MORPHOLOGICAL ANALYSIS OF EDUCATIONAL PROGRAMS IN THE CONTEXT OF INCREASING THE COMPETENCIES OF GRADUATES

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ABSTRACT

The problems of the peculiarities of the structure of main educational programs of the leading higher educational institutions of managerial and economic profile are considered in the context of the gradual increase in information competencies of students. With the help of morphological analysis and the study of the specifics of information content, the necessity of introducing a systematized, integrated and process approach to development of appropriate competencies with account of new trends and priorities that will determine the benchmarks for the graduate of the university is justified.

Keywords: university, transport environment, information competence, process approach, educational programs, morphological analysis, vocational training.

Background. *Information competencies of a student begin to form from the moment he enters the university. As a rule, a freshman is already familiar with such concepts as information, binary arithmetic, digital technologies, computer programs, programming languages, text and table processors, databases, visualization and image processing programs, video, audio (multimedia), e-mail services and electronic means of communication, based on the World Wide Web (WWW).*

Now the «World Wide Web» unites the interests of more than 2,5 billion users on land and sea, even in the space at the international space station. Most Internet resources are related to commercial activities. In the virtual world, goods and services are sold (online stores), officials and citizens interact (state services, municipal services), marketing research is conducted, advertising is presented, electronic payments are made, bank accounts are managed, and so on. The total world volume of electronic commerce is estimated at $20,4 trillion, which is about 13,8% of the total sales. The Internet integrates virtually all local management information systems into its domain. The main developers of ERP, CRM business management systems invest a significant part of the funds in development of promising «cloud» technologies implemented through the WWW. In the intellectual human environment, there already exists a completely scientific concept of creating a planetary mind based on the Internet.

Without knowledge, skills and possession (the general information competence of «Know», «Possess») of modern concepts and technologies, a complete existence in the information society is unthinkable.

From the first day of study at the university, the student begins to consistently acquire new information competencies registered in the FSES of higher education in the areas and corresponding training profiles. Depending on this, in higher educational institutions, educational disciplines are formed for the entire period of study.

Objective. *The objective of the authors is to present a morphological analysis of educational programs in terms of increased in competencies of graduates of universities of managerial and economic profile.*

Methods. *The authors use general scientific methods, comparative analysis, evaluation approach, statistics.*

Results. *For the morphological analysis of the structure of the main educational programs of the leading higher educational institutions of managerial and economic profile, in the context of a progressive increase in information competencies of students, the main educational programs of National Research University «Higher School of Economics» (HSE), Financial University under the Government of the Russian Federation (FU), Russian Economic University named after G. V. Plekhanov (REU). Statistical data on the information competencies of the fields «Economics», «Management», «State and municipal management», «Personnel management», and «Business Informatics» were systematized and structured using competency matrices, from which statistical sampling was then carried out on the profiles of interest.*

Information on the structure of the main educational programs was taken at open portals and websites of universities in the form of:

- *description of an educational program;*
- *the curriculum;*
- *calendar training schedule;*
- *working training programs.*

All materials were compared with Federal state educational standard (FSES), which were previously formalized in the form of information competence matrices in all directions. As an example, Pic. 1 depicts one of the matrices of explicit information competencies in the direction «Business Informatics», compiled from the morphological analysis of FSES 3+ VO (bachelors, March 38, 2005) [1].

For structural morphological analysis, more than 100 similar matrices were compiled in all directions, from which correlation links were then determined with the competencies of interest in the curricula. Analyzing the links, their cognitive structuring was carried out in order to identify problematic places.

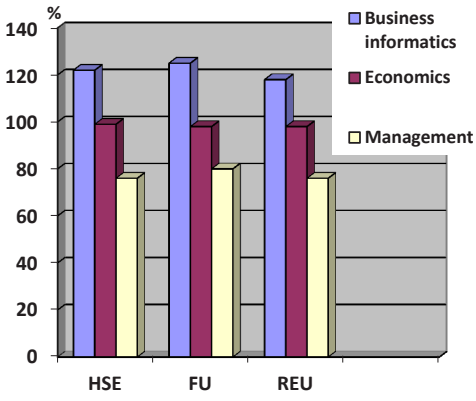
GPC-1	PC-2	PC-15
PC-3	PC-3	PC-16
	PC-4	PC-20
	PC-5	PC-22
	PC-6	PC-23
	PC-7	PC-24
	PC-9	PC-25
	PC-10	PC-26
	PC-12	PC-27
	PC-13	PC-28

Pic. 1. Matrix of information competencies for the studies' profile of «Business Informatics».

Table 1

Extract from the curriculum for bachelors in the direction of «Business Informatics»

Disciplines, studied in the 1st year	**Disciplines, studied in the 2nd year**
History of Russia	Psychology
Philosophy	Economics of a firm
Foreign language	Industrial organization
Microeconomics	Law
Macroeconomics	Financial management
History of Russia 2	Accounting and management accounts
Russian language and culture of speech	Rhetoric
Mathematical analysis	Communication processes in modern society
Differential and difference equations	Probability theory and mathematical statistics
Linear algebra	General theory of systems
Discrete mathematics	Theoretical fundamentals of informatics
Computing systems, networks and telecommunication	Databases
Informatics	Programming
Information technologies and data analysis	Personal and social safety
Information technologies of data processing	Object-oriented analysis of programming
Information technologies of data processing in economics	Design of human-computer interface
Physical culture	Operating systems
	Research work during the semester
	Theoretical fundamentals of automated control
	Architecture of computing systems, hardware and software support
	Real time systems
	Physical culture
Disciplines, studied in the 3rd year	**Disciplines, studied in the 4th year**
Information law	Management
Sociology	Simulation modeling
Research of operations	Enterprise architecture
Data analysis	Modeling of business processes
Econometrics	Management of a life cycle of information systems
Markets of information-communication technologies and organization of sale	Fuzzy logic and neural networks
Management of IT-services and content	Information safety
Electronic business	Distributed systems
Business communication	Decision support systems
Quality of program systems	Functional programming and intelligent systems
Project management	IT- consulting
Game theory	Logistics
Databases-2	Data storage
Research work during the semester	Research work during the semester
Theoretical fundamentals of automated control	Theoretical fundamentals of automated control
IT-marketing	IT-marketing
IT-business and innovations	IT-business and innovations
Business organization on software markets	
Software support cost evaluation	
Social-economic statistics	
Competitive analysis	
Physical culture	
Accounting information systems	



Pic. 2. Diagram of averaged values for formation of information competencies of graduates.

As a result of the analysis of the process of formation of information competencies among students in the above listed areas and profiles, a complex system was developed in which structural problems typical for all the universities studied were manifested.

Firstly, a uniform excessive acquisition of information competencies that are consistent with the competency matrixes prescribed in the FSES in the area of «Business Informatics» was revealed

Secondly, the profile of «Economics» in all studied universities turned out to be well coordinated on information competencies with matrices, but everywhere there was no systematic approach in the presence of process unevenness.

Thirdly, in such areas as «Management», «Personnel management», «State and municipal management», information competencies for students are not systematically built up. The FSES matrices are poorly correlated with working curricula of disciplines. In the training curricula of disciplines, information competencies also intersect repeatedly, or are not mentioned at all.

Pic. 2 depicts a diagram of formalized average values of development of information competencies in percent for three leading economic universities in Russia in three areas of graduate training. From the diagram it is clear that in all universities the information competencies within the profile of «Business Informatics» are formed with redundancy and reach up to 120%. In the area of «Economics» the formation of competencies varies in the region of 100%. The indicators in the field of «Management» are on average around 70–80%.

As an example of the structuring of the process of sequential building up of information competencies by students of management fields of higher education institutions, one can cite the results of analysis in the area of «Business Informatics», as the most saturated with information competencies. Table 1 provides a summary of the curriculum for bachelors in this area.

A detailed analysis of the correspondence of such a plan (Table 1) to the matrix of information competencies (Pic. 1) in dynamics over four years of training allowed to derive a generalized model of the process of building up information competencies of students in the management and economic fields of universities.

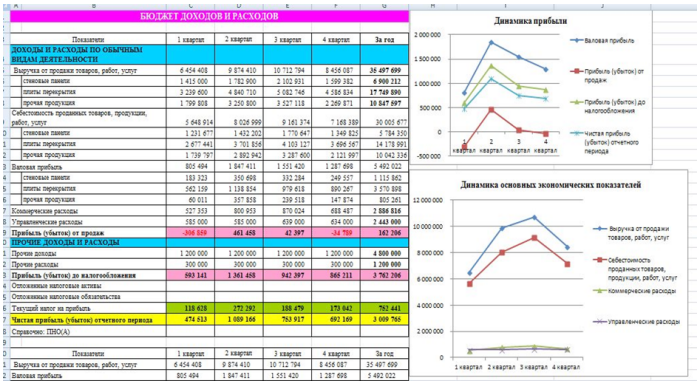
Already in the first year in the process of studying general and managerial disciplines, the student gradually consolidates the old ones and acquires new information competencies. During the seminars, coursework, laboratory work on all disciplines, students improve their knowledge and skills in working with text and graphics processors, with the means of «multimedia».

Studying subjects of a mathematical orientation, students get acquainted with applied programs which cover automation of studying of all areas of mathematics (for example, «GeoGebra», or «MATLAB»). Some cycles of disciplines introduce students to programs for visualization of 2D and 3D graphics (for example, «AutoCAD», «3Ds Max»). Almost immediately, when studying economic disciplines, students face with the need to use information and reference systems, such as «Consultant Plus», «Garant» and others. For statistical calculations and analysis, students get acquainted with statistical programs such as «SPSS», «Statistica».

As a rule, in the second year with the learning of such a concept as management, students consciously face the first problem – the problem of automation of management activity. The previously acquired general educational competences acquire a new orderly meaning. It is realized that the previously known text, tabular processors, DBMS are quite suitable for solving automation tasks for small companies. The managerial capabilities of Microsoft Office Excel spreadsheets are especially obvious, in which it is possible to display not only statistics, but also solve a number of economic problems, describe simple business processes and even manage projects (Pic. 3).

In the second and third courses, as the professional competencies grow, students need to develop specialized management programs. Students begin to divide the management into:

• strategic management, the main purpose of which is to create competitive advantages;



БЮДЖЕТ ДОХОДОВ И РАСХОДОВ

Показатели	1 квартал	2 квартал	3 квартал	4 квартал	За год
ДОХОДЫ И РАСХОДЫ ПО ОБЫЧНЫМ ВИДАМ ДЕЯТЕЛЬНОСТИ					
Выручка от продажи товаров, работ, услуг	6 454 408	9 874 410	10 712 794	8 456 087	**35 497 699**
стеновые панели	1 415 000	1 782 900	2 102 931	1 599 382	**6 900 212**
плиты перекрытия	2 239 600	4 640 710	5 082 746	4 586 834	**17 749 890**
прочая продукция	1 799 808	3 250 800	3 527 118	2 269 871	**10 847 597**
Себестоимость проданных товаров, продукции, работ, услуг	5 648 914	8 026 999	9 161 374	7 168 389	30 005 677
стеновые панели	1 231 677	1 432 202	1 770 647	1 349 825	5 784 350
плиты перекрытия	2 677 441	3 701 856	4 103 127	3 696 567	14 178 991
прочая продукция	1 739 797	2 892 942	3 287 600	2 121 997	10 042 336
Валовая прибыль	805 494	1 847 411	1 551 420	1 287 698	5 492 022
стеновые панели	183 323	350 698	332 284	249 557	1 115 862
плиты перекрытия	562 159	1 138 854	979 618	890 267	3 570 898
прочая продукция	60 011	357 858	239 518	147 874	805 261
Коммерческие расходы	527 353	800 953	870 024	688 487	**2 886 816**
Управленческие расходы	585 000	585 000	699 000	634 000	**2 443 000**
Прибыль (убытки) от продаж	-306 859	**461 458**	**42 397**	-34 789	**162 206**
ПРОЧИЕ ДОХОДЫ И РАСХОДЫ					
Прочие доходы	1 200 000	1 200 000	1 200 000	1 200 000	**4 800 000**
Прочие расходы	300 000	300 000	300 000	300 000	**1 200 000**
Прибыль (убытки) до налогообложения	**593 141**	**1 361 458**	**942 397**	**865 211**	**3 762 206**
Отложенные налоговые активы					
Отложенные налоговые обязательства					
Текущий налог на прибыль	**118 628**	**272 292**	**188 479**	**173 042**	**752 441**
Чистая прибыль (убыток) отчетного периода	**474 513**	**1 089 166**	**753 917**	**692 169**	**3 009 765**
Справочно: ПВО(А)					

Показатели	1 квартал	2 квартал	3 квартал	4 квартал	За год
Выручка от продажи товаров, работ, услуг	6 454 408	9 874 410	10 712 794	8 456 087	35 497 699
Валовая прибыль	805 494	1 847 411	1 551 420	1 287 698	5 492 022

Pic. 3. Preparation of the company's budgets in Excel. Example of organization of budgeting.

• *operational management, the purpose of which is to maximize current financial performance.*

Gradually, in the 3rd and 4th year students get acquainted with the general classification of management programs, which can be structured as follows:

- *CRM (Customer Relationships Management);*
- *SRM (Supplier Relationships Management);*
- *SCM (Supply Chain Management);*
- *ERP (Enterprise Resource Planning);*
- *BPM (Business Process Management);*
- *PPM (Project Portfolio Management);*
- *BI (Business Intelligence).*

In the 3rd, 4th year students get acquainted with business process modeling methodologies, such as IDEF and ARIS, learn about IT Service Management (ITSM) – the approach of information service management organization, etc.

However, it should be noted that such a generalized process structure in practice, as a rule, is implemented fragmentarily. The analysis of the structure of main educational programs of leading universities of managerial and economic profile in the context of the progressive expansion of information competencies has shown that each individual institution has its own individual approach that does not cover an integral information competence picture. Often, even following the studies within the profile of Business Informatics, students do not systematically receive information competencies that depend on a number of objective factors. These factors include:

– lack of qualified teachers (emphasis is placed on software application developers- partners, on their preferences);

– lack of IT-equipped rooms;

– absence of a unified approach to formation of information competencies.

Conclusion. *Based on the results of the morphological analysis of the students' gradual expansion of information competencies, it can be concluded that it is necessary to introduce systematic, integrated and process approaches into the learning process [3–7] to form the appropriate competencies that must take into account the world trends in the shift of priorities from traditional information technologies to the field of network analytics. The use of the proposed approaches will allow to optimize the training of students and to increase the economic efficiency of the work of higher educational institutions of managerial and economic profiles. The proposals made get a particular practical significance in the conditions of the emergence of a new global network economy.*

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