAP systems.

Process control systems are automated control systems of technological processes.

MES (Manufacturing Execution System) – executive production system, automated production control system, information technology system.

ERP (Enterprise Resource Planning) – system of enterprise resource planning.

OLAP (On-Line Analytic Processing) – online multidimensional analysis.

Let us take a closer look at the ERP systems. They have a modular structure; at present time they can be divided into two classes:

- systems for business management (i.e. processes that involve a product that already passed production phase);
- system designed for production management.

A model of enterprise management can be based on different concepts depending on the specifics of its activities and the adopted management strategy:

EAM (Enterprise Asset Management) system is a system designed for enterprise asset management. In case of the operation of production tools for quite a long period of time and as a consequence regular repair thereof, the forecasting of operating capacity and depreciation becomes crucial. These factors directly affect the technical equipment of production and costs necessary for the implementation of maintenance and capital repairs;

BSC (Balanced Scorecard) is a balanced scorecard system. It allows to evaluate the activity units of the corporation on the basis of several coordinates;

ABC (Activity Based Costing) is a process-based method of distribution of overhead costs. The main idea of this technology is that overhead costs are included in the cost of production as incurred and are not allocated after the completion of the cycle of production or sales by product. The most important process is the tracking of the transfer of overhead costs, which focuses on the sources of cost and their necessity;

EVA (Economic Valued Added) is a management system based on the definition and accounting of added value, it is based on a comparison of economic benefits from investing in a prospective project with the return on alternative investments.

ERP systems are most flexible and, consequently, most widely used. By way of illustration of such a system let us consider the software system "1C: Enterprise 8" (configuration "Accounting 8", "Salary and Personnel Management 8"). The relevance of its application is defined by the fact that it is currently is very common as a program for accounting, management accounting, payroll accounting and personnel records. These software packages are used by more than 1,500,000 accounting departments of the CIS countries, Baltic States and other countries. At the present time they are the standards for automating accounting activities of the Russian Federation. Knowledge of these configurations is the requirement of an employer to an accountant or a manager when applying for a job. This determines the high demand in the labor market for 1C programmers, which are able to support this program, so they are most in demand in the IT field in the field of the automation of work of the enterprise.

Models as means of scientific research represent a variety of material and ideal objects. They are used in the process of obtaining new information about the object of research in the course of determining the credibility of the received information. We will use the term "a model" to refer to any system that is in certain relations with another system (called original) so that the following conditions are true: between the model and the original there are relations of similarity, the shape of which is clearly expressed and accurately recorded; the model in the process of scientific knowledge is analogous to the studied object; the study of the model allows to obtain information about the original. Then, the model is both an object of study and an experimental means.

Optimization criteria: As a model of a complex organizational educational system we will take an ideal verbal model – a presentation; main focus will be given to the construction (description) of the objective function. Both the model of the system and its objective function, or the criterion of quality, are chosen to be figural.

As the quality criteria of the system we will take the following requirements to the graduates: 1.Knowledge and understanding of the subject area; 2. The ability to configure and support the software

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product; 3. Writing new configurations or modifying existing configurations; 4. The creation and refinement of new forms; 5. Consultation of users; 6. Support of several firms; 7. Patience and endurance in the process of developing and debugging software; 8. Quick adaptation; 9. High stress resistance.

3. RESULTS

Methods of teaching have been tested for a long time on different platforms "1C:Enterprise" at the Faculty of Applied Mathematics and Control Processes of the St. Petersburg State University in the form of a course, the purpose of which is the preparation for the certificate "1C:Professional" in the configurations "Salary and Personnel Management", "Factory Accounting". Students who successfully mastered the course are engaged in the implementation and maintenance of these programs at the enterprises of St. Petersburg and the Russian Federation. These configurations are the examples of application solutions developed on the platform "1C".

Let us define the objectives of the course: 1. The mastery of the user modes of the configurations "Salary and Personnel Management 8", "Accounting 8" and training the skills of implementation of custom tasks by means of standard configuration; 2. Getting knowledge about the basic functions of the configurations of "1C: Salary and Personnel Management 8" and "1C:Accounting 8"; 3. Acquaintance of participants with object-oriented database, with basic configuration objects – constants, reference books, documents, document journals, transfers, registers, information registers, accumulation, etc.; 4. Acquaintance of participants with the flow of documents on the enterprise and the organization of accounting on it.

As a result of the training the participants should acquire the following skills: 1. To be fluent in the tools of the program; 2. Know and be able to apply methods of reflection in the program of the standard operations for accounting, personnel records, salary accounting; 3. To be able to monitor the condition of critical sections of accounting.

Classes are held in a computer lab with multimedia equipment with Internet access. They are organized as an alternation of lectures and practical classes with the solution of an end-to-end example of accounting. Each student is provided an educational platform and configuration, and a test suite "1C: Professional" in order to explore a particular configuration on one's own. The study of the subject is in the process of working on the lectures and regular independent work with educational literature and solving tests in "1C: Professional". In the process of training the students take a test in "1C: Professional". Each test consists of 14 questions, each having five choices. The correct answer is only one. Successful test taking involves the correct answers to the questions of ten written tests based on the studied material and the recommended literature. The task of the test is to give the most complete correct answer. It is believed that the test is passed successfully if the participant gave the correct answers to at least 10 questions out of 14. All test questions are developed by "1C". To be permitted to the examination, an intramural student must attend at least 90% of classes and pass all of the proposed tests. Tests that are solved during the semester by the students themselves are done without time limit.

Upon the completion of the course a participant takes an exam. To pass the exam, each participant is offered a variant of test items in written form, as well as the solution a practical example on the material covered. It is believed that the test is passed successfully if the student gave correct answers to at least 12 questions out of 14. The use of supporting materials during the exam is prohibited; the time for completion of the test is 30 minutes.

4. CONCLUSION

The study of the developed ideal verbal model with the above mentioned quality criteria allows to build a system of management of educational process, and to adjust it when training students with different opportunities for training of graduates of high professional level who are able to obtain certificates of the company "1C" of the level "1C:Professional" and "1C:Specialist".

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