Educational and Methodical Union of Polytechnic University Education in Russian Federation

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INTEGRATING MICROSOFT OFFICIAL ACADEMIC COURSES INTO RUSSIAN TECHNICAL UNIVERSITIES' IT CURRICULUMS

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SPECIAL EDITION
Prepared for European E-skills Conference 2008 and
Russia-China Conference "Innovation in Engineering Education - 2008"

Moscow, 2008

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Integrating Microsoft official academic courses into Russian technical universities' IT curriculums // Special edition - prepared for European E-skills Conference 2008 and Russia-China conference "Innovation in Engineering Education - 2008". - Moscow, 2008. — 73 p.

This book presents the main results of a project completed jointly by the Educational and Methodical Union of Polytechnic University Education in Russia and Microsoft® Rus in 2006-2007.

The book is a short and adapted variant of the Russian edition. It includes concept description, methodology, and practical recommendations for integration of vendor-based and traditional academic education systems using educational and methodical materials based upon the competency approach. Main stages and results of the methodology approbation are considered by the example of the book *MOAC: Managing and Maintaining a Microsoft® Windows Server™ 2003 Environment (70-290)*

This edition is aimed at teachers, scientific workers, higher education methodologists, education and science literature publishers, employers, vendors, education providers, and other people who are interested in the questions of content harmonization and mutual recognition in ICT education.

FOREWORD

Microsoft Corporation is pleased to support the efforts of the Educational and Methodical Union of Polytechnic University Education in Russia and our own subsidiary, Microsoft Russia.

The work of integrating vendor education and certification programs into the academic model is of critical importance to the economic future of Russia and the world. The vital work of preparing people to work in this digital wealth system is challenged by the constantly changing technology, the need for acceptance of credentials and the practical realities of the world of business.

The changing nature of technology makes it difficult to create and sustain a validation program that addresses the changing technologies. Economies of scale are necessary to make this work. In this context, Microsoft and other ICT vendors address the question of skill validation at a global level with formal certification programs. We develop these certification programs with a great deal of rigor with an eye toward the needs of our customers, both employer and employee.

This attention to customer need or market need is important in terms of the changing technologies and in the question of the acceptance of the credentials. We have learned well over the years that for the validation of skills to be acceptable to employers and employees, it is important that they act as a valid and reliable measure of skill.

Finally, these defensible measures of knowledge and skill require that we maintain a level of granularity that matches the practical world of our customers. In other words, it is important that the credential match the way our customers are integrating our technologies into their work.

All this work is of value to academic institutions as they move to integrate vendor education and certification in their work. Our Microsoft Official Academic Curriculum supports students in an academic environment as they work to obtain Microsoft certification to supplement and enhance their formal education. This does not mean that the MOAC program, designed at a global level, is always a perfect match. For this reason, we support and encourage the good work of the Educational and Methodical Union of Polytechnic University Education in Russia and our own subsidiary, Microsoft Russia. The effort they have invested in this project will provide opportunities for their students and contribute to the economic development of Russia's digital wealth system.

David Gibson, Group Product Manager
Employability Certification and Career Excellence
Microsoft Learning

PREFACE

“Integrating Microsoft Official Academic Courses into Russian Technical Universities’ IT Curriculums” is the scientific and methodical edition based on the results of a project that was completed within the framework of collaboration between Microsoft IT Academy Russia and the Educational and Methodical Union of Polytechnic University Education in Russian in the 2006-2007 academic year.

The project was fulfilled at Bauman Moscow State Technical University and was supported by Softline IT Company, a main partner of the Microsoft IT Academy program in Russia, and Ecom Publisher, which signed a contract for localizing MOAC titles for Microsoft's growing IT academy project, and is the official MOAC distributer in Russia in 2006.

Some works were made under a grant from the President of the Russian Federation’s “Integration and convergence of modeling methods in the area of education” (№ МК-5341.2007.9) and with the support of CRADA “Russia-China partnership in the field of University management”.

This is a special edition prepared for the European E-skills Conference 2008 and the Russia-China conference “Innovation in Engineering Education – 2008”. It is oriented towards specialists who have competencies in the fields of international educational technologies (Bologna process, European-quality framework, credits accumulation and transfer systems, modular education, etc.), information and communication technologies (ICT), and corresponding systems of vendor-based education and vocational training (VET).

Results of the work were presented at all-Russian and international conferences and were acknowledged to be of significant interest to society. Some of the results were further developed within a number of initiatives and projects.

This book is a short and adapted variant of the Russian edition. During translation, difficulties concerning terminology and national features of the Russian higher education system have appeared. Therefore, the Abbreviations section has been extended to include definitions and terms.

CONTENTS

1. ABREVIATIONS AND DEFINITIONS **6**

2. INTRODUCTION **7**

3. CONCEPT OF THE PROJECT **10**

3.1 The main concepts of the competency approach *11*

3.2 Methods of designing competency models *14*

4. RUSSIAN EDUCATIONIONAL STANDARDS **17**

4.1 State educational standards *18*

4.1.1 Structure of the state educational standards 18

4.1.2 Approximate syllabus and exemplary course programme 21

4.1.3 Curriculums in the IT field 22

4.2 Validating educational literature *23*

5. THE METHODOLOGY OF MOAC INTEGRATION **27**

5.1 Experimental usage of MOAC *28*

5.2 Selecting courses and curriculums *29*

5.2.1 Comparison of courses' and textbooks' titles 30

5.2.2 Comparison of courses' and textbooks' sections 31

5.3 Developing competency models *32*

5.3.1 Competency model of SES course 33

5.3.2 Competency model of the exemplary course programme 36

5.3.3 MOAC Competency model 39

5.3.4 Comparison of competency models 47

5.4 Textbook analysis for conformity of validation conditions *54*

5.4.1 Determination of the volume and structure of necessary improvements 55

5.4.2 A typical structure of the MOAC textbook 56

5.4.3 The typical MOAC disadvantages and methods to address them 57

5.5 Improvement of the textbook *58*

5.6 Obtaining the EMU griffe *59*

5.6.1 Selecting the candidates for reviewing 59

5.6.2 Review preparation 60

5.7 Integration into curriculum *62*

5.7.1 Estimating workload of textbook study 63

5.7.2 Development of educational pathways 67

6. CONCLUSION **69**

1. ABREVIATIONS AND DEFINITIONS

APS	Approximate Syllabus, which is recommended by EMU and the Ministry of Education and Science and which includes sequence and timing of courses
BC	Basic Curriculum, the basic educational program
CCR	Centicredit. One credit = 10 centicredits
Competency	The integral characteristic of several components, which describes the necessary conditions for professional activity.
Griffe	A quality sign indicating the status of educational literature, which can be received as result of a special validation procedure from a university, EMU, or Ministry.
ECTS	European Credit Transfer System.
ECP	Exemplary Course Programme, which is recommended by EMU and the Ministry of Education and Science.
EMU	Educational and Methodical Unions. State and social communities in higher and post-graduate education in Russia, which lead the questions about designing and improving SES and analyzing and validating educational literature
EQF	European Qualifications Framework.
HE	Higher education (in Russia also called higher professional education).
ICT	Information and communication technologies.
IS	Information systems.
IT	Information technologies.
KKS	Set (scheme) of knowledge, know-how and skills. *Knowledge* - theoretical declarative knowledge *Know-how* - theoretical procedure knowledge, Skills - Experiential, practical knowledge.
MMC	Microsoft Management Console (Windows Server 2003).
MOAC	Microsoft Official Academic Course.
MOC	Microsoft Official Course.
OS	Operating system.
Project	This project, ”Integrating Microsoft Official Academic Courses into Russian Technical Universities’ IT Curriculums”.
SA	Administration system.
SES	State educational standard.
Specialist	One of the main degrees of HE in Russia, requiring at least five years of study.
Vendor	Developer and supplier of information technologies.
VET	Vocational education and training.

2. INTRODUCTION

Nowadays, information technologies (IT) are used in all spheres of human society and have a great influence on the development of science and business. Some of the main results of IT expansion are the reduction of product life cycle time, the necessity for an improvement in the production base, and an increase in the workforce quality level. That's why there is an active reformation of IT educational systems, which in many respects is driven by the aspiration of representatives from the business community to reduce the expense and time required for graduates to adapt to industrial activity performance and subsequently improve their professional skills. To resolve this problem, many companies create special vocational training programmes and corporate universities, which prepare experts for the particular activity as effectively as possible.

At the initial stage of vendor education development, this approach was effective enough, because it was oriented toward increasing qualifications after higher education. But a lot of factors have led to the necessity for reconsidering the existing approach.

First of all, some companies do not have the necessary funds or experience to create their own educational systems; they must rely on traditional academic education and require it to provide a lot of professional and technical vendor-based or industry-based competencies.

Secondly, it is difficult to achieve a strong dichotomic separation of academic and vocational education; that's why there should be a balanced view of educational content.

Thirdly, vocational education and training (VET), which is traditionally oriented only toward practical skills, is transforming and becoming more like academic training; VET is now including methodological and theoretical courses, changing the system of certification and qualification improvement (as is evident in the preparation of individual works, their oral defense, etc.).

Fourthly, active transition to knowledge-based economics had led to a lot of problems that were traditionally addressed by the academic community and the higher education experts. All of these and many other factors have led to the current situation, in which academic and vocational education significantly overlap, resulting in a negative economic effect, the necessity "to pay twice": The first time, one must pay for traditional academic education, and second time one must pay for obtaining certificates from vendors. To avoid this situation in the future it is necessary to change the content of the specialist preparation curriculum using the integration and convergence of the different educational systems.

To reach these goals, major European and American IT companies, together with universities, are developing mutual recognition schemes and creating hybrid learning, which includes universities' and vendor's educational courses. The situation in Russia is different from that worldwide, because:

- The national vendor education systems are in their formative phases;
- The necessity of orientation for knowledge management technologies is only realized by employers;
- "Free of charge," "compulsory," "equal comprehensible" and other principles concerning education are mental components of the social community's consciousness;
- Chargeable education, especially the in academic sphere, is not developed enough;
- Insufficient financing of universities is the result of teachers' and the academic authority community's reduction of prestige.

These factors make conversation between universities and most business communities very difficult. That's why while the international approach to solving this question is being discussed, the main efforts of the business community and industrial unions are concentrated on critics of the quality and content of education.

Some industrial unions have offered the development of professional standards for industries and specialties on their own. On this basis, it is proposed to the

academic community to develop educational standards for HE. But currently it is difficult to create professional standards, because the business community does not have enough experience to solve these questions on its own.

The present situation in the field of academic and vocational education requires solving a lot of actual problems, conducting , and elaborating best practices. Focusing on modern tendencies and positive international experience, the Educational and Methodical Union of Polytechnic University Education in Russia and Microsoft Rus LLC in 2006 concluded a cooperation agreement and have initiated mutual works in the field of integration and convergence of academic and vocational education.

3. CONCEPT OF THE PROJECT

The key principle of the mutual work was found during the discussion: the necessity of gradual and weighted convergence of academic and vendor-based educational systems, instead of changing or dominant integration of only one of them.

To implement this principle, the structure of the educational process and its main components were analyzed, the main problems were determined, and the consequence of the proposed implementation was found.

Fig. 3.1 shows the resource scheme of the educational process, which includes a student who has a certain "luggage of knowledge" (initial competencies) and the resources that are necessary for the student to acquire new competencies.

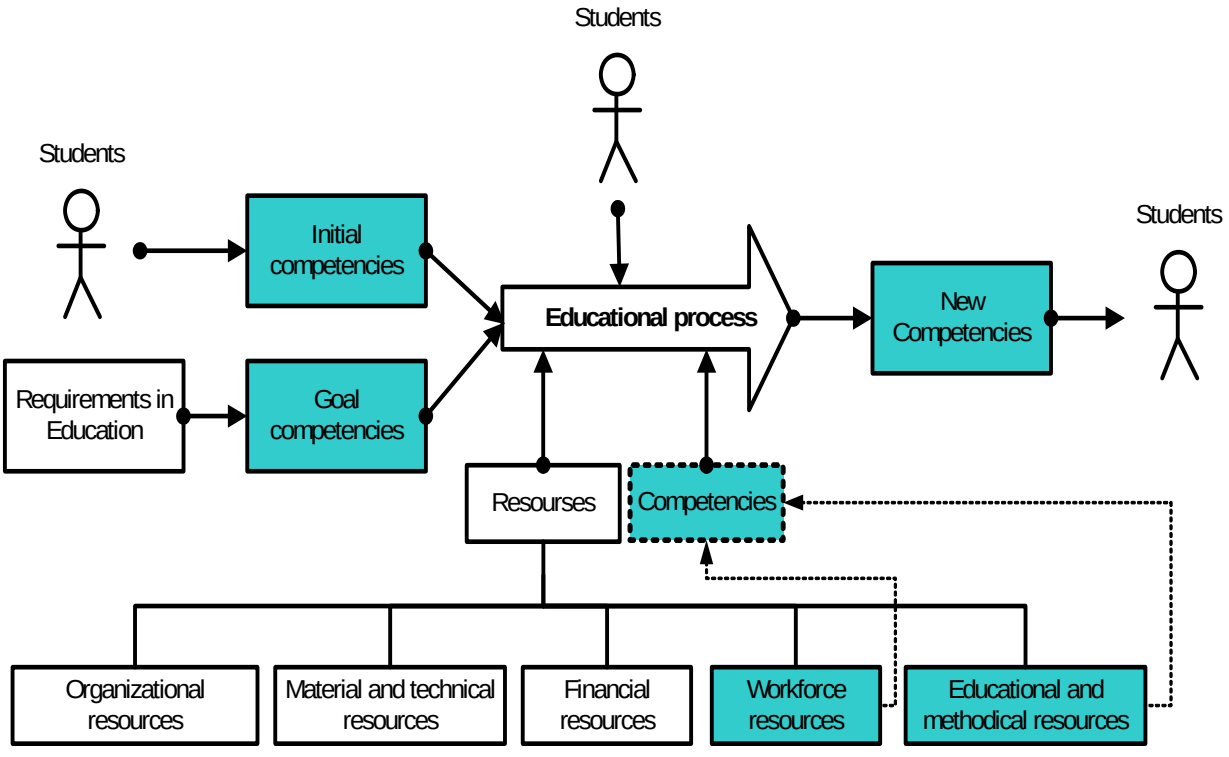

Fig. 3.1 Resource scheme of the educational process

It can be seen in the scheme that workforce and educational/methodical resources play a key role in the formation of the outcome competencies of a student; that's why a lot of attention should be paid to it in mutual projects. In this connection, the goal of analysis, determination, and harmonization of the educational and

methodical basis, which is used in HE and within the framework of the Microsoft IT Academy program, was selected for the first stage of the project.

To reach this goal, in 2006-2007 the "Integrating Microsoft Official Academic Courses into Russian Technical Universities' IT Curriculums" project was launched. The main objectives were identified as:

- Developing the concept of introducing Microsoft educational-methodical materials for use in the IT curriculums;
- The analysis of the normative documents and existed practices for MOAC integration;
- Developing the methodology of MOAC integration based on modern approaches;
- Methodology approbation on a selected MOAC and IT curriculum set.

To accept the results of the project the following normative documents and procedures were chosen:

- State educational standards, which regulate the quality and content of curriculums accredited by the Russian Ministry of Education and Science;
- Quality assurance and validation procedures for textbooks based on corresponding normative acts, for further usage of the textbooks in the educational process.

A competency approach and knowledge management technology were chosen as the methodological basis for project realization.

3.1 The main concepts of the competency approach

Nowadays there are many ways in which the term *competency* is used by foreign and national specialists[1]. Some of them define it in terms of personal cha-

[1] The questions of using competencies are considered in the works of Robert White, David C. McClelland, Zemke, Lyle & Signe Spencer, N/ Homskiy, A./K, Markova, I.A. Zimnia, and V.A. Baidenko.

racteristics; others define it as the readiness or capability of solving a problem, a responsibility area, or an activity indicator.

In this report, *competency is identified as an integral characteristic of several components that describe the necessary conditions for professional activity.* Detailed content of the components depends on whether the competency follows the theoretical or the practical model.

The theoretical model of competency is presented in Table 1. The first four components of it actually correspond to the KKS system (the set of Knowledge, Know-how and Skills) that is actively used in the Russian educational system. The fifth component shows the current tendencies of development and the consideration of the personal characteristics of the staff. The last (sixth) component is used for competency classification.

Table 1. Theoretical competency model

Competency component	Description
1. Horizon	Theoretical extensional declarative knowledge (to have an idea about the subject, process or situation -- the capability to point it out, to name it, to give an example)
2. Knowledge	Theoretical intentional declarative knowledge (to know and understand the content of the subject, process or situation – the capability to provide a definition through structure and connections with other subjects)
3. Know-how	Theoretical procedure knowledge (the capability to solve problems, to take actions, to use a methodic approach)
4. Skills	Experiential, practical knowledge (to have experience to solve problems, to implement knowledge and skills during work activity)
5. Personal characteristics	Personal characteristics, which are necessary for effective work in the specific situations
6. Properties, classification parameters	Auxiliary information, which is necessary to make competencies structured and to present them in the form of ontology or other hierarchical structures

The developed theoretical model was implemented in the information and communication technologies (ICT) field for designing the real IT competency models (for the federal customs service). As a result, difficulties appeared in the description of many competencies, so the simple (practical) competency model was invented, which is presented in Table 2.

Table 2. Simple (practical) competency model

Competency component	Description	Remarks
1. Short description	The definition of a competency in the form of "the competency in the field of…" or "the competency, providing…"	
2. Behaviors	A description of the professional activity, received from the process of the specialist's work observation.	Indirect indicators can be used, because of the difficulty of clarifying the content of competency components and the inability to determine the requirements of them. For example, "the specialist, who has this competency, can solve the following problems …"
3. Level of skills	The quality and quantity dimensions of a competency level.	In practice, to compare the competencies of specialists it is useful to use some common estimates on the selected scale, but not descript specifications (knowledge, skills, indicators, etc.). If possible, one or several indicators should be compared for each level.
4. Cluster characteristics	Auxiliary information, which is necessary to make competencies structured and to present them in the form of ontology or other hierarchical structures.	In practice, it is difficult to make nonintersecting and independent (classified) competencies, which is why they can be structured using the cluster principle.

Following the simple competency model, development indicators can be converted into a number of elements that are inside the theoretical competency model.

Competencies can be united to create a *specialist competency model* or can be structured into different groups. To group competencies effectively it is reasonable to introduce the notion of *monatomic competency*, which cannot be divided into smaller parts, because the competencies can be part of each other[2].

[2]It is important to mention that the competency elements or indicators cannot be used in the form of the low level competencies. They should have the attribute quality of a competency, should not have duplicates, and should be passed on the inheritance principle.

3.2 Methods of designing competency models

Nowadays many developers of the competency models and systems focus their main emphasis on the questioning of the experts and bringing them to participate in the methodical work. For this purpose, authoritative experts who have broad experience and who are capable of estimating all needs for knowledge, skills and personal qualities of experts are chosen. However, in practice, the use of this approach has revealed the following basic problems:

- *The complexity of the knowledge extraction process*, caused by a lack of the time, an absence of experts or their unwillingness to actively participate in the work process;
- *The subjectivity of the expert's professional vision*, caused by their narrow professional experience and difficulty defining their real qualifications;
- *A shortage of qualified experts on extraction and structuring of knowledge* and the small quantity of successful practices in this sphere;
- *The lack of experts' experience in educational and methodical work.*

To overcome these difficulties it is useful to look at the broad experience and the results of research based on such sciences as knowledge engineering and knowledge management. Traditionally there are three methods of knowledge (competency) extraction (Fig. 3.2):

- *Work activity, experience*;
- *Specialists' experience*, which is received during practical work;
- *Artifacts*, which are the materialized results of practical experience, the study of which allows the receipt of new knowledge (competencies).

Because the usage of the first two methods is restricted, it is better to use the knowledge artifacts alternative, among which special groups, which are oriented on the social and individual transformation of experience, can be identified:

- operational textbooks;
- scientific and popular editions;
- educational and methodical complexes;
- other artifacts.

Educational and methodical complexes can include the following components:

- Printed materials (textbooks, methodical recommendations for doing exercises, etc.);
- Learning mechanism models, laboratory equipment, and special instruments;
- Electronic textbooks, e-learning courses, virtual laboratories, and specialized educational information technologies;
- Other components.

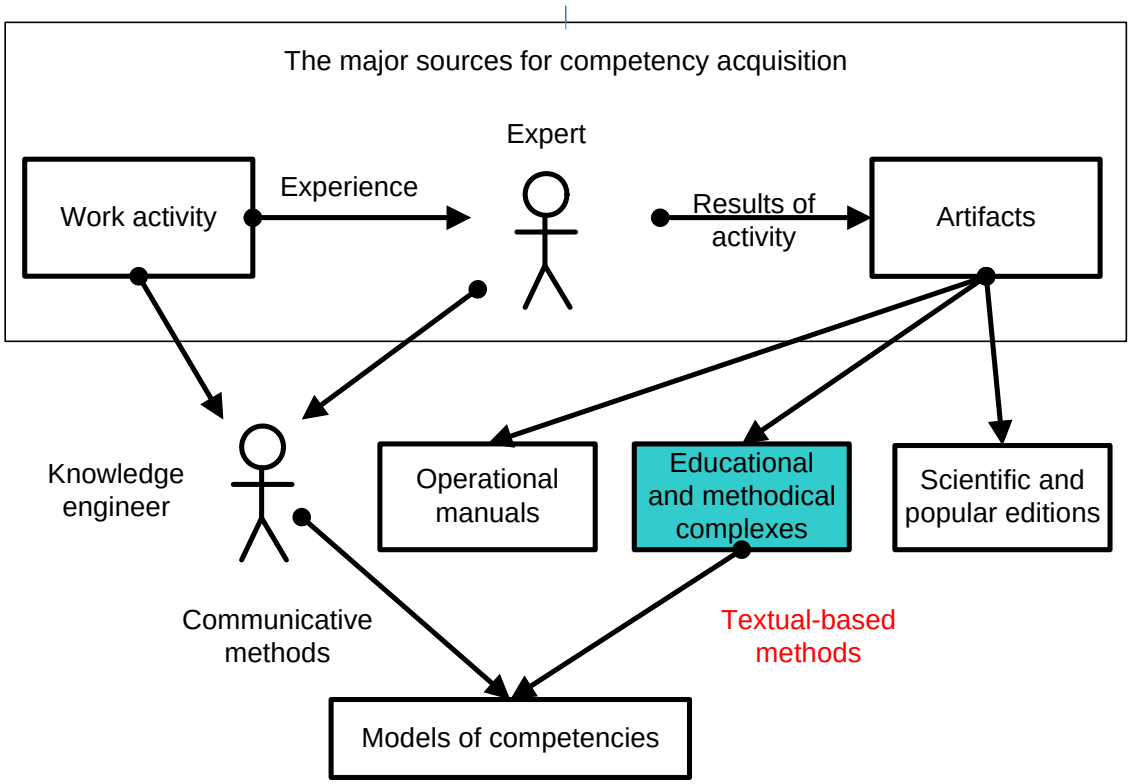

Fig. 3.2. Methods and sources for competency acquisition

Textual-based methods, which are more formalized and can be automated, can be used for knowledge extraction from educational and methodical complex components.

The best variant of making competency models is the combination of all existing methods, but it is useful to choose the textual-based method as a starting point, and communicative methods can be used for evaluation, elaboration, and coordination. The structure of educational and methodical complexes can serve as a pattern to form knowledge systems, skills, and personal characteristics.

An additional reason for the chosen approach is the fact that each specialist should have the following competency: "*Reads and understands special literature (technical, economical, juridical, etc.)* "

The main disadvantage of this method is the different interpretations by textbook authors, research that does not clearly present their ideas, or differently understood verbal ideas.

But there is an advantage in this method. It consists of potential openness and comprehensibility of the methods of knowledge extraction, which allows estimation and checking of these models.

4. RUSSIAN EDUCATIONIONAL STANDARDS

There is freedom of choice in the content of educational programmes and methods of teaching in the Russian higher education system. That's why each university and teacher can use any modern textbooks for teaching and can recommend them to the students. At the same time, there is a state educational standards system, which determines the requirements of the content and the licensing of educational programmes, to assure the high quality, the guaranteed level, and the method of education.

Licensing and accreditation of programmes, based on the state educational standards (SES), allows HEIs receiving the right to issue state recognition diplomas and receive funds from the state budget. The state educational standards system allows employers and the state to map the requirements for specific specialists and regulate the content and quality of education.

The main disadvantage of the state educational standards system is the necessity for a regular evaluation of the requirements of science, business, and society, and for keeping the standards up to date. This is especially critical in the ICT realm, which is developing rapidly and experiencing a changing nomenclature of specialists. In order to solve this problem, the state and the academic community are developing a project for the reformation of the educational system, focused on increasing the scope of education, increasing the variety of the state educational standards, and actively using the competency approach.

To ensure a high quality of educational literature, a system of validation (accreditation) is used, which is based on the evaluation of the content of textbooks according to the state educational standards and the quality assurance system. Students and teachers can use any literature, but the presence of validation allows them to better orient themselves among the published editions.

The Educational and Methodical Unions, which are the state and social communities in higher and post-graduate education in Russia, lead the questions about the design and SES improvement, analysis, and validation of educational li-

terature. The Educational and Methodical Union of Polytechnic University Education in Russia exists within the framework of Bauman Moscow State Technical University and St. Petersburg State Technical University and unites almost all technical universities in Russia.

Additional information about the educational system in Russia can be received from the following sources:

- Website of the Russian Ministry of Education and Science (http://eng.mon.gov.ru/).
- Bologna process national reports 2005-2007: Russia (http://www.aic.lv/bolona/2005_07/Nat_reps/RussianFederationNationalReport.pdf).
- Bologna process national reports 2004-2005: Russia (http://www.bologna-bergen2005.no/EN/national_impl/00_Nat-rep-05/National_Reports-Russia_050117.pdf).

4.1 State educational standards

4.1.1 Structure of the state educational standards

The main document that defines the content and requirements of educational programmes is the State Educational Standard system (SES). Historically there are three types of the SES, which are different in their structures. There is the second-generation SES system, which has been implemented during the last 10 years. But a third-generation SES system is being developed, to follow the Bologna process and reform the educational system in Russia. This system is known as the Federal State educational standards system.

Following is the structure of the key sections of SES, which reflect the competencies and content of the educational programme:

1. The common characteristics of study direction:
    - Qualification characteristics of a graduate:
        - Areas of professional activity;

        - Objects of professional activity;
        - Types of professional activity;
        - Objectives (generalized) of professional activity;
    2. Qualification requirements;
    3. Requirements for the level of education;
    4. Common requirements for Basic Curriculum (BC);
    5. Requirements for the compulsory minimum of BC content;
    6. Period to complete BC;
    7. Requirements for development and conditions of realization of BC:
        - Requirements for educational and methodical provision of the educational process;
        - Requirements for practical work organization;
    8. Requirements for the level of the graduate's education:
        - Requirements for the professional skills of a graduate for …

The section *Requirements for the compulsory minimum of BC content* is the main criteria in making educational programmes, pathways, etc. It consists of the courses, united into the following cycles:

- Common humanities and social and economics courses;
- Common mathematics and natural science courses;
- Common professional (vocational) courses;
- Special courses, including specialization courses;
- Optional courses.

Each cycle is divided into three components:

- *Federal*, which is compulsory for all universities;
- *Regional*, which can be established by districts;
- *University*, which can be established by a university itself.

Each educational programme can contain an author's course, the content of which is not accredited by external organizations or restricted by SES or by other normative documents. This possibility can be under the framework of each course cycle in the university or regional component, as well as under the framework of optional courses.

There is a possibility to show in the graduates' diplomas all additional courses (or most of them). For monoprogrammes this designation is developed in the form of a specialization, and for the two-tiered structure of education it is developed in the form of master's programmes. Specializations and master's programmes are approved at the Educational and Methodical Union, after which they do not require validation by the organizations of the Russian Ministry of Education and Science.

The main points of the new generation of SES are the following:

- A new component is added to the graduate's quality characteristic: aims of the programme, which describe the graduate's personal skills, realms, and fields of competencies.
- *Qualification requirements* in the form of knowledge, know-how, and skills (KKS) are substituted for the *requirements for the level of education* in the form of competencies, which are divided by fields and spheres of competencies such as cognitive, social and professional activity, and also in the field of fundamental sciences and self-development.
- The form of requirements for the minimum content of education is changed principally. Instead of the list of courses, the list of KKS is used, which is divided into cycles. The skills, which were mentioned in the section on requirements for practical work organization, are presented in this section.
- It is important to mention that the graduate's quality characteristic and the requirements for the graduate's level of education should be worked out together with interested employers.

- The list of courses for development of preliminary course syllabus, textbooks, and literature is pointed out in Federal SES, but it is not compulsory and can be changed by a university without endorsement from controlling organizations.

4.1.2 Approximate syllabus and exemplary course programme

Usually there is an approximate syllabus (APS) for each SES, in which an approximate sequence of courses and approximate data about audience, self, and total workload is defined (see Table 3). APS is recommendable, which is why universities usually make their syllabi in another sequence, adapting them to their potentials and the individual abilities of the students. Unfortunately, table data cannot give a picture of all of the connections and possible opportunities for course design.

Table 3. A fragment of a syllabus

№	Course	Hours			Approximate courses by semester										Assessment (exam/test)
		Student workload according to SES	From which		1	2	3	4	5	6	7	8	9	10	
			Contact hours	Self work											
Curriculum 230201 – Information systems and technologies															
	Federal component	*850*	*493*	*357*											
1	Information security and privacy protection	136	85	51						+					E
2	Corporate information systems	136	85	51								+			E
3	Administration in information systems	102	68	34							+				E
4	Artificial intelligence	102	68	34							+				E
5	Multimedia technologies	68	34	34								+			E
6	Reliability of information systems	102	51	51								+			E
7	Information system design	204	102	102								+			E

For each course from the syllabus the course programme should be designed. A course programme is approved by the university and is the basis for control of students' performance, laboratory practice, choice of necessary literature, etc. Course programmes of the federal component should satisfy the requirements of SES.

To standardize a course programme, EMU develops an exemplary course programme (ECP) and sends it to the Russian Ministry of Education and Science to approve it as recommendable. Exemplary and working programmes have the following typical structure:

- Goals and objectives;
- Intended learning outcomes;
- Workload and types of study work;
- Course content;
- Practical work (labs);
- Educational and methodical provision:
  - Recommended literature;
  - Educational and methodical materials for students;
- Material and technical provisions;
- Methodical recommendations for organization of the education process.

4.1.3 Curriculums in the IT field

Nowadays the main degrees of HE in Russia are as follows:

- Bachelor: study for at least 4 years;
- Specialist: study for at least 5 years;
- Master: study for at least 6 years.

In compliance with the current legislation, persons receiving documents certifying higher education of a certain degree have the right to continue studies in the educational programme of the subsequent degree. In order to ensure the academic freedom of HEIs with respect to the formation of educational master's pro-

grammes, as well as interdisciplinary and practice-oriented programmes, the Ministry of Education and Science has developed appropriate regulatory standards and letters.

The structure of educational curriculums is defined by the list of the state educational standards (special All-Russia Classifier for Educational Programmes). It has several hierarchical levels, which include areas, directions, and specialties.

In the area of ”Techniques and Technologies” there are two main IT directions: “Informatics and computer science” and “Information systems.” Each direction consists of bachelor’s\master’s and four specialist curriculums (see Table 4, below). In the Classifier there are some other educational programme, but these historically appeared first and are widely spread.

Table 4. List of IT curriculums

Code	Name of the area or curriculum	Qualification
230100	*Informatics and computer science*	Bachelor / Master
230101	Computers, complexes, systems and networks	Engineer
230102	Automated systems	Engineer
230104	Computer-aided design systems	Engineer
230105	Program engineering	Engineer
230200	*Information systems*	Bachelor / Master
230201	Information systems and technologies	Engineer
230202	Information technologies in education	Engineer
230203	Information technology in design	Engineer
230204	Information technology in media industry	Engineer

4.2 Validating educational literature

The procedure of validation of educational literature is intended to ensure the quality of textbooks, manuals, etc. It consists of the accreditation technology, reviewing, and expertise. The objects for accreditation can be:

- *Textbook*. This is the main book for a specific course. It contains basic knowledge that is necessary for students to master. The content of the textbook should satisfy the SES and contain a full description of the preliminaries for the specific course. The name of the textbook should be the same as the course name in SES.
- *Teaching book.* This is an addition to the textbook. The teaching book does not need to contain a full description of a course, but can contain on-

ly a part of it. In comparison with a textbook it can contain not only approved knowledge and options, but also different opinions about a problem.

The quality of a textbook can be assured by a griffe, the educational and teaching reviewer status, and the expertise result. The basis of the quality model is the hierarchy of griffes[3]. The following griffes are used in HE:

- *Sub-faculty's, faculty's, and university's griffe* can be given to the textbook or teaching book by the decision of education and methodic consultation committees, which are organized under the appropriate organization. The committees are adopted by the head's instructions and orders of the organizations or universities.
- *Educational and Methodical Union griffes* can be given using the rules established by the Educational and Methodical Unions or by the Russian Ministry of Education and Science. The common scheme is:
    - *Admitted or recommended by EMU* for … education
    - In the form of a *textbook* or *teaching book*
    - For *course (specialty or direction)*…

EMU's griffe is given to a textbook through the expertise procedure, which is organized by the education and methodic committee for the special groups of specialties and the methods of preparation. The decision about approbation or declining of a griffe is based on the results of the expertise and the decision of the committee.

The EMU griffe signifies that the textbook fulfills all requirements of the State educational standards in HE, in the exemplary course programme and other requirements, which are defined by EMU.

[3]Griffe is a transliteration originating from the French word *Giffe*. One meaning of the word is the inscription on a document or on an edition that defines the way the document is used.

The text of a griffe is placed on the face of the list. The content of the griffe cannot be changed by a publisher or author. The period of publishing of a textbook after the accreditation is one year.

The materials of a textbook received by EMU are registered and sent together with a short description to one or two experts, who are elected by EMU management and are the specialists in the selected field. The conclusion for the textbook is made by experts based on the following questions:

1. The name of a manuscript, volume, number of copies, and date;

2. Author's (authors') surname, name, middle name, academic degree and status, work place, and position;

3. Information about the griffe;

4. The name of a course and SES, with its code according to the list of curriculums, on which the manuscript is based;

5. Structure and content evaluation, correspondence of the manuscript content to SES, and the exemplary course programme;

6. New ideas and singularity and continuity of the content;

7. Correspondence to up-to-date science development;

8. The level of practical questions discussed and their topicality;

9. The methodical level of material and the adaptation to information technologies;

10. The level of psychological and teaching requirements to the content and design of the textbook;

11. Suitability (or non-suitability) of accreditation;

12. Information about the editor's remarks;

13. Information about the reviewers and their remarks;

14. Suggested content of a griffe.

The form of expert conclusion can be free or can contain the answers to the listed questions.

The expert conclusion can include the remarks and recommendations to correct them, and also the conditions under which the griffe can be received. It is

signed by the expert (experts) denoting their position, academic degree, academic title, name, surname and middle name, and then it is examined by a committee or board of the education and methodic council and then signed by the manager or by the management of EMU.

5. THE METHODOLOGY OF MOAC INTEGRATION

The methodology of MOAC validation and integration into IT curriculums is the key result of the project between EMU and Microsoft. This methodology includes traditional Russian education procedures, which are adapted and upgraded for chosen education and methodical literature, based on the competency approach and textual-based methods.

This methodology approbation is executed on the basis of the textbook, *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment (70-290)*. The courses, based on this textbook, were the most popular among the participants of the Microsoft IT Academy in the IT field. It consists of the following stages:

- Experimental usage of the textbook;
- The analysis of the IT curriculum and courses for the opportunity to introduce the methodical study aids:
  - Selecting educational courses and curriculum;
  - Developing competency models of the chosen courses and curriculums;
  - Developing the MOAC competency model;
  - Comparing competency models and generating the list of corresponding IT curriculum and courses;
- The analysis of the textbook to match with the requirements of the HE and the conditions of the official accreditation (griffe):
  - Selecting the accreditation (griffe) variant;
  - Defining of the necessary revisions;
- Editing and adding to the textbook;
- Reviewing, examining, and obtaining an accreditation (griffe):
  - Selecting candidates for reviewing;
  - Writing and submitting of reviews;
  - Preparing recommendations from academic councils;

- Presenting the official documents to the Educational and Methodological Union (EMU);
- Eliminating the remarks and obtaining the griffe;

- Introduction of the textbook into an existing educational programme (curriculum):
  - Estimating the workload of textbook study;
  - Crediting of educational modules within the limits of the curriculum;
  - Developing educational tracks (pathways);
  - Preparing recommendations from the EMU.

5.1 Experimental usage of MOAC

According to the requirements for validation to get the approval and education and methodical status of methodical researches for materials, it is necessary to approbate, to get positive experience and experimental usage of the materials in the educational process of one or more national universities.

To get this experience for MOAC, materials can be used for teaching students within the framework of the Microsoft IT Academy. To get accreditation, the recommendation of the academic council of one university is enough, but to get better practical experience and ensure the high quality of Microsoft education and methodic researches assurance, it is better to present the recommendations of more than one university or to attach to the documents a list of successful introductions.

The chosen textbook was approved by some universities. One of them was the Bauman Moscow State Technical University. This textbook was used as the basis of an *Automated Systems* sub-faculty in two courses with 50 students of intramural and 10 students of extramural forms of education in 2006.

The approbation results were considered by the sub-faculty and were accepted as successful and the textbook is recommended for accreditation to EMU. Positive experience in usage of the textbook for a concrete course gives the opportunity to use it under the framework of other IT curriculums.

5.2 Selecting courses and curriculums

For validation it is necessary to choose concrete courses and curriculums, within the framework in which they will be used. In the framework of the project, two directions were chosen. They are “Informatics and computer science” (230100) and “Information systems” (23200), within the framework of which bachelors, masters, and engineers for 12 different curriculums are prepared.

The choice of the courses should satisfy the following criteria:

- Prepare a full list of IT courses for the chosen curriculum;
- Prepare the sample from SES with the short description of the courses;
- Classify the courses by name and content (based on the SES);
- Select the courses;
- Research the necessary normative documents (exemplary or working course programme).

More than 80 courses, which have a connection with ICT, were detected during the SES curriculum analysis. It is necessary to mention that different courses in different SESs may have the same names but different content and hour workload.

The competency models and the method of content comparison can be used to choose the course. The first method is aimed at the modern tendencies in the educational sphere: federal SES structure, knowledge management technology, and using competency models to solve other problems.

The second method is more simple and traditional. It assumes the comparison of the textbook and the documents, describing the course (SES and ECP). There are the following types of comparison:

- Full or part correspondence of the course’s and textbook’s names;
- Full or part correspondence of the textbook’s name with one or more sections of a course on the SES or ECP basis;
- Full or part correspondence of the course’s name with one or more sections of a textbook;

- Full or part correspondence of the course and the textbook sections.

5.2.1 Comparison of courses' and textbooks' titles

Before the comparison of the names is undertaken to identify the list of possible synonyms and semantic equivalents, the words connected with the textbook series and the number of the textbook should be excluded. The results are shown in Table 5.

Table 5. Semantic equivalents of a textbook's names construction

Key terms of a name	Semantic equivalents
Managing and maintaining the environment	Management, administration, installation, configuration, technical support, maintaining, exploitation, service
Environment	Information system, network, network connections, IT infrastructure, IT system, IT resources, technical and program support.
Microsoft Windows Server 2003	Operating system (OS), information system, Server OS, network OS, server management system, system software.

In the process of comparison, of five courses (of eight courses, taking into account different SESs) were chosen for further research (see Table 6).

Table 6. List of the courses

Code	Curriculum name	hours
230100	Operating systems	130
230101, 230102, 230104, 230105	Operating systems	130
230200, 230201, 230202, 230203, 230204	Operating systems	102
230201	Administration information systems	102
230101	System software	170
230102	System software	100
230200	Architecture of modern information systems	100
230204	Design and exploitation of information systems in media industry	102

"Architecture of modern information systems" (SES 230200) and "Design and exploitation of information systems in media industry" (SES 230204) were excluded from the list on the basis of their detailed descriptions.

5.2.2 Comparison of courses' and textbooks' sections

The comparison procedure for courses' and textbooks' sections (subjects and topics) is the same as the procedure for names comparison, but it is more complicated, because more comparisons should be done. It is better to automate this process with the help of the standard context browser tool in the text editor or in the internet browser. In the case of textbook retrieval, it is better to use the content and subject indexes of the textbook. In the long term, existing methods of comparison can be used or new ones could be developed.

This procedure can be used in the following cases:

- No discernible correspondence between the names of the textbook and a course;
- The textbook has a module structure;
- There is aim to maximize the quantity of the courses (for example, to unify the technologies used in the educational process and minimize the costs for licensees).

Except for the listed reasons, the necessity for detailed comparison can be determined by the level of correspondence of a textbook and the course content.

If the textbook contains all necessary topics of the course in accordance with SES and ECP, the textbook can be recommended for accreditation. Table 7 shows the example of a fragment of the content comparison of the "Administration information systems" course with the topics of *MOAC Managing and Maintaining a Microsoft Windows Server 2003 Environment*.

Table 7. Comparison of the topics

Fragment of the course content	Section (chapter, page)
Functions and procedures of administration	
▪ IS installation	▪ Chapter 1. Introducing Microsoft Windows Server 2003; ▪ Installing Windows Server 2003 (p. 23); ▪ Configuring Windows Server 2003 (p. 34); ▪ Creating a domain controller (p. 36).
▪ Exploiting and maintaining IS	▪ Practically all sections of the book; for example, Part I - Managing and Maintaining the Operating System
▪ Operational managing and regulation works	▪ Chapter 3. Monitoring Windows Server 2003
▪ Managing and maintaining hardware devices	▪ Chapter 10. Working with printers; ▪ Chapter 11. Managing device drivers; ▪ Chapter 12. Managing disk storage.
Administration methods	
▪ Creating databases for administration	▪ Chapter 1.Introducing Microsoft Windows Server 2003. Section Introducing Active Directory ▪ Chapter 4. Backing up and restoring data, section of Backup catalogue.
▪ Programming in administration systems	▪ Chapter 6. Working with user accounts (creating user objects with Dsadd.exe); ▪ Chapter 7. Working with groups (automating group management).

5.3 Developing competency models

The textual-based method of competency model construction is based on the usage of electronic versions of textbooks, normative/regulatory documents, professional magazines, and any other textual sources. Depending on the level of methodical processing of the material, the method for design competency models can be based on:

- methodical instructions in the text,

- analysis of the structure and metadescriptions,
- detailed analysis of the content.

The first way is the simplest one and assumes that the authors of the material have written their content for competency selection; that's why the material can merely be summarized and presented in the form of the chosen model. Examples are qualification characteristics of a graduate, qualification requirements, and goals and objectives of the textbook's section.

The second way consists of two stages. In the first stage, the model of the subject area is constructed in the form of tree of notions, thesaurus, or ontology on the basis of the name, annotation, alphabetic index, or any other structural description of the material. In the second stage, high-level elements of the model are used to make short competency descriptions, and others – for elements formulation of the competency.

The third way is the most complicated and is useful when metadescriptions reflect the material or the content of the material is insufficient or incomplete. To solve these problems, the subjective analysis method[4] is recommended, because the detailed textual-based model has big dimensions and is not well defined.

5.3.1 Competency model of SES course

The competency model of SES should be based on the *Requirements for the minimum of BC content* section. For each course, the main terms, notions, functions, problems, methods, algorithms, examples, and other questions connected with determined subject area are listed (see Table 8.).

The specific nature of the SES is that the necessary level of the depth of course mastering and elaboration of some points are defined by a university. That's why it is difficult to define the level of competency based on the SES description.

[4] Within the framework of the subjective method, experts are involved for learning the materials and estimating the models or deepness of the content.

Table 8. Example of the requirements for the compulsory minimum of BC content of the course

Index	The name of the course and the main sections	hours
SD.03	*Administration information systems* Functions, procedures and services for administration; objects for administration, program structure; methods for administration. Configuration managing service, characteristics, errors, registrations and safety control; management service of common use, information service, intellectual service, registration , selection and data processing service, planning and development service; exploitation and support of information systems; installation of IS. Efficient management and regular support activities; managing and maintaining hardware devices; hardware and software for administration; information systems for administration; database preparation for administration; programming in the systems for administration; the examples of systems for administration.	102

The simplest variant of the SES competency model is the usage of the names of the courses for names of the competency, and the requirements of them, for the description of the competency. The most complicated method is the preparation of the structure of the requirements for a course and the development of different levels of competencies and their indicators. After this tree of requirements will be the following:

- Administration information systems
    - Objects for administration:
        - Hardware and software platforms for administration;
        - Information systems for administration;
        - Program system structure for administration;
    - Examples of systems for administration;
    - Administration services:
        - Configuration management services,
        - Management characteristics services,
        - Managing troubleshooting services,
        - Registration and safety management services,
        - Management of common use services;
        - Information services;
        - Intellectual services;
        - Registration, selection and data processing services;

        - Planning and developing services;
    - Functions and procedures of administration:
        - Installing IS;
        - Exploitation and maintenance of IS;
        - Effective management and regular support activities;
        - Management and maintenance of hardware devices;
    - Administration methods:
        - Database preparation for administration;
        - Programming in the administration systems.

On the one hand, it is seen that the course is aimed at the development of different competencies in the fields of programming, databases, safety, intellectual systems, hardware and software means, systems and configurations control, etc. On the other hand, the course does not assume the acquisition of the listed competencies in full volume but ties them to specific, applied development in IS administration. That's why it is useful not to increase the number of competencies, but to accept them as the component of the common competency (see Table 9).

Table 9. Example of preparing competency on the basis of the SES competency description

Competency identifiers	
Name of the course	IS Administration
Short description	Competency in the field of objects, services, functions, procedures and methods of IS administration
Competency elements (indicators)	
Knowledge	▪ Hardware and software platforms for administration; ▪ Information administration systems (SA); ▪ Program structure of SA; ▪ Examples of SA; ▪ Management service of SA configuration; ▪ Maintaining services of SA characteristics; ▪ Management services of SA troubleshooting; ▪ Registration and safety services of SA;

	▪ Management services of SA common use; ▪ SA information services; ▪ SA intellectual services; ▪ Registration, collection and data processing SA services; ▪ Planning and development SA services.
Know-how, Skills	▪ Installing IS; ▪ Exploiting and maintaining IS; ▪ Managing and regularly supporting the activity; ▪ Managing and maintaining hardware devices; ▪ Using the administration methods; ▪ Working with administration databases; ▪ Programming in SA.

5.3.2 Competency model of the exemplary course programme

The exemplary course programme (ECP) includes more detailed information in comparison with the SES description and is constructed in such a way that the detailed course (competency) content gathering goes though four stages:

- Course goals;
- Course objectives;
- Intended learning outcomes;
- Course content.

Preparing a detailed competency model. The content of the competency sections should meet the SES requirement, that's why the preparation of the competency model on the SES requirement basis should be made in the same way described in section 5.3.1[5]. If there is a competency model, that is recommended as the basis, to check it for conformity to APS and to evaluate the subject area structure that was previously made. During this process the following difficulties can appear:

[5] The difference consists of the possibility of more detailed and wide description of competency content.

- APS does not include some SES requirements,
- The content of some sections is not described completely,
- The combination of subjects and questions do not allow classification them and representation in the module.

The first difficulty should not be taken into account if the course, which is approved by the appropriate organizations, is taken for the basis for competency model preparation. Some programme aspects may be described in other course sections such as *Practical work (labs)*, *intended learning outcomes,* etc. If the programme is not approved, it is better to use SES requirements if there are paradoxical questions.

Uneven description and specific distribution of topics cannot be taken into account as a crucial factor, because according to normative documents a university can select the deepness of course learning and the teaching methodic by itself.

To prepare competency elements (indicators) it is necessary to look at the *Practical work (labs)* section, which describes the received practical skills.

Preparing a high-level competency model. To form a short description of a competency, the *Goals and objectives* section can be used. To identify indicators (elements) of competencies, the *intended learning outcomes* section, which is usually formed using the KKS scheme, should be taken into account[6].

For example, consider the high-level competency model, *"Administration information systems,"* which is recommended by the Russian Ministry of Education and Science for preparation of diploma specialists in the field of information systems in 2001 (see Table 10).

[6] In some cases some subjects of the courses can be used as the indicators.

Table 10. High-level competency model "Administration information systems"

Goals and objectives of the course	Short description of the competency
The goals of the course are the introduction *to the working principles of administration systems* and managing information systems, learning *the program structure*, and *common and special functions of administration management procedures.*	Competency in the field of the working principles, program structure, functions, creation and evaluation of SA characteristics in different subject areas; common and special procedures of administration management
The objectives of the course are to identify the place of processes and the techniques among other technical systems, *to create systems in different subject areas, and to estimate their characteristics.*	
Intended learning outcomes	**Competency elements (indicators)**
To know the principles of system administration construction and management, the program structure, protocols and services, informational database management, and modern methods and means of developing such systems.	*Knowledge:* ▪ The principles of construction of systems administration and management; ▪ Program structure of SA; ▪ SA protocols and services; ▪ Informational database management; ▪ Modern methods and means of developing such systems.
Know how to use the methods of modeling for selecting the SA structure and management, and methods and means of informational and telecommunication technologies.	*Know-how:* ▪ To model and evaluate the structure of SA and management; ▪ Use the methods and means of informational and telecommunication technologies.
Gain experience in preparing such systems, selecting the architecture and interconnecting of program and hardware means for administration and IS management.	*Skills:* ▪ SA designing; ▪ Selection of SA structure; ▪ Interconnecting of program and hardware means for administration and IS management; ▪ Management in IS.

5.3.3 MOAC Competency model

For preparation of the MOAC competency model all means listed in the beginning of section 5.2 can be used, because MOAC has good education and methodic examination. Table 11 shows the recommended implementation of MOAC sections for different variants and stages of competency model design.

Table 11. The recommended implementation of MOAC sections.

Typical MOAC sections	Recommended implementation
Target audience	Initial competencies
Requirements to the listeners	
The Microsoft certified professional programmes	
Goals and objectives of the section (fragment "Upon completion of this chapter, you will be able to: …)	Target competencies
Some chapters (for example, "the skills of a qualified specialist for technical support", "positions and requirements" and etc.[7])	
Exercises	A detailed view of the practical skills of target competencies
Review questions[8]	
Case scenarios	
Summary	High-level of the subject area
Conclusion	
Content	
Glossary	Detailed model of subject area, detailed view of theoretical knowledge and know-how, target competencies
Index	
Content at a glance	
Correspondence of the sections of a textbook to the requirements of the certificate exams.	Connection with the competency models of Microsoft specialists.

The analysis of some MOACs has shown that the *Goals and Objectives of a chapter* section has a more detailed description in comparison with the *Content*

[7] Such topics can be found only in some editions. The examples are taken from "MOAC: Supporting users and troubleshooting of a Microsoft Windows XP operating system (70-271).
[8] Most MOAC questions are aimed at the estimation of the specific practical skills.

fragment and is better to use for the target competencies description. But its definitions usually are connected with know-how and skills, rarely with knowledge. This problem appears from the Microsoft official courses (MOC), which are aimed at the training of practical skills. The fragment from the *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment (70-290)* is given as an example (see Table 12).

Table 12. The comparison of the content and the sections of the *Goals and Objectives...*

Name of the chapter	Fragment of the content	Goals and objectives of the chapter sections (fragment you can …)
Administering Windows Server 2003	▪ Using Microsoft Management Console (MMC); ▪ Managing services with remote desktop for administration ▪ Using remote assistance	▪ Using the MMC interface; ▪ Creating customized MMC consoles; ▪ Administrate local and remote computers with the help of MMC; ▪ Terminal Services troubleshooting; ▪ Installing and configuring remote desktop connection; ▪ Using remote assistance; ▪ Enabling remote assistance.
Monitoring Windows Server 2003	▪ Server monitoring practices; ▪ Using Event Viewer; ▪ Using Task Manager; ▪ Using the Performance console.	▪ Event Viewer Logs; ▪ Monitoring performance level; ▪ Using System Monitor; ▪ Using Performance logs and alerts.

The primary competency model of *MOAC: Managing and Maintaining a Microsoft Windows Server 2003* is based on the "Goals and objectives" chapter and their fragments, "learning the materials of this chapter you will be able to…"

Table 13. The primary competency model of *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment*

Name of the chapter	Competency indicators (know-how, skills)
Introducing Microsoft Windows Server 2003	▪ Identify the key differences among the Windows Server 2003 editions; ▪ Install Windows Server 2003; ▪ Create a domain controller; ▪ Identify the logical components and concept of Active Directory.
Administering Windows Server 2003	▪ Use a preconfigured MMC console; ▪ Create a new MMC console; ▪ Administer both local and remote computers using an MMC console; ▪ Troubleshoot Terminal Services; ▪ Configure a server to enable remote desktop for administration; ▪ Enable a computer to accept requests for remote assistance; ▪ Use one of the available methods to request and establish a Remote Assistance.
Monitoring Windows Server 2003	▪ Use Event Viewer to monitor system logs ▪ Configure Task Manager to display performance data ▪ Use System Monitor to display real-time performance data ▪ Create counter logs and alerts.
Backing up and restoring data	▪ Describe various types of hardware used to perform backups; ▪ Understand the capabilities of network backup software products; ▪ Understand the difference between full, incremental, and differential backup jobs; ▪ List the capabilities of the Microsoft Windows Server 2003 backup programs; ▪ Backup and restore an Active Directory database; ▪ Use volume shadow copies.
Managing the operating system	▪ Understand the difference between service packs and hot-fixes; ▪ Deploy service packs using Windows Update, Automatic Updates, and group policies; ▪ Integrate service packs and hot-fixes into a Windows Server

Name of the chapter	Competency indicators (know-how, skills)
	2003 operating system installation; ▪ Use Microsoft Baseline Security Analyzer; ▪ Install and configure a Microsoft Software Update Services server; ▪ Understand Per Server and Per Device or Per User licensing modes; ▪ Configure licenses using the Choose Licensing Mode tool in Control Panel and the Licensing; ▪ Licensing administrative tool; ▪ Create license groups.
Working with user accounts	▪ Understand the differences between local user accounts and domain user accounts; ▪ Plan user account creation; ▪ Create and manage local user accounts; ▪ Create and manage domain user accounts; ▪ Create and manage user accounts with templates, importation, and command-line tools; ▪ Manage user profiles; ▪ Understand the differences between local, roaming, and mandatory profiles; ▪ Troubleshoot user authentication issues.
Working with groups	▪ Understand the functions of groups and how to use them; ▪ Understand the difference between local groups and domain groups; ▪ Identify the two group types and three group scopes and their proper use; ▪ List the predefined and built-in groups included in Microsoft Windows Server 2003; ▪ Understand the difference between groups and special identities; ▪ Create, manage, and delete groups.
Working with computer accounts	▪ Describe the process of adding a computer to an Active Directory domain; ▪ Create and manage computer objects; ▪ Troubleshoot computer accounts.

Name of the chapter	Competency indicators (know-how, skills)
Sharing file system resources	▪ Create and manage file system shares and work with share permissions; ▪ Use NTFS file system permissions to control access to files; ▪ Manage file sharing using Microsoft Internet Information Services (IIS).
Working with printers	▪ Understand the model and terminology used for Windows printing; ▪ Install a logical printer on a print server; ▪ Prepare a print server to host clients; ▪ Connect a printer client to a logical printer on a print server; ▪ Manage print queues and printer properties; ▪ Troubleshoot printer failures.
Managing device drivers	▪ Understand the relationship between hardware devices and drivers; ▪ Install a device driver; ▪ Use Device Manager to view and manage hardware devices and their device drivers; ▪ Troubleshoot device driver problems.
Managing disk storage	▪ Understand disk storage concepts and terminology; ▪ Distinguish between basic and dynamic storage; ▪ Identify the types of storage volumes supported on Windows Server 2003 managed disks; ▪ Identify the best RAID implementation given a particular storage requirement, in terms of capacity utilization, fault tolerance, and performance; ▪ Add storage to a Windows Server 2003 computer; ▪ Manage disks using Check Disk, Disk Defragmenter, and disk quotas.

Some competencies are developed on the basis of the textbook. They are the following:

Managing and Maintaining a Microsoft Windows Server 2003. *The competency is in the field of installation, administering, monitoring, supporting; back-*

ing up and recovering data; working with user accounts and computer accounts, groups accounts and printer accounts; configuring access to file system resources; management of device drivers and disk storage of OS Microsoft Windows Server.

Because of the division of indicators into two groups, the structured competency model has been developed, which is represented in Table 14.

Table 14 The structured competency model of the MOAC textbook *MOAC*: *Managing and Maintaining a Microsoft Windows Server 2003 Environment*

Competency name	Horizon/knowledge	Know-how/Skills
Installing Microsoft Windows Server 2003	▪ Identify the key differences among the Windows Server 2003 editions; ▪ Identify the logical components and the concept of Active Directory.	▪ Install Windows Server 2003; ▪ Create a domain controller.
Administering Windows Server 2003		▪ Use a preconfigured MMC console; ▪ Create a new MMC console; ▪ Administer both local and remote computers using MMC; ▪ Troubleshoot Terminal Services; ▪ Configure a server to enable remote desktop of administration; ▪ Enable a computer to accept requests for remote assistance; ▪ Use one of the available methods to request and establish a Remote Assistance.
Monitoring Windows Server 2003		▪ Use Event Viewer to monitor system logs; ▪ Configure Task Manager to display performance data; ▪ Use System Monitor to display

Competency name	Horizon/knowledge	Know-how/Skills
		real-time performance data; ▪ Create counter logs and alerts.
Backing up and restoring data	▪ Describe various types of hardware used to perform backup; ▪ Understand the capabilities of network backup software products; ▪ Understand the difference between full, incremental, and differential backup jobs; ▪ List the possibilities of the Microsoft Windows Server 2003 backup programs.	▪ Back up and restore an Active Directory database; ▪ Use volume shadow copies.
Managing the operating system	▪ Understand the differences between service packs and hotfixes; ▪ Understand Per Server and Per Device licensing models.	▪ Deploy service packs using Windows Update, Automatic Updates, and group policies; ▪ Integrate service packs and hotfixes into a Windows Server 2003 operating system installation; ▪ Use Microsoft Baseline Security Analyzer; ▪ Install and configure a Microsoft Software Update Services server; ▪ Configure licenses using the Choose Licensing Mode tool in Control Panel and Licensing; ▪ Create license groups.
Working with user accounts	▪ Understand the differences between the local users accounts and domain user accounts; ▪ Understand the differences between local, roaming, and man-	▪ Plan user accounts; ▪ Create and manage local user accounts; ▪ Create and manage domain user accounts;

Competency name	Horizon/knowledge	Know-how/Skills
	datory profiles.	▪ Create and manage user accounts with templates, importation, and command line tools; ▪ Manage user profiles; ▪ Troubleshoot user authentication issues.
Working with groups	▪ Understand the functions of groups and how to use them; ▪ Understand the difference between the local groups and domain groups; ▪ Identify two types and three group scores and their proper use ▪ List the predefined and built-in groups included in Microsoft Windows Server 2003; ▪ Understand the differences between groups and special identities;	▪ Create, manage, and delete groups.
Working with computer accounts	▪ Describe the process of adding to an Active Directory domain.	▪ Create and manage computer objects; ▪ Troubleshoot computer accounts.
Sharing file system resources		▪ Create and manage file system shares and work with share permissions; ▪ Use NTFS file system permissions to control access to files; ▪ Manage file sharing using Microsoft Internet Information Services (IIS).
Working with printers	▪ Understand the model and terminology used for Windows	▪ Install a logical printer on a print server;

Competency name	Horizon/knowledge	Know-how/Skills
	printing	▪ Prepare a print server to host clients; ▪ Connect a printer client to a logical printer on a print server; ▪ Manage print queues and printer properties; ▪ Troubleshoot printer failures.
Managing device drivers	▪ Understand the relationship between hardware devices and drivers.	▪ Install device drivers; ▪ Use Device Manager to view and manage hardware devices and their device drivers; ▪ Troubleshoot device driver problems.
Managing disk storage	▪ Understand disk storage concepts and terminology; ▪ Understand the difference between base and dynamic storage; ▪ Identify the types of storage volumes supported on Windows Server 2003 managed disks.	▪ Identify the best RAID implementation given a particular storage requirement, in terms of capacity utilization, fault tolerance, and performance; ▪ Add storage to a Windows Server 2003 computer; ▪ Manage disks using Check Disk, Disk Defragmenter, and disk quotas.

5.3.4 Comparison of competency models

To evaluate the comparability of the course programme and the textbook, two main approaches can be used. They are the comparison of the content and the competency models. When the competency model is created from the content, then the results of both approaches will be equal.

In Table 15, the example of the comparison of MOAC and the "Administration in information technologies" course is considered. The comparison of competency models (Table 16) shows that the MOAC textbook corresponds with the SES

description by more than 80% and with “IS administration” by more than 50%. It should be mentioned that the depth of the subject description does not correspond to the traditional teaching level of engineer courses, because it does not consider the aspects of implementation, design, development, and scientific problems.

It is not necessary to determine the correspondence of the content of the textbook to the topics (sections) of the course as is shown in Table 16. It is enough to list sections, the competency, or its components, which are considered in the textbook.

Table 15. Comparison of competency models

	SES	ECP	MOAC
Short description	Competencies in the field of objects, services, functions, procedures and methods of IS administration.	Competency in the field of work principles, program structure, functions, construction and evaluation of system administration characteristics in the field of different subject areas, special and common procedures of administration service	Competency in the field of installation, administering, monitoring, servicing, backing up and restoring data, working with user accounts and computer accounts, group accounts and printer accounts. Configuring access to file system recourses; drivers and disk storage management in OS of Microsoft Windows Server 2003
Knowledge	▪ Hardware and software platforms for administration; ▪ Information systems for administration (SA); ▪ Program structure of SA; ▪ Examples of SA; ▪ Management service	▪ Construction principles of SA and management of them; ▪ Program structure of SA; ▪ Protocols and services of SA; ▪ Information database for management; ▪ Mutual methods and	▪ Key differences among Windows Server 2003 editions; ▪ Logical components and concepts of Active Directory ▪ Types of hardware used to perform backups; ▪ Capabilities of program products used for network backup; ▪ Differences between full, incremental and differential backup jobs; ▪ Capabilities of backup Windows Server 2003 backup programs; ▪ Difference between service packs and hot-fixes; ▪ Differences between Per Server, Per Device and Per User licensing models; ▪ Differences between local user accounts and domain user accounts. ▪ Understand the differences between local, roaming, and mandatory profiles;

	SES	ECP	MOAC
	for SA configuration ▪ Control services for SA characteristics; ▪ Control services for troubleshooting SA; ▪ Registration and SA safeguards; ▪ Managing shared files of SA; ▪ Information services of SA; ▪ Intellectual services of SA; ▪ Registration, selection and data processing services of SA; ▪ Planning and developing services of SA.	tools of development of SA.	▪ Understand the functions of groups and how to use them; ▪ Difference between local groups and domain groups; ▪ Two group types and tree group scopes and their proper use; ▪ The list the predefined and built-in groups in Microsoft Windows Server 2003; ▪ Difference between groups and special identifiers; ▪ The process of adding a computer to an Active Directory domain; ▪ The model and terminology used for Windows printing ; ▪ Relationship between hardware devices and drivers; ▪ Disk storage concepts and terminology; ▪ Identify the types of storage volumes supported on Windows Server 2003 managed disks.
Know-how	▪ Install IS;	▪ Model and evaluate the	▪ Install Windows Server 2003;

	SES	ECP	MOAC
	▪ Explore and maintain IS; ▪ Manage and regulate works; ▪ Manage and maintain hardware devices;	administration and management structures; ▪ Use methods and means of informational and telecommunication technologies in SA purpose.	▪ Create a domain controller; ▪ Use a preconfigured MMC console; ▪ Create a new MMC console; ▪ Administer both local and remote computers using an MMC console; ▪ Troubleshoot Terminal Services; ▪ Configure a server to enable remote desktop for administration; ▪ Enable a computer to accept requests for remote assistance;
Skills	▪ Use administration methods; ▪ Work with database for administration; ▪ Programming in SA.	▪ Project SA; ▪ Select of SA architecture; ▪ Complexity of hardware and software devices for administration; ▪ Managing Information systems.	▪ Use one of the available methods to request and establish a Remote Assistance; ▪ Use Event Viewer to monitor system logs; ▪ Configure Task Manager to display performance data; ▪ Use System Monitor to display real-time performance data; ▪ Create counter logs and alerts. ▪ Backup and restore an Active Directory; ▪ Use volume shadow copies. ▪ Deploy service packs using Windows Updates, Automatic Updates, and group policies; ▪ Use Microsoft Baseline Security Analyzer; ▪ Install and configure a Microsoft Software Update Services server (SUS); ▪ Configure licenses using the Choose Licensing Mode tool in Control Panel and the Licensing; ▪ Create license groups.

	SES	ECP	MOAC
			▪ Plan user accounts; ▪ Create and manage local user accounts; ▪ Create and manage domain user accounts; ▪ Create and manage user accounts with templates, importation, and command line tools; ▪ Manage user profiles; ▪ Troubleshoot user authentication issues; ▪ Create, manage, and delete groups; ▪ Create and manage computer objects; ▪ Troubleshoot computer accounts; ▪ Create and manage file system shares and work with share permission; ▪ Use NTFS file system permissions to control access to files; ▪ Manage file sharing using Microsoft Internet Information Services (IIS); ▪ Install a logical printer on a printer server; ▪ Prepare a print server to host clients; ▪ Connect a printer client to a logical printer on a print server; ▪ Manage print requests and printers properties. ▪ Troubleshoot printer failures; ▪ Install device drivers. ▪ Use Device Manager to view and manage hardware devices and their device drivers;

	SES	ECP	MOAC
			▪ Troubleshoot device driver problems; ▪ Identify the best RAID implementation given a particular storage requirement, in terms of capacity utilization, fault tolerance, and performance; ▪ Add storage to a Windows Server 2003 computer; ▪ Manage disks using Check Disk, Disk Defragmenter and disks quotas.

Table 16. Comparison of sections of the "Administration in information technologies" course and *MOAC: Managing and Maintaining a Microsoft Server 2003 Environment*

Fragment of the content of the course	Section, chapter (pages)
Functions and procedures of administration	
▪ Installation of IS;	▪ Chapter 1. Introducing Microsoft Windows Server 2003 ▪ Installing Windows Server 2003 (p. 23.) ▪ Configuring Windows Server 2003 (p. 34) ▪ Creating a domain controller (p. 36)
▪ Exploitation and maintenance of IS;	▪ Practically all sections of the textbook, for example Part I. Managing and Maintaining the Operating System
▪ Operational management and regulation works;	▪ Chapter 3. Monitoring Windows Server 2003
▪ Managing and maintaining devices	▪ Chapter 10. Working with printers ▪ Chapter 11. Managing device drivers ▪ Chapter 12. Managing disk storage
Administration methods:	
▪ Database creation for administration	▪ Chapter 1. Introducing Microsoft Windows Server 2003 Section: An Active Directory primer ▪ Chapter 4. Backing up and restoring data
▪ Programming in systems for administration	▪ Creation of packet files and the download scenarios ▪ Chapter 6. Working with user accounts (modifying user objects with Dsadd.exe) ▪ Chapter 7. Working with groups (automating group management)

5.4 Textbook analysis for conformity of validation conditions

Taking into account that this edition is recommended for accreditation for the first time and does not cover all competencies of chosen courses, to introduce and actively use *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment*, which is used for preparation of students for IT curriculum, the following griffe variant was chosen: "***Accredited*** *by the Educational and Methodical Union of Polytechnic University Education in Russia to use* ***the textbook*** *for*

the students of higher educational institutions taught for 230100 "Informatics and computer science" and 230200 "Information systems" curriculums.

The preliminary griffe, which shows the successful approbation of the textbook in the educational process, was chosen. It is the griffe of the *information processing systems and management* sub-faculty, which is included in the *Informatics and management systems* faculty of the Bauman Moscow State Technical University.

5.4.1 Determination of the volume and structure of necessary improvements

A lot of disadvantages or possibilities for improvement can be found by detailed examination of any textbook, but it is better to eliminate or implement only some of them. Only bad mistakes should be eliminated, and the volume of necessary improvements of the textbook is determined by minimal requirements for accreditation (validation).

Requirements for the textbook content and the volume of the improvement depend on the edition positioning. The more courses it should cover, the more students it is intended to teach, the higher the requirements to be set for this edition.

MOAC is made on a high educational and methodical level and it represents the best practice in the field of vendor education for the information technology realm. It has wide methodical apparatus: alphabetic indexes, a terminology thesaurus, case studies, tests, etc. Within the framework of the electronic enclosure, a computer encyclopedia that covers the subject and is good help assistance, is distributed.

It will be difficult to make corrections in the text, because there is a copyright law, which assumes the endorsement of corrections in original text with authors and the Microsoft Corporation, which has the property rights and implements the international distributional policy for MOAC.

5.4.2 A typical structure of the MOAC textbook

Microsoft Official Academic Course (MOAC) represents the educational and methodical complex, which includes:

- Textbook,
- Lab Manual,
- CD, which includes:
    - Preliminary exam questions and test software;
    - Files, which are necessary for making labs;
    - Software, which is necessary to read the documents and presentations and make the exercises;
    - Other materials.

The textbook for different MOACs has a typical structure that includes:

- A description of the target audience for the textbook, which includes a description of the sections *"target audience"* and *"prerequisites."* The *"Course coverage of exam objectives"* section describes the connection of the textbook with certification programmes and requirements for the applicants.
- In each chapter, the following points are determined:
    - Goals and objectives (target competencies);
    - Contents at a glance;
    - Different types of remarks, which include additional information, cautions and recommendations for labs;
    - Practice, which allows preparation for more difficult laboratory work;
    - Exercises for independent work;
    - Review questions;
    - A summary, in which short results and main conclusions are described;

        - Case scenarios, which allow analysis of real situations to implement received knowledge and skills practically;
    - Glossary;
    - Correspondence of the textbook sections to requirements of certificate exams;
    - Contents and alphabetic index.

5.4.3 The typical MOAC disadvantages and methods to address them

The following disadvantages were determined during the analysis of *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment*:

- Undefined and conflicting position of the textbook concerning the target audience.
- Not sufficient quantity of schemes and visuals describing difficult questions of structure, functioning, and configuring principles of operating system and hardware.
- Review questions have practical character and do not assist in mastering theoretical material.
- Most questions are oriented on successful realization of case studies; that's why explicit answers for them cannot be found in theoretical material (textbook).
- Because the book is oriented toward certificate exams, explicit levels of difficulties and detailed material are not highlighted. This leads to difficulties in highlighting by students the main principles from concrete details and help material, which duplicates software manuals.
- The module structure of the material's organization break consequence of introduction notions and definitions and models, which describe them, do not determine.
- There is no list of cited and recommended literature.
- There are slang words or emotional phrases, which are not typical for academic style in higher education textbooks.

- There are a lot of notes in the text about requirements to the exams, but they give little information, i.e. they do not allow students to "useful" or "useless" material for passing exams. All MOAC sections contain an index for "Correspondence of textbook sections to the prerequisites for taking certification exams."
- Illustrations (screens) in the textbooks are presented in English, which leads to difficulty in studying Russian versions and understanding translated notions.

To determine the volume and necessary revisions of selected textbook detailed analysis was made, in the process of which the list of remarks per page was made, which describes typical and other disadvantages.

5.5 Improvement of the textbook

There are few ways of removing disadvantages and improving the textbooks:

- *Add information to the textbook during preparation of a manuscript and original layout.* This approach is the most useful one for making a review copy for accreditation. But, as a rule, corrections are made by authors and it is difficult to connect them because of the translated character of the book. It is possible when corrections in view of the remarks can be made by a scientific editor or interpreter.
- *Preparation of additional illustrations, schemes, and comments.* This variant is useful in the case of a published textbook, but it is difficult to implement, because there are no footnotes in the original text.
- *Preparation of a chapter (or some chapters) that contains revisions of difficult fragments.* The difference from the mentioned variant is that the textbook is not supplemented with additional materials; the chapter remains in the structure and the style of its original, but it is fully revised

5.6 Obtaining the EMU griffe

5.6.1 Selecting the candidates for reviewing

Selecting the candidates for reviewing the textbook is the main stage of manuscript preparation for publishing and receiving a griffe. Reviewers of textbooks are not appointed, but they are selected by the author. The main requirements of reviewers are their competency and capability to criticize the manuscript constructively. Candidates should be authorities in the subject area and in publishing activity.

Reviewer's competency is usually connected with the following characteristics: academic status (academic degree and title), position, educational and pedagogical experience, popularity and authority in the educational and scientific community, professionalism, etc.

The first five characteristics are necessary for document preparation of reviews. Other reviewer's characteristics are not written in the documents and are meant for people, who are responsible for manuscript accreditation.

Responsible for making decisions about receiving griffes are experts or heads of the educational and methodical unions. They are experts in different subject areas, teachers with broad experience, and also organizers of educational and scientific works and educational process. They know or have access to information about the scientific and educational activity of their review colleagues. The resources of this information are printed along with electronic editions, license and universities' accreditation documents, etc.

More often, reviewers are doctors of science[9], professors, or heads of subfaculty, scientific or educational organization units. Sometimes there are reviewers from social organizations. As a rule, reviewers are authors of popular textbooks, monographs, scientific and technical research works.

The most important reviewer's characteristic is his professionalism, under which in this case the capability (possibility) to conduct a review is understood and considered all requirements of accreditation.

Reviewer's capability for constructive criticism of a manuscript is connected with the expected form of remarks on its content and presentation. More often constructive remarks are concrete ones, which can be accepted and implemented in the future. Concrete remarks are not only imperative statements, they contain logical explanation, are connected with typescript pagination, and include recommendations for possible revisions. During the review all remarks taken into account by reviewers are checked by authors of the manuscript.

5.6.2 Review preparation

Review preparation includes the following stages: writing, approval, and document preparation. There are two traditions within the framework of validating textbooks.

*The first tradition. The a*uthor of a manuscript writes the review template (preliminary variant) and approves it with the reviewer. This tradition has a theoretical basis; it does not contradict the creative process of writing educational work and can be met very often. In this case, the reviewer receives the manuscript and other documents necessary for data and document reviewing, and a review template. The approval process consists of text approbation and making changes.

When there are no corrections, the reviewer signs the review and confirms his signature. In this case, the author of a manuscript is responsible for the review quality, and the review's correspondence to the requirements depends on the au-

[9] In Russia Doctor of Science is the second scientific degree and is higher than Candidate of Science (the Russian equivalent of a Ph.D. degree).

thor's capability to "self-review." Review texts that were prepared under this traditional scheme have the following characteristics: there are no remarks, the author's style is used, and author's formal mistakes are not repeated. During expertise stage reviews, which are prepared under this tradition, these characteristics are taken into account formally or their minor importance is noted. Making changes in the review template has a positive influence on the text, and if there are remarks on the manuscript, it favors improvements.

The second tradition. The reviewer receives manuscripts and cover materials, which also include recommendations for reviewing the contents (called the "reviewer's memorandum"). In this case, review writing represents a creative process. Approval of review is the mutual creative work of the author and the reviewer, which is implemented in intramural, extramural or virtual forms. The aim of approval is to create the review's text, which will provide further steps toward accreditation and improvement. The most important question is the question about remarks, which have agreed forms, and to make the review text close to the recommended structure.

The remark problem appears in the results of the competency comparison of the subject of the textbook by the author and the reviewer, and when the reviewer does not accept the description form of the subject in the author's manuscript. A special feature of the remark problem is the context that is used for the positive opinion about the typescript publication and recommendations for accreditation (typescripts with negative reviews are not accepted for accreditation).

The solution to the remark problem consists of searching forms for acceptable formulations, focusing on addition, deletion and changing the text of the textbook. To make text close to the recommended structure (see above aspects, which are recommended to be mentioned in the review), the form of review should be found, which can satisfy the author of the manuscript and the reviewer and can be effectively used for further stages of accreditation.

Two forms of reviews are used: free and "formalized." The free form of the review represents text in a free order, which includes answers to the questions that

appear during the process of accreditation at the expertise stage. In a "formalized" review, the manuscript characteristics are presented by points according to a recommended list and define its structure.

5.7 Integration into curriculum

Curriculum contains descriptions of target competencies and requirements for management, realization, and provision of educational process and other components. Courses that contain obvious descriptions of the contents and study workload, the type of learning activities, and the final control form are the key element of the programmes according to educational standards (SES). A textbook usually fully corresponds the course (then it can be a textbook) or its section (sections). In general there is a common notion – the educational module, which implements education using a textbook[10].

To integrate the educational and methodical complex into a curriculum it is necessary to make two types of positioning:

- Determine the place of MOAC target competencies in the common specialist (bachelor, master) model;
- Estimate the workload of MOAC study (including the final control) and its distribution among types of learning activities.

In spite of the first factor playing a more important role than second one, in practice it is not taken into account, because:

- It is thought that the more hours are given to course, the more important it is and gives "bigger outcome effect";
- Financing of the educational process is made taking into account the hours quantity that were spent for preparation by the student, not the resulting competencies of graduates.

[10] A textbook can also correspond to some educational modules from different courses.

- In Russia, there is no course gradation system by difficulty level (for example, as in Great Britain) ,and payment for different types of learning activities is rarely differentiated.

5.7.1 Estimating workload of textbook study

To estimate the workload of textbook study it is necessary to work out the course syllabus, in which the hour workload will be determined and its division for self work and contact work, and also for lecture and labs components. Required information can be taken from existing and approved courses. For creation of a new syllabus two approaches can be used:

- Take into consideration SES requirements or the ECP description, and within the framework of existed requirements plan necessary types and volumes of learning activities. This variant is useful when the course is introduced in accordance with HE normative documents.
- Use for the basic syllabus description analogous courses from the MOC series[11]. This variant is recommended when a separately listed course (in full volume and according to Microsoft recommendations) is planned instead of a course (module) from basic curriculum.

Regarding the second approach, it should be mentioned that MOAC courses in comparison with MOC courses have the following distinctions:

- Some topics are described in a low level or are not described at all.
- The quantity of case studies and their difficulties are decreased;
- MOC courses do not presume time for self study of material;
- Students have limited possibilities for preparing practical material at home;
- It consumes more time to repeat material before the beginning of lectures. For example, MOC courses presume only half an hour per each day.

[11] In the MOAC edition analyzed here there is no syllabus with timing, but such syllabi can appear in further editions and can be taken for the basis.

- As a rule, at higher education levels 2 or 4 hours per day are spent for the exercise, that's why it requires a deviation from the norm or a working out of additional possibilities for labs.

Different approaches for calculation credits can be used in Russia, but it is better to focus on the *Methodology of calculating workload in credits in the basic curriculum of higher education* approved by the Russian Ministry of Education and Science. It is based on the usage of the following norms:

- One credit corresponds to 36 academic hours of common workload, in which an academic hour is 45 minutes long (or 27 astronomic hours).
- Maximum volume of educational workload is 54 academic hours per week, which corresponds to 1.5 credits.
- Workload calculation in credit represents the division of its workload in academic hours by 36 with rounding up by 0.5 using accepted rules.
- One practical work week corresponds to 1.5 credits.
- One semester exam corresponds to 1 credit (three days for preparation and one day for the exam).

To adapt this method to vendor education an analysis of Microsoft courses was made. The workload of MOC study is represented by astronomic hours, but one astronomic hour corresponds to 45 minutes of private work and 15 minutes of break. There are two ways of adjusting to the credit system:

- 1 hour of vendor education = 1 academic hour. Then a week's workload of 36-40 hours corresponds to one credit.
- 1 hour of vendor education = 1 astronomic hour. Then a week's workload of 40 hours corresponds to 1.5 credits.

Using the timing of MOC as a basis for workload calculation, the MOAC "lightness" should be taken into account (see section 5.7.1) and the first variant is preferable.

Other than the hours credit equivalent there are many other proposals for changing methodology calculation, one of which is the national credit linkage to the analogous European system, the European Credit Transfer System (ECTS). Taking into account all of this, it is recommended to credit educational models within the framework of HE using the following scheme:

1. Re-count of course hours (workload) into credits using the following formulas:
   - 40 hours = 1 credit;
   - 1 hour = 0.025 credit = 2.5 centicredits (ccr.).
2. During introduction into the educational programme (curriculum), it's necessary to take into account the requirements for a standardized total workload during a semester.

To estimate the workload of the textbook study time of Microsoft official educational courses (MOC), *Managing Microsoft Windows Server 2003 (2274)* and *Maintaining Microsoft Windows Server 2003 (2275)* should be used.

Table 17. Timing of MOC

№	Name of sections and courses	Total hour	Including	
			Lectures	Labs
1.	*Managing Microsoft Windows Server 2003*	*40*	*30*	*10*
1.1	Introduction to Administering Accounts and Resources	2	2	0
1.2	Managing User and Computer Accounts	4	3	1
1.3	Managing Groups	5	4	1
1.4	Managing Access to Resources	5	3	2
1.5	Implementing Printing	4	3	1
1.6	Managing Printing	5	4	1
1.7	Managing Access to Objects in Organizational Units	3	2	1
1.8	Implementing Group Policy	5	4	1
1.9	Managing the User Environment by Using Group Policy	4	3	1
1.10	Implementing Administrative Templates and Audit Policy	3	2	1
2.	*Maintaining Microsoft Windows Server 2003*	*24*	*18*	*6*

2.1	Preparing to Administer a Server	2	2	
2.2	Preparing to Monitor Server Performance	3	2	1
2.3	Monitoring Server Performance	4	3	1
2.4	Maintaining Device Drivers	2.5	2	0.5
2.5	Managing Disks	4	3	1
2.6	Managing Data Storage	2.5	2	0.5
2.7	Managing Disaster Recovery	3	2	1
2.8	Software Maintenance Using Windows Server Update Services	3	2	1
	Total	**64**	**48**	**16**

Table 18. Programme credit results of textbook study

№	Name of sections and courses	Total, CCR	Including	
			Lections	Labs
Managing Microsoft Windows Server 2003				
1.1	Introduction to Administering Accounts and Resources	5	5	0
1.2	Managing User and Computer Accounts	10	7.5	2.5
1.3	Managing Groups	12.5	10	2.5
1.4	Managing Access to Resources	12.5	7.5	5
1.5	Implementing Printing	10	7.5	2.5
1.6	Managing Printing	12.5	10	2.5
1.7	Managing Access to Objects in Organizational Units	7.5	5	2.5
1.8	Implementing Group Policy	12.5	10	2.5
1.9	Managing the User Environment by Using Group Policy	10	7.5	2.5
1.10	Implementing Administrative Templates and Audit Policy	7.5	5	2.5
	Total	100	75	25
Maintaining Microsoft Windows Server 2003				
2.1	Preparing to Administer a Server	5	5	0
2.2	Preparing to Monitor Server Performance	7.5	5	2.5
2.3	Monitoring Server Performance	10	7.5	2.5
2.4	Maintaining Device Drivers	6.25	5	1.25
2.5	Managing Disks	10	7.5	2.5
2.6	Managing Data Storage	6.25	5	1.25
2.7	Managing Disaster Recovery	7.5	5	2.5
2.8	Software Maintenance Using Windows Server Update Services	7.5	5	2.5
	Total	60	45	15
	Total in credits	**1.6**	**1.2**	**0.4**

Table 19 shows selected results from SES IT courses crediting. For *System software,* course data is determined for the section devoted to OS study.

Table 19. Results of course crediting

Course	Hours	Credits
Operating systems	130	3.6
Administration in information systems	102	2.8
System software: OS section	70	1.8

Calculation of credits for a university course should take into account the percentage of content and textbook correspondence, and also the depth and necessary specifics of description. To estimate the course correspondence, comparison results of competency models were taken, and expert evaluation was used for depth and content description. For the basis of expert evaluation the idea of the following aspects presented in IT and IS study was taken: exploitation, design, implementation and research (the scientific aspect). The educational course touched upon these aspects to some extent, and the textbook takes into account only the administration and exploitation aspect. It should be mentioned that received indicators are not mutual, because credits received within the framework of university course study can be credited in vendor curriculum.

Table 20. Calculation of credits in favor of university course

Course	Credit	% topics coincidence	Depth description	Share of MOAC credits
Operating systems	3.6	10%	1	0.36
Administration in information systems	2.8	80%	0.5	1.12
System software: OS section	1.8	80%	0.5	0.72

5.7.2 Development of educational pathways

One of the key principles of MOCs, which are used in vendor training centers, is the possibility to divide them into separate independent modules. MOAC academic editions also have module structure, but the connections between modules are increased because of additional theoretical materials, and it is necessary to clarify the sequence and the level of study.

A Map of the educational module that is oriented on the module structure description and the determination of interconnection of separate educational modules, should be worked out for the basis for pathway preparation (sequence of educational module study).

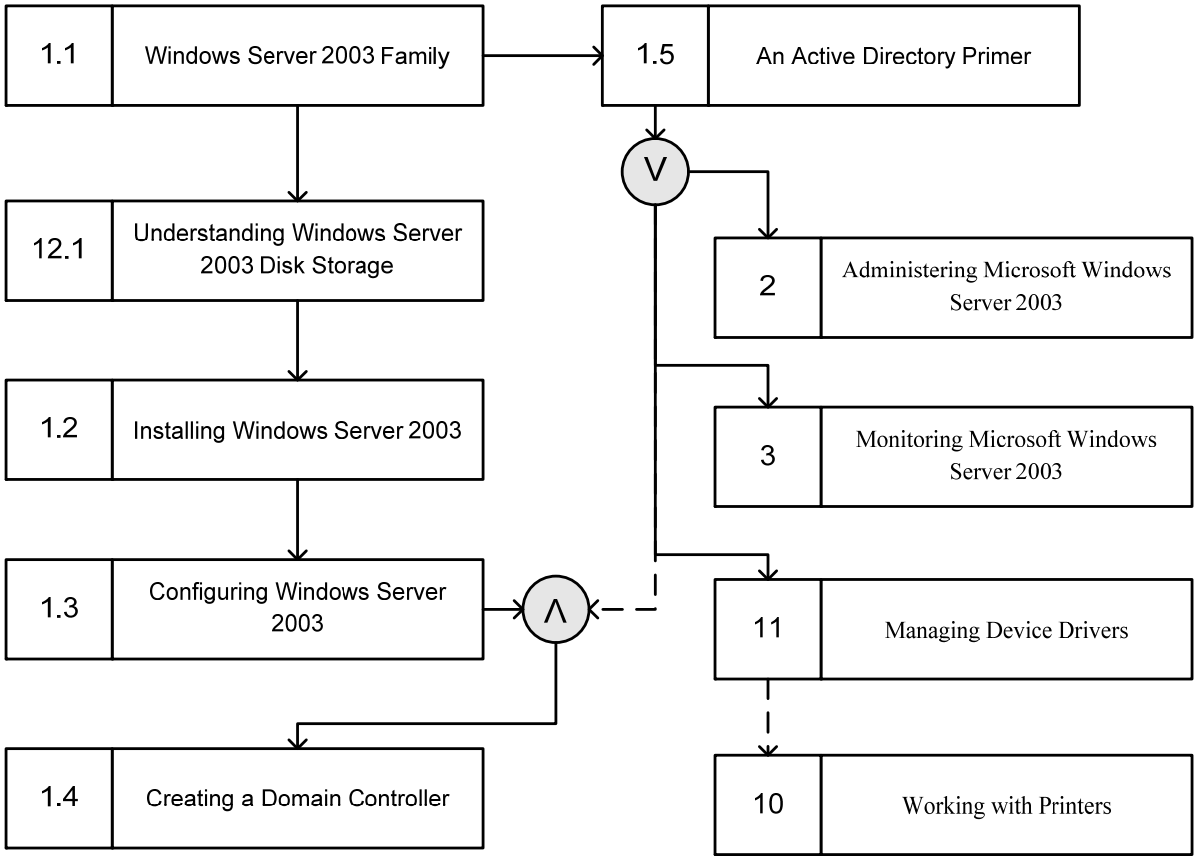

Fig. 5.1 Map of educational module fragments of *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment*.

For example, in Fig. 5.1 the map of module fragments for *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment* is described. Numbers and module symbols correspond to the numbering of chapters or their sub-sections in the book; solid lines show a compulsory sequence of learning, and dotted lines show the recommended sequence. Crossed lines show conjunctions (logical "And" operations) and disjunctions (logical "Or" operations).

Educational tracks (pathways), which include vendor's courses and academic courses and that are included into approved curriculum, are of interest. Nowadays there are no mechanisms or normative documents for academic education recognition in the HE system of Russia, which is why development of mixed educational tracks (pathways) is actual in the case of introducing into curriculum some vendor's courses (including the textbooks).

6. CONCLUSION

Educational and methodical complexes are integral components of a quality assurance system in education. The existing tendencies toward active use of e-learning technology and blended learning, and also universal transition to the knowledge management concept, make these the basic and dominant components of the educational process.

In this connection, integration of an educational and methodical base of IT curriculums for HE and vocational courses of IT vendors is the effective mechanism of convergence of academic and vocational (vendor) education and training.

The competency approach, knowledge management technologies, continuous training concepts, and mutual recognition of education on the basis of credits are methodological bases for integration, and in the long term, convergence of an educational and methodical base.

Within the framework of this Project, this is the first time in Russia that the methodology of integration of vendors' courses into Russian technical universities' IT curriculums was proposed. Its approbation was made on the basis of *MOAC: Managing and Maintaining a Microsoft Windows Server 2003 Environment (70-290)*, corresponding to one of the most popular courses in the field of IS administration. The most popular and prestigious directions in the field of IT have been selected as the target curriculums of higher education. They are the "Information system," "Informatics and Computer Science" directions and several curriculums concerning them.

The analysis of the textbook has shown a high methodical level of the materials (a good structuralization of the text, the presence of the control questions, a description of the target competences, a extensive back matter, etc.) and their great value for the purchase of practical skills.

Also, a number of restrictions and potential opportunities for the perfection of the textbook are revealed. One of them is that MOAC in many respects keeps the characteristic features of its prototypes, the MOCs (Microsoft Official Courses)

that are focused to a greater degree on training for practical skills under an instructor's supervision, instead of specialist development, which requires a profound and independent study of various theoretical aspects.

The urgency of the specified restriction is connected with the fact that in the requirements of the state educational standards to the contents of the courses, theoretical questions are mainly considered. At the same time the absence of instructions for practical skills cannot be considered as an advantage and should be compensated. Partially this problem is carried out with provisional programmes of courses, but in the long term this problem can be solved more successfully with competence models and curriculum, made as MOAC textbooks. Such integration can be a good base for the creation of the balanced competence curriculum and models.

By comparison of the contents of the textbooks and the requirements there is a problem because the existing normative documents in the educational sphere do not regulate the depth of the study of different courses, leaving this question for universities. On the one hand it leads to the situation where there is no formal obstacle for the recommendation of the textbook for a concrete course, irrespective of the depth of disclosure of subjects of a corresponding subject area.

On the other hand, in any attempt to make a real estimation and comparison there is nearly always the need for a mechanism or tool to differentiate the material's complexity and the target competency levels. Unfortunately, the EQF (European Qualification Framework) cannot be used directly to solve this problem, because it is focused on educational levels. However, its prototypes - the systems of accumulation and transfer of credits (CATS) in Great Britain, which allocates eight levels of complexity for courses, can form a basis for the further study of this question.

The results that have been received in the framework of the project allow analyzing the opportunity of the creation of the integrated curriculum. Their pathways include studying both academic and vendor courses. The integration can be

carried out at a level of the modules of the courses, a set of the competence, a step or a structure of education.

Within the limits of the project's realization, the following essential results that can find application in the solution of a lot of problems in the educational sphere have been received:

- Methods for the formation of competence models of state educational standards and provisional curriculum that can be used for the creation of a new generation of educational standards are developed.
- The experience of reviewing of textbooks and textbooks is generalized, the general recommendations are made, typical mistakes and lacks are systematized.
- Methods of crediting (calculation credits) are offered for the estimation of the workload for studying vendors' textbooks and courses.
- The received results represent one of the best practices of the use of the competence approach for the solution to the problems of the integration of education systems, and the offered concepts and developed methods can be recommended for the perfection of validating (accreditation) procedures and estimations of the quality of the educational literature.

The further development of the project can be organized with the support of the Russian Ministry of Education and Sciences, IT vendors and other interested organizations in the following directions:

- Application of a technique for a group of MOAC textbooks, revealing the features of fascicles, the account of their coherence in a series and optimization of the developed methods.
- Use of the received results as a methodological basis for the integration of other components of the authorized training system: tests, certifications, specialized programmes (for example, Microsoft IT Academy), etc.

- Convergence of the educational and methodical base by the creation of a new class of textbooks that meet the requirements of both the academic and the vocational community.
- Duplication of the received results and creation of the best practice in HE for various directions and specialties of preparation.

The area of practical application of the received results can be designated by the following directions:

- Providing the license software delivered in educational institutions, MOAC textbooks with a Microsoft recommendation and an accreditation (griffe) of educational and methodical associations.
- Realization of the project to supply the universities' libraries with the modern literature recommended by educational and methodical associations and the business community.

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SPECIAL EDITION
Prepared for European E-skills Conference 2008 and
Russia-China conference "Innovation in Engineering Education - 2008"

Translator: *Marina Ilyina*

Editor: *Kathy Krause,*
Editorial Services: Online Training Solutions, Inc.

Printed in "LLC "Vash poligraficheskiy partnier"
Moscow, Ilmenskyi proesd, bld. 1"
tel.: +7 (495) 504-75-27