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THEORETICAL BASIS OF PROFESSIONAL ACTIVITY ANALYSIS AND ESTIMATION EXPERT SYSTEMS DEVELOPMENT

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Abstract—*Theoretical basis of professional activity analysis and estimation expert systems development are presented. Conceptual expert system functional model has been presented in the article. Expert system is considered as a direction of declaration programming because of information processing carried out on the level of rules instead of the level of algorithms, using programming languages like CLIPS, OPS5. Problem of joining of two methods, which have been realized using different programming languages: imperative and declarative, is presented in the article as well.*

Index terms—Professional activity; expert system; knowledge base; human resource management theory.

I. INTRODUCTION

According to researches of British Research Company Fast Future [1] global changes in part of appearance and artificial creating of new professions are waiting for our world in nearest 20 years. Ecology, medicine, economy, and even social arrangement of society will been changed. Therefore, changes will influence labor force market: new technology will allow creating a lot of new profession or inspiriting new life in old ones.

Researches in part of labor force market global changes confirm human resource management paradigm main trends in part of virtualizing workspace and creating more intelligence profession. Therefore, it will demand higher level of cognitive and personal characteristics of persons. Appropriate changes will happen in part of and estimation processes connected carrying of focus from qualification, which is formalized on normative level to personal characteristics of persons, described by competencies as a rule.

Theory of competencies have been developing for a long time and is in active faze now. Describing of competencies is nonstructural tasks, so it demands to use expert's knowledge during analysis and estimation processes.

Analysis of information systems and latest researches in area of profession estimation [3], [4] allow making a conclusion about absence of intellectual systems, which are based on knowledge for implementation control methodology methods and principals.

Also, modern methodology supposes professional activity analysis from both prospective: qualification and personal characteristics, actually none of 86 information systems [2], which were analyzed, don't resolve tasks of modeling and estimation competencies as a part of common professional activity estimation. The biggest gap is in direction of professional activity estimation and human resource system integration. Now it is known only one system "Capital-CSE", which was developed according to MRPII and ERP standards.

Algorithm, actualized in module "Position analysis", allows inputting data in appropriate libraries in part of quantity, level of grades and compensation aspects. The module doesn't actualize data estimation algorithm and connection with other system modules. So, it is only reflect decisions, which were accepted before.

According to the analysis, it could been made conclusion about absence of professional analysis and estimation information systems as a part of ERP. Obviously, absence of integration professional analysis and estimation systems is connected with absence of formalized models of entity "Competencies" and theoretical bases in the area, that make them unusable in informational systems, created with procedural programming languages. This aspect defines actuality of creating theoretical bases of expert systems developing for solving of professional activity estimation and their integration with modules of HRM systems.

II. SOLUTION OF THE PROBLEM

Developing of systems, basis on knowledge assume creating corresponding data bases, as a main part of expert systems and inference engine [4]. Developing of an expert system supposes answering the question about applicability of intellectual methods for solving professional activity analysis and estimation tasks. For defining area of an expert system usability it is necessary to take into account a lot of aspects and clear up borders of area, which knowledge will been realized in the system [5].

The investigating area – professional activity, presented by conceptual functional and informational models [3], which describe entities of

modeling area in terms of their attributes and connections between them. Obviously, that the biggest part of entities are completely formalized as investigation objects and could been described be procedural programming languages. Transition to mathematical models in order to create task estimation algorithms and their ranking also can been fulfilled using object-oriented approaches.

Information model of entity "Competency" (Fig. 1) was been structured on the level of basis entities of second and third levels and connections between them. On the fig. 1 symbolical connection between entities "Competency" and other entities (N, N+1) and corresponding codes, which describe each competencies for implementation entities in frame of the task, are presented.
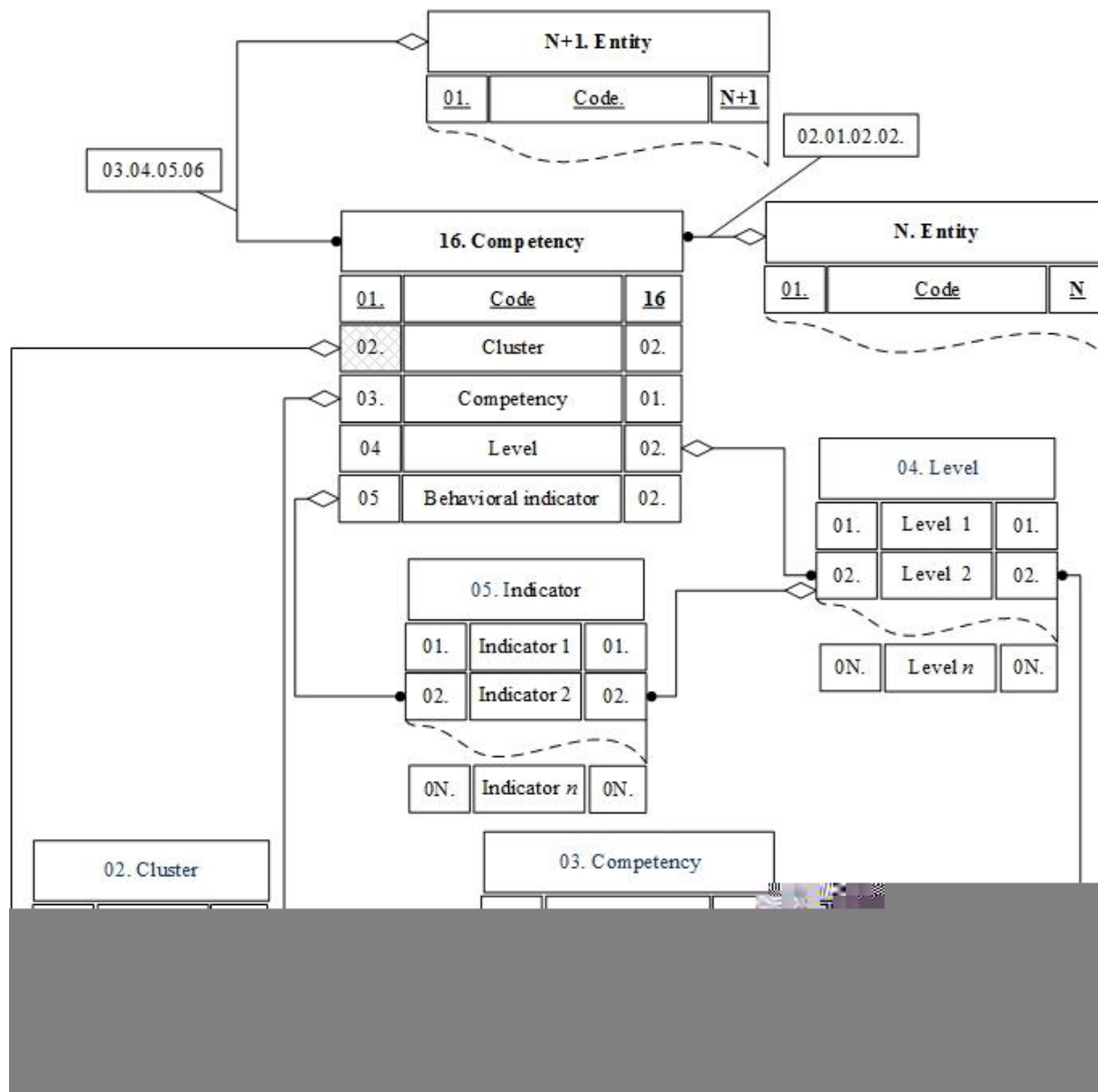

Fig. 1. Information model entity "Competency"

For example, for implementation the entity N it is necessary the first competency of second cluster, which has second level and could been described by second pattern of behavior – 02.01.02.02. Structure of entities are been described as standard pattern, which could been filled specific models during the presses of corresponding object area.

Entity "Indicator" describes pattern of behavior [6] in terms of rules, which describe necessary

characteristics for fulfilling tasks and demand expert knowledge, like a systems basis on knowledge. So, information model (Fig. 1) is been structured in border of entities and their connections, but level of behavioral indicators belong to the area of unstructured tasks, which could been resolved using production systems basis on rules [7].

Conceptual expert system functional model has been presented on the Fig. 2. User's interface allows

organizing data input or their loading from database into module, responsible for data calculating, and dialog with users. Method of decision interpreting allows getting reasons of the decision by the system.

Working memory keeps facts, which are been creating during working of entity calculation algorithm.
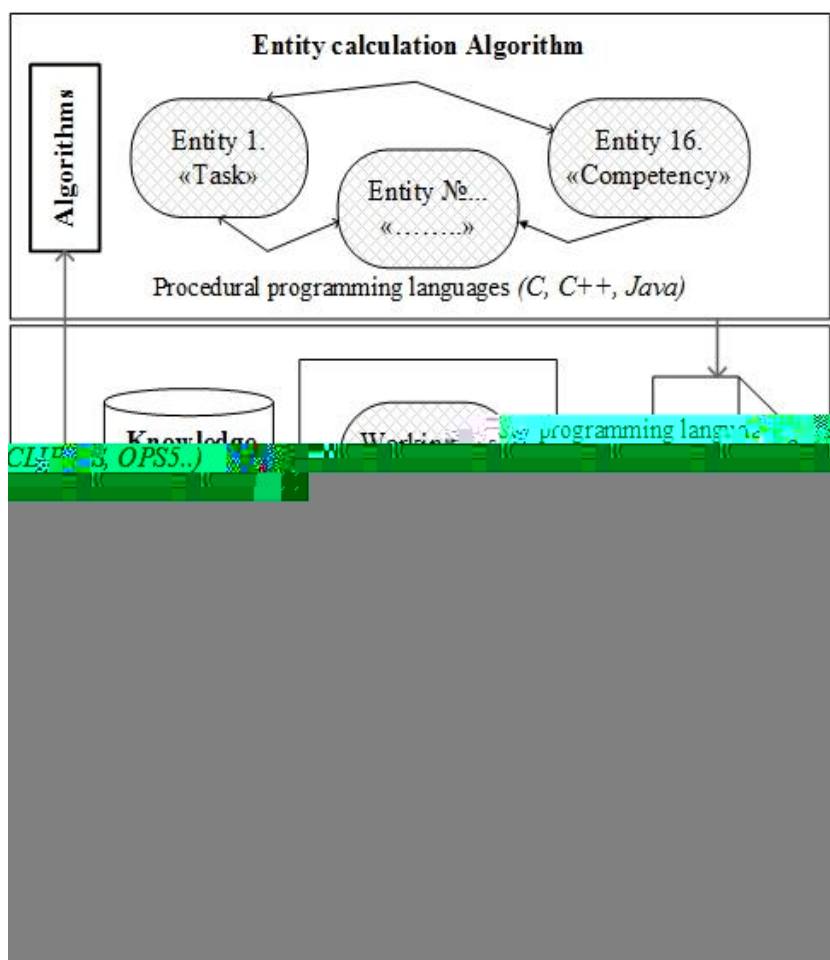

Fig. 2. Expert system structure, basis on the rules

Inference engine – program component of system, responsible for inference, taking into account correspondence between rules and facts. It ranks rules and fulfill rule with the highest priority.

Working list of rules contains actual rules in order of priority, which patterns satisfy facts or objects from working memory. Method of knowledge acquiring – automatize tool, which allows users to input knowledge in system without helping of knowledge engineer. Existing such a module is actual aspect from prospective of absence both formalized knowledge and the competency theory, that demand tolls and method of knowledge acquiring.

Expert system is considered as a direction of declaration programming because information processing carried out on the level of rules instead of the level of algorithms, using programming languages like CLIPS, OPS5 etc [8].

CONCLUSIONS

The main tasks in area of creating expert systems for professional activity analysis and estimation are tasks of developing knowledge base, methods of filling it and integration working memory module with entities calculation algorithms module, other words integration data and algorithm, realized with different basis: imperative and declarative programming languages.

Expert system functional structure (Fig. 2) could been used as the basis of further specification and creating technical task for designing and developing modules of system with corresponding programming languages.

The main difficult task is developing factor's patterns, that will been formed in entities calculation algorithms module, and their integration with corresponding expert system modules for activation rules from knowledge base.

Developing module, responsible for knowledge acquiring because of continuous competency theory developing, is not less important task.

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О. В. Заріцький. Теоретичні основи побудови експертних систем аналізу та оцінки професійної діяльності
Представлено теоретичні основи професійного аналізу діяльності та розвитку оцінки експертних систем. Представлено концептуальну експертну систему функціональної моделі. Експертна система розглядається як напрямок декларації програмування, оскільки обробка інформації здійснюється на рівні правил, а не на рівні алгоритмів, за допомогою мов програмування, таких як CLIPS, OPS5. Також розглянуто проблему об'єднання двох методів, які були реалізовані за допомогою різних мов програмування: імперативного і декларативного характеру.
Ключові слова: професійна діяльність; експертна система; база знань; парадигма управління людськими ресурсами.

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О. В. Зарицкий. Теоретические основы построения экспертных систем анализа и оценки профессиональной деятельности
Представлены теоретические основы профессионального анализа деятельности и развития оценки экспертных систем. Представлена концептуальная экспертная система функциональной модели. Экспертная система рассматривается как направление декларации программирования, поскольку обработка информации осуществляется на уровне правил, а не на уровне алгоритмов, с помощью языков программирования, таких как CLIPS, OPS5. Также рассмотрена проблема объединения двух методов, которые были реализованы с помощью различных языков программирования: императивного и декларативного характера.
Ключевые слова: профессиональная деятельность; экспертная система; база знаний; парадигма управления человеческими ресурсами.

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