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Impact of the New Economy on Business Informatics Education

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1. Introduction

The "New Economy" of the 21st century is driven in large measure by advances in computing, information, and communications technologies (ICT). To be competitive and also developed country is to satisfy the needs such as the greater use of science and new technologies by average citizens; more interdisciplinary/multidisciplinary work; greater understanding of highly complex and interacting systems; new and renewed efforts at building community and solving local challenges in the face of globalization; and a substantial rethinking of business in general (Moore, 2007).

The changed view of reality in this way causes the need of defining completely changed needs in education. Many authors state that success in the global economy mostly depends on the new system of education. ICT has been applied in many new fields or the existing fields have been significantly broadened. The education system needs to be transformed and new components, which will adapt it to the requirements of globalization and the "New Economy", should be built. New and changed requirements for higher education have contributed to the development of initiatives to radically change the curricula especially in the field of Economy, Management and Business Informatics at many universities.

This Chapter shows components of the new education system, caused by globalization and the "New Economy". Also, the influence of developing ICT and their application to higher education is shown. Bases which should be obligatorily considered in developing new curricula in the field of Economy, Management and Business Informatics are described in detail. Requirements of the Bologna processes, requirements and standards defined during realizing the European projects, as well as requirements of the global economy are described before all.

In order to satisfy the identified requirements, the new Curricula of the Faculty of Economics in Subotica has been developed using innovated process which is significantly different from the previous ones. The Chapter also presents the realized results, as well as experience and attained effects of the newly-developed Curricula, especially in the field of Business Informatics.

2. Globalization, "New Economy" and Education

Globalization is a very real phenomenon that is transforming the world economic system including all business processes. With the emergence of a new development model, knowledge and information take on increasing importance. Thus, the era of globalisation has implications for knowledge, education and learning. One implication of this transformation is that a new system of knowledge, education and learning will include many components that do not exist in current educational system. This new system should include the following components (Cogburn, 1998):

- A focus on abstract concepts and uncertain situations – The academic environment is still preparing students to be capable to solve known problems, although reality very rarely or does not deal with clearly defined problems. Therefore, students should be prepared to recognize the problem first, collect necessary information, and then make decision in the complex and uncertain environment.
- Uses of holistic, interdisciplinary approach – Education and learning environment today is divided into very rigid academic disciplines. However, the e-society and the global economy need the holistic approach to the system. The interdisciplinary approach to researches is considered as critical in understanding the complex reality. This component is specially expressed with curricula in the fields of Economy, Management and Business Informatics.
- Enhances the student's ability to manipulate symbols and to acquire and utilise knowledge – Manipulating the symbols, which represent abstractions of the highest levels of some concrete forms of reality, is one of the most important requirements of today's economy. Also, globalization of the economy requires education increasing students' capability to access, assess, adopt and apply knowledge, to think independently to exercise appropriate judgment and to collaborate with others. The objective of education is no longer simply to convey a body of knowledge, but to teach how to learn, problem-solve and synthesize the old with the new.
- Produces an increased quantity of scientifically and technically trained students – Research and development become the key and critical components of the global development. The requirement that the staff is well trained in the field of science and technology is of special importance. Academic institutions come into contacts with research enterprises within the public and private sectors. Universities must quickly adapt to these needs and become a key component of new national systems of research and development.
- Encourages students to work in teams or virtual teams around the world – the need for capable students to work in teams is very expressed, therefore, they must possess developed capabilities for group dynamics, compromise, debate, persuasion, organisation, leadership and management skills. This is a very important component of the new system because academic institutions until recently developed just the opposite capabilities of students, where students' individuality was developed with a very limited size of the group work. Forming virtual teams for work in the global network is a speciality in international organizations dealing with research and development.
- Agile and flexible system – Academic institutions must be more flexible in attempts to satisfy different and very changeable needs of students in the global economy. It

means variety in time, place, approach and curriculum offerings. Academic course offerings should be adapted to reflect these new knowledge, education and learning requirements. It is necessary to emphasize the remove of borders existing between professors and students. New systems understand synchronic and asynchronous activities. Thus, in synchronic appear real time lectures, quizzes and group discussions, where students and professors can be in the same or different locations. With asynchronous activities appear archived lectures (in audio and video) that can be accessed at nearly anytime, anyplace.

Besides briefly described requirements of globalization according to the higher education, it is important to emphasize impact of "New Economy" on business informatics and information system education. The growing importance of ICT and innovation in the market place brings with it a need for the better management of professional knowledge for knowledge workers in the "New Economy". The educational system in these changed circumstances must satisfy requirements of Knowledge Economy and E-Business Management. Multidisciplinarity or interdisciplinarity of curricula is the key element of these requirements (Handzic, 2002).

2.1 Interdisciplinary - multidisciplinary Approach in Curricula Development

Historical experience on university teaching process indicates that computer programming disciplines contents evolves from syntax and logical structures to solve practical cases, problems, or even immediate tasks, towards modeling complex tasks. The contribution from Information Technologies courses added to the Business Economics, Management and Quantitative Methods and Techniques courses, promotes a welcome synthesis approach, in terms of innovative curriculum proposals.

The multidisciplinary curricular structure tendency is a kind of horizontal aggregation. It is direct related with increasing complexity projects toward interdisciplinary times. Interdisciplinary orientation and inverted curriculum can be considered synonymous because under complexity parameters, claimed from interdisciplinary abstraction models, there is an indissoluble interdependence of the categories of knowledge. Interdisciplinary curricular trend is more recent and it has been practiced also, under isolated disciplines context. But, of course, its potentiality increase a lot, if it is supported by a global curricular proposal, putting all together, under a course inverted curriculum. It is inverted the direction, yet from generic – complex categories of knowledge, on those carries courses, to part categories of knowledge.

Business informatics is interdisciplinary and can be summarised as a socio-technological and business oriented subject with engineering penetration (Helfert & Duncan, 2006). The need for interdisciplinary, i.e. multidisciplinary approach in curricula development is confirmed by numerous developed fields of applied informatics, illustrated in Figure 1, where Business Informatics can be seen. Core subjects of the information age are illustrated in the same Figure.

The final curriculum as outlined comprises a balanced and interdisciplinary structure, which centered on ICT principles and focuses on transformation, models and methods. The ICT penetration throughout the programme is seen as an important characteristic, which differentiates this programme from management oriented information system degrees. Therefore the business informatics approach appears to us not only to be innovative with

regard to its interdisciplinary character, but moreover the ICT perspective and the integration of cultural studies and practical experiences in an international setting equip graduates with required capabilities.

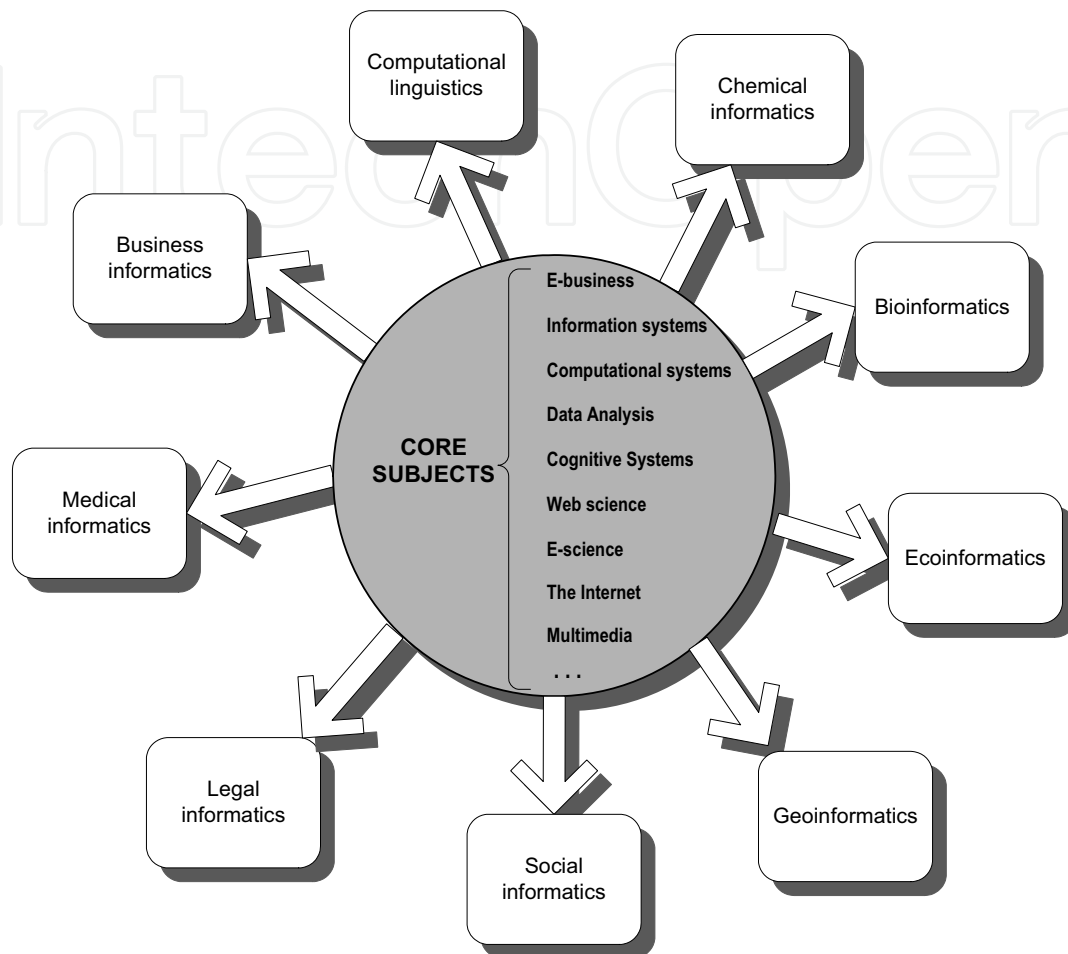


Fig. 1. Core subjects of the information age and fields of applied informatics

3. Fundamentals of Developing the Curriculum

Impacts of globalization and the “New Economy” on higher education have caused the development of new and significant changes of the current curricula at universities, especially in the fields of Economy, Management and Business Informatics. Except satisfying the cited requirements of globalization and the “New Economy”, curricula have been completely harmonized with the requirements of the Bologna process and the need of creating the European Higher Education Area (EHEA). Results of some projects in the field of higher education (Tempus, Socrates, WUS), gave important contribution to their quality, where already implemented curricula and positive experience were analyzed in detail and used for developing new curricula.

After passing the Law on higher education, the missing legal framework for realizing new curricula was also provided in the Republic of Serbia in 2005. Faculties in the country have

approached to very intensive changes of their curricula. The Faculty of Economics in Subotica, as the leader in these processes, has changed its curricula at all three study levels. The Curriculum of the Faculty was developed in accordance with the established concepts of the Bologna process, attained results of the JEP Tempus projects, as well as the Euro-Inf Framework Standards of the Socrates project. Therefore, during developing the new Curriculum, requirements of globalization and the "New Economy" in the field of higher education expressed in the form of competences were especially taken into consideration. Theoretical approaches gave us bases for research, but what we needed, in addition, were practical, simple approaches to curriculum development. For that, we turned to curriculum, instruction and assessment specialists such as Dee Fink and Grant Wiggins. Fink developed integrated course design (ICD) model, that includes the triad of learning goals, teaching and learning activities and feedback/assessment (Fink, 2003). Learning goals identify what we want students to learn, learning activities identify how students will learn what it is we want them to learn, and the feedback/assessment identifies how we will know students have achieved the intended goals. These components are all influenced by "situational factors", such as course context, professional expectations, and the nature of the subject, the students, and the teacher (Howard, 2007). Using ICD model, we designed the coherent curriculum of the Faculty.

3.1 Concepts of the Bologna Process

Concepts of the Bologna Process represented the basis for developing the new Curriculum. The most important objectives of this process are (ECTS, 2007):

- Determining the joint qualifications framework for an easier diploma recognition and comparison,
- Implementation of a three-level cycle of university education system,
- Introduction of the common European Credit Transfer and Accumulation System (ECTS),
- Mobility of students and teaching staff,
- Promotion of the European cooperation in providing quality, and
- Promotion of European contents.

Following trends and international standards in the field of higher education, the Faculty of Economics developed new Curriculum making an important move to the complete new education system. Except the Bachelor studies lasting three years, the Faculty organizes Master studies lasting two years and the Doctoral studies taking three years to complete. This model of Curriculum "3+2+3" is the most often used in the European countries in the field of Economy, Management and Business Informatics. It is illustrated in Figure 2.

The presentation of the model in the form of a sandglass points to the inverted logic of learning, and gaining knowledge and skills. In the first two years, students gain mostly basic scientific and technological knowledge and theoretical methodological knowledge. The third year emphasizes major knowledge. The fourth year emphasizes them even more, while the fifth year turns the process to the applied methodological knowledge. The next three years understand the advancement of knowledge by the original scientific research work.

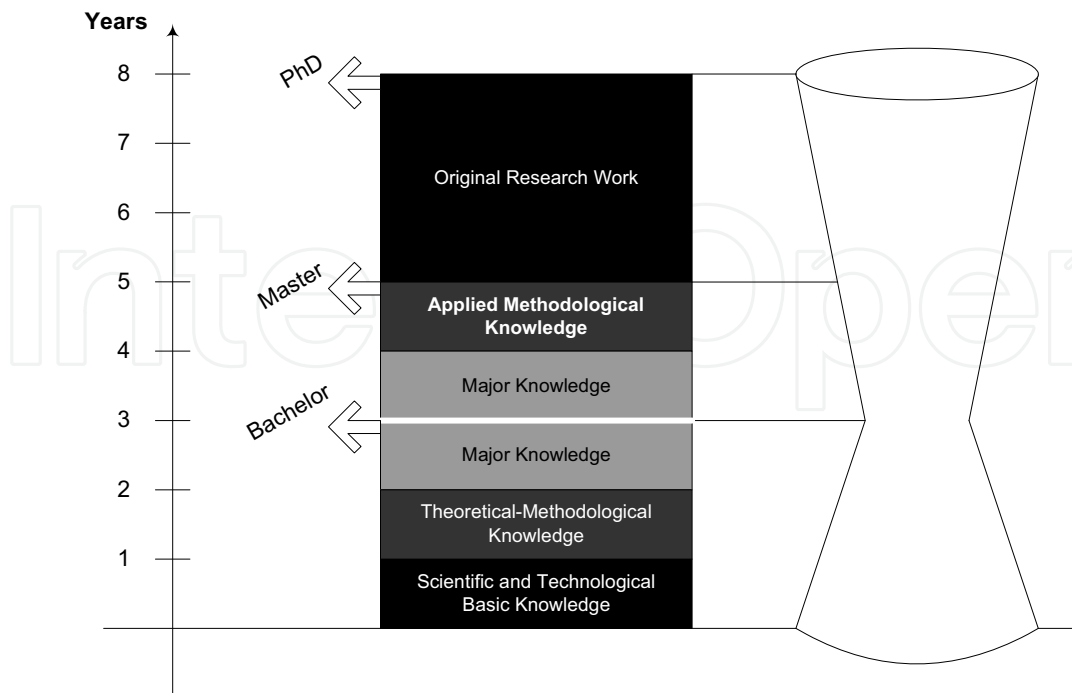


Fig. 2. The Model of Curriculum

The basic characteristics of the Curriculum are (Plančak, 2006):

- › European Credit Transfer System – ECTS, that provides suppositions for including the Faculty into the European Higher Education Area. ECTS is a student-centered system based on the student workload, or notional learning time required to achieve the objectives of a programme. These objectives should preferably be specified in terms of the learning outcomes and competences to be acquired.
- › 60 ECTS measure the student workload during one academic year. To calculate the equivalence between ECTS and the student workload of a study programme, it is necessary to emphasize that it is supposed that the student works 8 hours a day, 5 days a week and that there are average of 40 to 45 weeks in an academic year. It means that the student workload amounts to 1800 hours per year and in this case one credit stands for 30 working hours.
- › The number of credits (X) belonging to one course is proportionate to the number of hours (Y) the student spends at all learning activities of the course. The proportion for defining ECTS points to the courses is: $X: 60 \text{ credits} = Y: 1800 \text{ hours}$.
- › Workload is not linked with the level of the course (a core course may require less workload than an elective course).
- › One-semester courses, classified into four categories: obligatory core courses, elective core courses, obligatory major courses and elective major courses. Depending on the level of studies, elective courses make 15% at the Bachelor studies, 20% at the Master studies and 50% at the Doctoral studies. This broad choice of majors and elective courses enable students a very narrow specialization.

- The Faculty used top-down method to allocate credits, where the programme is divided into course units or modules, to which are allocated a limited and reasonable number of credits in more or less standard multiples. Also, the Faculty, implemented the non-modularized system, where each course unit have a different number of credits.
- The Faculty implemented the even number system in credit allocation so the courses got 4, 6 or 8 ECTS. Therefore, the courses with 8 ECTS credits allows around 240 hours of work of a typical student, the courses with 6 ECTS credits allows 180 hours and the courses with 4 ECTS credits allows 120 hours.
- Credits in ECTS can be obtained after successful completion of the work required and appropriate assessment of the learning outcomes achieved.
- Learning activities include: lectures, seminars, practical works, homework, projects, placements, fieldwork, and preparation of exams, exams, and so forth.
- Mobility of the teaching staff, students and administrative personnel.
- Specially created diploma supplement, giving possibilities to emphasize characteristics of the student, his basic and specialist knowledge and skillfulness, successes and rewards awarded during his study at the Faculty.
- A number of small groups of students in both lectures and exercises, especially in the lectures where practical knowledge and skills are gained.
- Programs of courses are simply and transparently formulated, according to the basic requirements of the Bologna standards. They are the aim of the course, competences, short contents of the course, year and semester of the course, number of lectures and exercises, way and form of knowledge test, literature, teaching language, week schedules of classes with the date of tests and midterms, date of accepting the program, as well as the date of its last change.
- The assessment methods proposed by ECTS should provide the distribution of grades 10%-25%-30%-25%-10%, respectively for the grades 6-7-8-9-10 and meet the Gauss schedule. Therefore, 10% of students should pass the exam obtaining the grade six and ten, 25% of students should pass the exam obtaining the grade seven and nine, and 30% of students should pass obtaining the grade eight. From the total number of students, 90% should pass the exam obtaining one of passing grades.

Taking the accepted model into consideration, the distal aim of the Curriculum Business Informatics Major at the Faculty of Economics can be expressed in the following way:

- During the first three years of the Bachelor study, Faculty educates experts in the field of Business Informatics for efficient application of information technologies and contemporary software products in business in order to attain an increasing business effectiveness and efficiency;
- During the next two years of the Master study, students of the above average performance are enabled to choose narrow specialist fields and acquire new specialist knowledge, broaden theoretical and methodological knowledge in their narrow educational fields, and train for development and research projects;
- Further develop, in the course of the last three years of the doctoral study, research capabilities and the capabilities of the best students for educational

work, providing gradually in this way the teaching base of the faculties, scientific institutes and universities.

- Business Informatics can complement the managed-oriented stream of an information systems discipline, which often focuses on the business and management aspects.
- Business Informatics curriculum should include many related subjects ranging from business and information system strategy, to management and marketing, organizational concepts, modeling and information system architecture, programming, mathematics, statistics and operations research as well as computing, networking and communication technologies.

3.2 Results of the JEP Tempus Projects

The Faculty took part very successfully in realizing two JEP Tempus projects, whose primary objectives were to develop new curricula.

Tempus JEP-16067-2001: "Teaching Business Information Systems" was realized in cooperation with:

- University of Brighton, School of Computing, Mathematical and Information Sciences, U.K.;
- University of Belgrade, Faculty of Organizational Sciences, Belgrade, Serbia;
- Centre for Research and Technology Thessaloniki, Greece;
- University of Vienna, Department of Computer Science and Business Informatics, Austria;
- University of Novi Sad, Faculty of Science, Novi Sad, Serbia.

Bachelor and Master Curricula contents of the project partners, in the field of Business Informatics and Business Information Systems, were analyzed in order to take over positive experiences and to innovate current courses. Aims and learning outcomes were defined at the level of curriculum, as well as necessary contents at the level of some courses. Special importance was paid to studying skills and knowledge in the field of Informatics in educating economists and managers. The conclusion was that it was necessary to introduce courses, both on Bachelor and Master level, in all majors in the fields of Economy and Management, which would enable broader application of ICT.

Tempus JEP-17027-2002: "Upgrading Business Information Studies in FRY" (Federal Republic of Yugoslavia), was realized in cooperation with:

- Università Degni Studi di Udine, Italy;
- Faculte Universitaire Des Sciences Agronomiques de Gembloux, Belgium;
- Università Degni Studi di Foggia, Italy;
- Wirschatssuniversitat Wien, Austria, and
- University of Podgorica, Faculty of Economics Podgorica, Montenegro.

The result in this project was the first versions of Curricula of the Bachelor studies at the Faculty in the fields of Economy, Management and Business Informatics. The groups of obligatory and elective courses were indentified at the Faculty for the first time, as well as the groups of core-educational, theoretical-methodological, scientific-professional and

professional-applicative courses. Experiences of the European partners in the project of curricula development were taken over and build in.

The project identified application domains in Business Informatics Curriculum, created the distinction between general and specialised application domains and defined the amount of application domain that may need to be incorporated into a curriculum (Cowling, 2007).

3.3 Results of the Socrates Euro-Inf Project

The Faculty took part as partner in the project: Euro-Inf – Informatics Education in Europe and built on established framework standards in its Curriculum during the final design of the Curriculum of Bachelor and Master studies in the field of Business Informatics. The partners of Euro-Inf Project were:

- ASIIN (Accreditation Agency for Degree Programmes in Engineering, Informatics, the Natural Sciences and Mathematics), Germany,
- CEPIS (Council of European Professional Informatics Societies - 37 informatics societies from 32 countries),
- University of Applied Sciences Hamburg, Germany, and
- University of Paderborn, Germany.

The ultimate goal of the Euro-Inf Project is to facilitate European-wide professional recognition by the competent national authorities of informatics degrees. These recognitions are awarded by study programmes accredited on the basis of the programme outcomes and accreditation criteria defined in the Euro-Inf Framework Standards. The Euro-Inf, based on standards and accreditation systems, created a set of framework standards which were tested and refined through trial accreditations.

The Euro-Inf Project aims to create a framework for setting up a European system of Standards for assessing informatics education at the First Cycle and Second Cycle level. Based on the establishment and approval of this set of standards, the main objectives of the Euro-Inf Project are (Aszalos, 2008):

- to improve the quality of educational programmes in informatics;
- to provide an appropriate “European label” for accredited educational programmes in informatics;
- to provide a basis for comparing educational qualifications in informatics in the EHEA;
- to facilitate mutual transnational recognition by programme validation and certification;
- to facilitate recognition of accredited degrees in informatics higher education in accordance with the EU directives and other agreements;
- together with other field-specific standards and criteria, to contribute to the harmonisation of the EHEA;
- to support the mobility of informatics graduates;
- to contribute to international transparency - as one of the objectives of the Bologna Declaration, and
- to support improvements to the quality of informatics programmes in general.

The project defined: Learning Outcomes for First Cycle Degree Programmes and Second Cycle Degree Programmes. The programme outcomes are described in project as quality

standards for competences, skills and knowledge a graduate of an accredited course would be expected to have achieved as the education base for practising their profession or for graduate studies.

Programme outcomes vary in extent and intensity in accordance with the differing objectives of the First and Second Cycle degree programmes. In the Euro-Inf project, they have been ranged in the following four categories (Euro-Inf, 2007):

- Underlying Conceptual Basis for Informatics,
- Analysis, Design and Implementation,
- Technological, Methodological and Transferable Skills and
- Other Professional Skills.

For each of the mentioned category expected learning outcomes for informatics programmes have been formulated. The first category “Underlying Conceptual Basis for Informatics” identifies capabilities that are essential to satisfying the other learning outcomes. Furthermore, it provides help for defining which knowledge and understanding graduates should demonstrate of their informatics specialisation as well as of the wider context of informatics.

Subsuming the aspects “Analysis, Design and Implementation” in a single category appears worthwhile because they describe the basic steps of a work cycle. The category “Technological, Methodological and Transferable Competences” refers to the expected ability of a graduate to work to combine and abstract his technical skills to solve problems involving aspects of a wider, technological context. Thus he is able to use appropriate methods and material to achieve an industrial objective.

Social or soft competences, listed under the category “Other Professional Skills” are crucial to communicate information, ideas, problems and solutions. Besides the so-called soft skills, the category refers to project management skills and the knowledge of disciplines and those ancillary principles that are relevant to the working environment of the graduates' specialisation.

4. New Solutions in the Curricula

The new Curriculum of the Faculty of Economics, realized in accordance with all defined and in advance described fundamentals, at three study levels has 9 Bachelor, 10 Master and 3 doctoral study programmes. Curricula are accredited at the national level.

Special attention in developing curricula is paid to the interdisciplinary of its contents; therefore, it is represented at all the study levels. Knowledge structure in the model of curriculum, illustrated in Figure 3, includes: basic knowledge (knowledge of economics, knowledge of business economics, knowledge of quantitative methods and techniques, knowledge of management and social science, knowledge of information technologies) and major knowledge. Major knowledge includes the group of core courses and the group of elective courses.

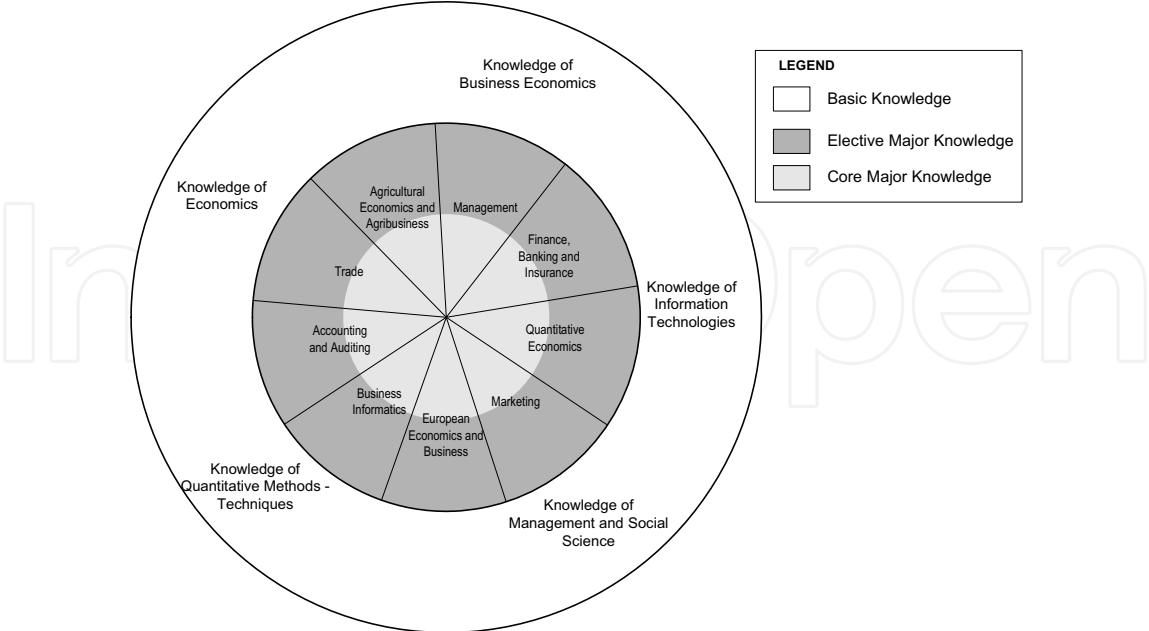


Fig. 3. Structure of Knowledge in the Model of the Curriculum

Major knowledge is in accordance with different majors in the curriculum model:

- › Agricultural Economics and Agribusiness
- › European Economics and Business
- › Finance, Banking and Insurance
- › Quantitative Economics
- › Marketing
- › Management
- › Business Informatics
- › Accounting and Auditing
- › Trade

The central focus of the curriculum for Business Informatics is to educate individuals to plan and lead information system related projects. The core aim is enabling students to apply technological solutions and develop information system architectures to solve business problems of organizations. A major goal of this program is to prepare students for their future carrier in business informatics, either in academia or in practice. In addition to the strong knowledge in business informatics, the programme aims to enhance key transferable skills. This will enable the students to take on a variety of jobs in various types of organizations.

The fundation for the curriculum design is the learning process of a student, which is supported by learning situations that promote student activity and learning. Curriculum design is thus based on both the targeted learning outcomes and students entrance level, illustrated in Table 1. The learning process is being constructed in between these two from the various learning and teaching situations, assignments, counselling and assesment.

| Subject specific competences | Description of the competence |
|----------------------------------|---|
| Information Systems Competences | <ul style="list-style-type: none">▸ Understands information system as a whole▸ Understands the production, acquisition and deployment process of an information system▸ Understands the principles of data management▸ Is able to specify, design and implement secure software systems, databases, and user interface▸ Is able to program▸ Is able to document and decode documentation of an information system▸ Is able to plan and implement training |
| Project Work Competence | <ul style="list-style-type: none">▸ Understands the differences between various kind of ICT projects and the role of projects as a part of an organizational structure▸ Understands the purpose of a systematic way of action in project work and is able to work in a responsible manner in ICT projects▸ Is able to use and apply various ICT project planning and management methods▸ Is able to identify and provide for possible risks related to ICT projects |
| Business Competence | <ul style="list-style-type: none">▸ Understands essential business processes and functions▸ Understands the role of ICT within an organization and its supportive role in business processes and their development▸ Is able to develop business processes using ICT▸ Understands the purpose of contracts, offers, licences and immaterial rights in their work▸ Is able to serve costumers |
| Specialized ICT Field Competence | <ul style="list-style-type: none">▸ Is able to apply their knowledge and skills in a specialized ICT field▸ Is able to analyse, evaluate and develop operations in this field |

Table 1. Subject specific competences for Business Informatics Curriculum (Adam, 2006)

The competence-based curriculum is outlined by learning outcomes, core competeces, to which the education aims at. The aims are:

- all our students with a set of general skills that require them to think analytically, express themselves clearly, work independently, meet deadlines, and encourage initiative;
- all our students with a set of subject-specific skills, appropriate to the level of their programme, that enable them to access, analyse, present and sustain coherent and logical argument, and implement and complete independent research in IT;
- all our students the opportunity to participate in processes of course review and evaluation.

Students who have successfully completed the programmes of study will have acquired:

- the analytical skills to understand and construct cogent arguments in the basic principles of ICT and apply these;
- an appreciation of the strengths and limits of their discipline through following complementary interdisciplinary or multidisciplinary programmes of study;
- literacy skills enabling them to assemble and structure material, and write concisely and coherently with reference to scholarly sources;

- quantitative skills to interpret, understand, and evaluate informatic data and appreciate both the limitations of the evaluation methods and the data used;
- the skills to produce a dissertation that is structured, well written, presents analysis and conclusions in a logical, coherent and transparent fashion and makes adequate reference to scholarly sources;
- a range of general transferable skills including decision-making skills inherent in the study of the discipline, computer literacy skills, the organisation and management of time, and the meeting of deadlines;
- an awareness of their own strengths and weaknesses through feedback on their work;
- opportunities to participate in course review and evaluation.

4.1 Curriculum in the Major of Business Informatics

The big change was the move to competency-based curricula. Identified learning outcomes were the basis to design the Curricula in the Major of Business Informatics (Baross, 2007). Studying the major obligatory and major elective courses, students of the Major of Business Informatics will acquire fundamental knowledge of the narrow specialized area. They will be trained to differentiate the kinds and resources of information systems, as well as ethical and social aspects of ICT and their impact on modern organizing and functioning business systems.

The choice of majors and gaining theoretical, domain and practical knowledge are special distal aims in the Major of Business Informatics, and, of course, every student. In this way, concrete aims of the educational system are attained: “know-what”, “know-how” and “know-who”. Students are directed to some narrow specialist fields, in the first and second year of the master study to meet their preferences, democratic education and satisfy their interest and learning need.

BSc

| Features of the course/year | Name of the course | ECTS credit points |
|-----------------------------------|--|--------------------|
| Core Obligatory/1 | Information technologies | 6 |
| Major Obligatory/1 | Programming | 6 |
| Major Obligatory/2 | Databases | 6 |
| Major Obligatory/2 | Information System Development | 6 |
| Core Obligatory/3 | Business Information Systems | 6 |
| Major Obligatory/3 | Intelligent Systems | 6 |
| Major Elective/3 (two of four) | <ul style="list-style-type: none">‣ Development of Web Applications‣ Business Software Applications‣ Knowledge Management Systems‣ Structural Analysis and Design | 2x6 |

Table 2. Courses in the field of Informatics according to the Curriculum of B.Sc degrees, Business Informatics Major

MSc

The Major of Business Informatics, Master degree is structured into two modules:

- a) Module Information Engineering
- b) Module Business Intelligence and Electronic Business

| Module INFORMATION ENGINEERING | | |
|--------------------------------|---------------------------------------|--------------------|
| Features of the course / year | Name of the course | ECTS credit points |
| Major Obligatory/1 | Object Software Engineering | 6 |
| Major Obligatory/1 | Business Process Modeling | 6 |
| Major Obligatory/1 | Management of IS Project | 6 |
| Major Obligatory/1 | Database Design | 6 |
| Major Elective/1 | Two elective courses from Group 1 | 2x6 |
| Major Obligatory/2 | Methods of Software Development | 6 |
| Major Obligatory/2 | Implementation of Information Systems | 6 |
| Major Elective/2 | Two elective courses from Group 1 | 2x6 |
| | Master diploma work | 30 |

| Major Elective Courses / Group 1 | |
|----------------------------------|--|
| 1. | Database Administration Systems |
| 2. | Supply Chain Management |
| 3. | Customer Relationship Management |
| 4. | Methods and Techniques of Data Analyzing |
| 5. | Business Intelligence Systems |
| 6. | Internet Applications Development |

| Module ELECTRONIC BUSINESS and BUSINESS INTELLIGENCE | | |
|--|--|--------------------|
| Features of the course /year | Name of the course | ECTS credit points |
| Major Obligatory/1 | Object Software Engineering | 6 |
| Major Obligatory/1 | Business Process Modeling | 6 |
| Major Obligatory/1 | Business Intelligence Systems | 6 |
| Major Obligatory/1 | Methods and Techniques of Data Analyzing | 6 |
| Major Elective/1 | Two elective courses from Group 2 | 2x6 |
| Major Obligatory/2 | Customer Relationship Management | 6 |
| Major Obligatory/2 | Web Portals | 6 |
| Major Elective/2 | Two elective courses from Group 2 | 2x6 |
| | Master diploma work | 30 |

| Major Elective Courses / Group 2 | |
|----------------------------------|------------------------------------|
| 1. | Database Administration Systems |
| 2. | Database Design |
| 3. | Software Agents and Soft Computing |
| 4. | Performance Management |
| 5. | Management of IS Project |
| 6. | Internet Applications Development |

Table 3. Courses in the field of Informatics in the Curriculum of Master degree, Business Informatics Major, illustrated according to the modules

PhD

Primary aim of the Curriculum of doctoral studies at the Faculty of Economics is to train the Ph.D candidates for their independent research work. The most significant part of the Curriculum is to prepare the themes of doctoral dissertations, carrying out researches, writing and defense of dissertations. Students are independent in choosing narrow scientific fields for their doctoral dissertations. They select the program they are interested in, the theme being relevant and current being in accordance with contemporary scientific trends in the field.

Candidates must specially concentrate on the methodology and scientific method in the field. An important aim of the curriculum is including the Ph.D candidate into the educational and scientific-research work at the Faculty. In this way, a systematic and serious training and recruiting the best students for the future work at the University will be attained.

When defining the research and educational structure of the doctoral studies, a great care is taken to select the themes, subjects and research projects connected to the scientific fields being in the focus of interest and which represent the basis for solving the current problems of contemporary business.

The Curriculum of the doctoral studies determines the aims and learning outcomes of the Curriculum, academic, i.e. scientific title, entrance requirements, list of obligatory and elective study fields, i.e. courses with general contents. It also determines the way and time for conducting studies, credits for each course in accordance with the ECTS, credits of the doctoral dissertation. It points to prerequisites for enrollment of some courses or groups of courses, elective way of courses from other study programs, requirements for passing from other study programs with the framework of the same or related study fields, and so on.

Three fields form the structure of the Curriculum:

- › Lectures and consultations of core and major scientific fields with the obligatory and elective courses (A).
- › Work in the scientific-research process (B),
- › Doctoral dissertation (C).

The curriculum of doctoral studies is based and valorized in the following way:

| Activity | ECTS |
|---|------------|
| A - Lectures and consultations | 60 |
| A1 - Course of the major scientific field - Modul Management or Modul Economics (elective course) | 10 |
| A2 - Course of the major scientific field - Modul Business Informatics (obligatory course) | 12 |
| A3 - Course of the major scientific field - Modul Business Informatics (elective course) 1 | 10 |
| A3 - Course of the major scientific field - Modul Business Informatics (elective course) 2 | 10 |
| A3 - Course of the major scientific field - Modul Business Informatics (elective course) 3 | 10 |
| A3 - Course of the major scientific field - Modul Business Informatics (elective course) 4 | 8 |
| B - Work in the scientific-research process | 60 |
| C - Doctoral dissertation | 60 |
| | 180 |

The doctoral studies last three years, i.e. six semesters. Lectures and consultations last two semesters, where elective courses cover 50% ECTS credits at least. Six courses make the major scientific field. The major scientific fields are Economy, Management and Business Informatics. Each of them is established from one obligatory (A2) and 8 elective major courses (A3), of which the Ph.D candidate enrolled in some major freely chooses four; the selected doctoral dissertation is done in accordance and agreement with the mentor. The student suggests the subject, problems, objectives and the way of researching in accordance with the potential mentor. The doctoral dissertation is an original scientific research, contribution to science and an important contribution to solving practical problems. The doctoral thesis is registered and worked in selected scientific field.

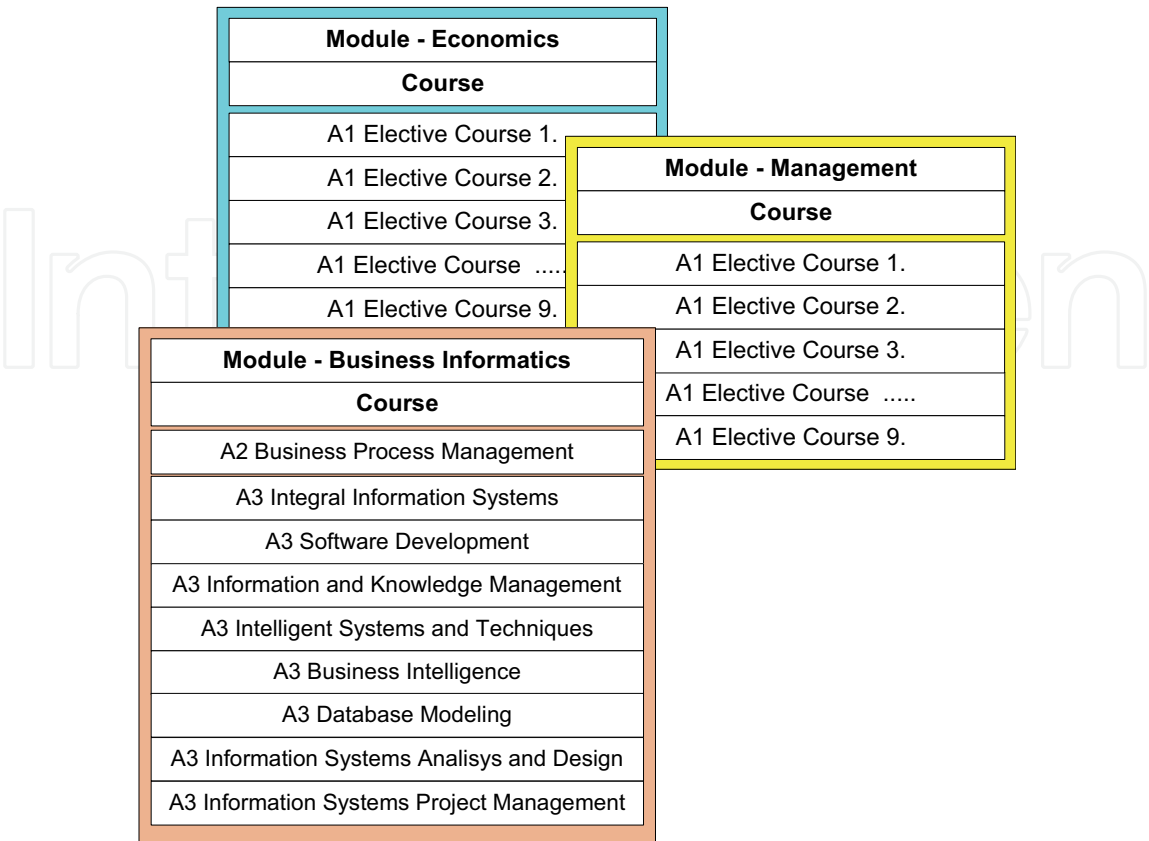


Fig. 4. Courses in the field of Informatics according to the Curriculum of Ph.D degrees, Business Informatics Major

5. Experiences and Effects of the New Curricula

The ECTS grading system is oriented to the study. The study process is in the focus of university education, contrary to the previous higher education system, where the emphasis was on the teacher and his transfer of knowledge. The basis of this system are competences that the student should acquire at the end of the selected curriculum, and the selected university degree. The curricula should clearly defines the study process and approximate the way and direction of professional development through defined learning outcomes and competences.

The basic principle of the ECTS grading system is obtaining credits according to the student workload. The analysis of the student workload, together with the analysis of contents is necessary for a successful curriculum defining. Workload measuring starts with time allocation needed to realize the study results defined in the curriculum and to finish some educational degree. After that, time is allocated according to different modules, courses, subjects, teaching units. Time allocation cannot be done according to the social prestige of the teacher and the course or any other irrelevant factor but rationally, to the needs of competences, study results, as well as the importance to apply it.

The analysis of the previous almost three years in applying the Bologna process at the Faculty points to the noticed and expressed direct proportional connection between preliminary exam obligations and study results. Namely, preliminary exam obligations have

been gradually introduced in courses of the Curriculum in the forms of tests, midterms, projects, essays, case studies, and so on. At the final exam, oral or written, the student takes only part which has not been passed in the preliminary examination, as a midterm. The students are not obliged to pass preliminary exam obligations, but they have to take preliminary obligations and realize the established minimum to verify the course attendance and so acquire the right, on the basis of activity, to take the final exam. At the beginning, when preliminary exam obligations were less according to the kinds and volume, exam success was significantly lower. Also, the minimum level increase of credits for preliminary obligations make students more active during the whole term and they continually work in order to take the final exam with more knowledge and realize increased exam passing and higher grades, especially those who have not passed the segments of the Curriculum. The analysis of study results points to the fact in courses where these rules and standards are not satisfied, exam passing is significantly lower than where they are satisfied.

Of course, the number of attempts to pass exams influences efficiency of the study according to the Bologna processes. The increase of allowed number of attempts decreases efficiency and we can state that it is lower with us than in neighboring countries regarding to the legally defined three or four attempts, especially in those countries where the number of attempts is twice at the most. At the same time, the lack of the legal limit in relation to the possibility of repeated enrollment of the course during the study significantly influences efficiency. Therefore, students are usually allowed to enroll three times the same course at most. After that, the study of the selected curriculum is finished.

At the end, we should emphasize that the new methodology, which pays attention to the student and concerns what the student will learn, not what the teacher will teach, significantly determines the study efficiency. The change of proportion between the number of lectures and exercises in the Curriculum in favor of exercises and giving bigger importance to the contents which are taught, enable students to acquire empirical knowledge through practice and apply it in concrete situations instead of acquiring historical knowledge and knowledge to reproduce theoretical contents.

Effects of the new Curricula are also the following learning outcomes (Smith, 2005):

A: Knowledge and understanding

- › Have demonstrated knowledge of the core principles;
- › Have demonstrated an understanding of those core principles as they relate to other problems and issues;
- › Have demonstrated a more detailed knowledge and understanding of an appropriate number of specialised fields of ICT;
- › Have demonstrated a knowledge of quantitative techniques appropriate to the study of ICT;

B: Intellectual Skills

- › Be able to use the power of abstraction to focus upon the essential features of an economic problem and to provide a framework for the evaluation of the effects of policy or other exogenous events;
- › Be able to analyse an economic problem or issue using an appropriate theoretical framework;

C: Practical Skills

- Have displayed a knowledge of sources and content of economic information and data;
- Have demonstrated a knowledge of how to conduct and evaluate empirical work;
- Have demonstrated an ability to carry out empirical work using appropriate techniques;
- Have demonstrated the ability to carry out self-directed study and research;

D: Transferable skills

- Have an understanding of appropriate concepts in economics that may be of wider use in a decision-making context (e.g. opportunity cost);
- Have learnt to communicate economic ideas, concepts and information using means of communication appropriate to the audience and the problem at issue;
- Have learned to appreciate the importance of, and be able to construct, rigorous argument to help evaluate ideas;
- Have demonstrated a facility in numeracy and other quantitative techniques, such as correctly interpreting graphs;
- Have demonstrated competence in the use of a wide range of appropriate computer software.

5.1 Place and Importance of Informatics Courses in the Curriculum Model

Regarding to the wish to analyze the place of Informatics courses in the Curriculum, we shall analyze separately the Curriculum and the Major of Business Informatics, on one side and separately other majors on the other side. Namely, the model of the Curriculum is built so that Informatics and the courses in the field of Informatics in other majors are identical.

The Major Business Informatics combines informatics (the study of creating, applying and communicating information, mainly by computer systems) and management techniques. Its success is based on the powerful synergistic benefits that are released when business and administration concepts are integrated with computer science technology.

When the Curriculum is considered from the standpoint of Informatics and especially the Major of Business Informatics, it is important to emphasize its mission and aims: forming experts with knowledge in the field of analysis; designing; developing and implementing integral information systems and operative system management and its further development; then software product development; developing and implementing business intelligence systems, and e-business systems.

The curriculum courses in the field of informatics are studied as obligatory core courses, major obligatory courses and major elective courses. Obligatory core courses in the Curriculum are Information Technologies and Management Information Systems with special characteristics in some majors. They enable students of all the majors to acquire necessary theoretical and practical knowledge on contemporary information technologies and their implications on business.

In addition, they give the possibility to master basic skills in working on the computer with a view of creating the basis for achieving specific competences needed for data and information management, and business knowledge. In this way, students, besides the capability for information management, develop the capability to collect and select relevant

data and information from various sources, as well as the capabilities for their qualitative analyses.

Studying the obligatory core courses in the field of informatics, students will acquire knowledge of informatics terms, realize all the suppositions for better cooperation with experts in the field of information technologies, and understand the significance of cooperation between the users and experts. Students will be able to learn independently, to choose and apply specific information technologies in some functional fields of economics and business, as marketing, finance, accounting, or in some branches of economics, as agriculture, trade, banking, insurance, and so on.

Studying the major obligatory and major elective courses, students of the Major of Business Informatics will acquire fundamental knowledge of the narrow specialized areas (Information Engineering, Electronic Business and Business Intelligence). They will be trained to differentiate the kinds and resources of information systems, as well as ethical and social aspects of information technologies and their impact on modern organizing and functioning business systems. The major obligatory courses enable the development of capabilities, self-confidence and knowledge of an independent learning and work. Students acquire methodological and practical knowledge on the application of different software development tools. They become skilled in the principles of development, methods, techniques and methodologies of developing software and business information systems.

Analyzing the place and importance of Informatics and courses of Informatics at some majors of the first two education level at the Faculty of Economics, the following statements can be quoted. First, at the Bachelor level studies, Major of Business Informatics, from the total 27 courses, students have eight courses in the field of informatics or 29.62%, illustrated in Figure 5. Considered proportionately, it may be too much. However, regarding to the need for creating the basis for two modules at the Master studies, to kinds and contents of the courses, it may be insufficient. Students acquire fragmentary knowledge in some fields that cannot be connected into the harmonious entirety to be applied in practice. Therefore, at this level of the study, the Curriculum should be segmented from the beginning to some modules, or rebuilt with the supplementary courses in the field of informatics.

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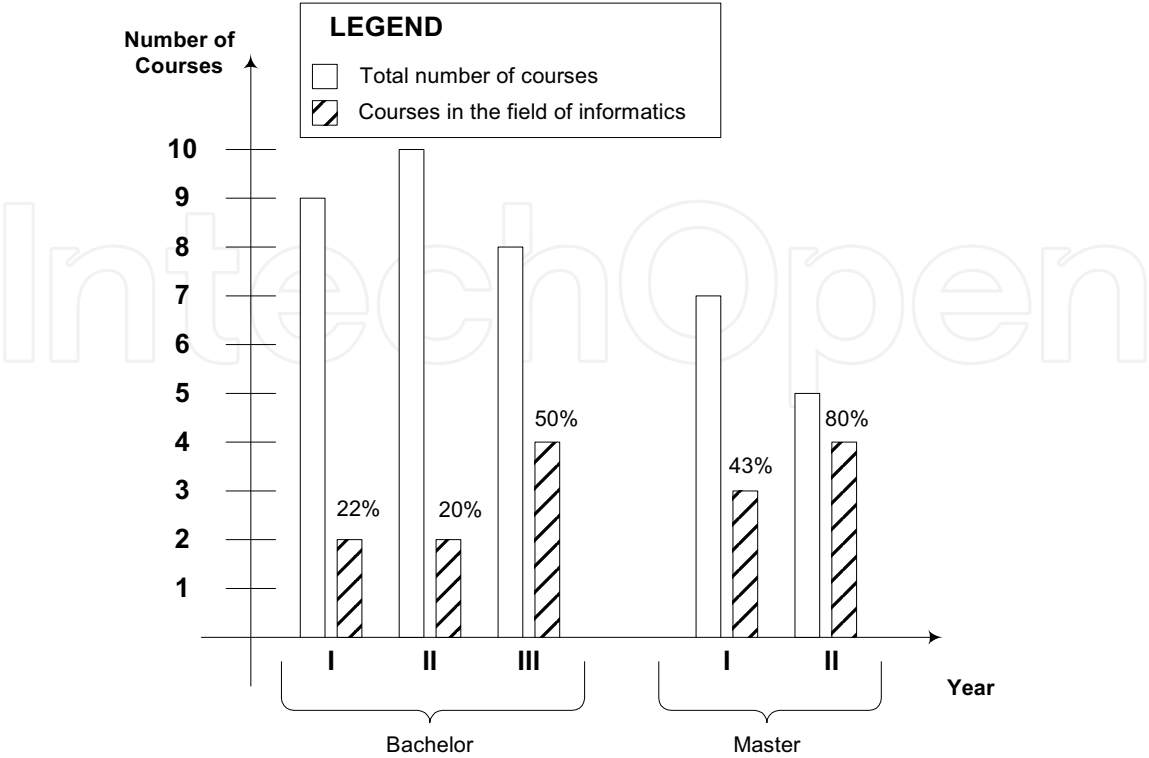


Fig. 5. Overview of the correlation between the total number of courses and informatics courses in the Major of Business Informatics

As for the other majors at the Bachelor three-year studies, from the 27 courses, students have only two courses in the field of informatics, or 7.40%, illustrated in Figure 6. It means an insufficient representation of courses in the field of informatics. This fact makes worse the contents of the other courses where the representation of informatics is insignificant. We cannot assert that our students are illiterate in informatics after three years of the study, but they are not quite ready to the challenges in practice. Their future employers do not expect traditional accountants with their sleeves rolled up any more, but the economists who use the world network and the newest software solutions in order to do qualitative analyses. The analysis of the two-year Master study, the Major of Business Informatics, shows that there are even seven courses, from 12 in total, in the field of informatics, or 58.33%, illustrated in Figure 5. This percent completely satisfies every module. The weak choice of the courses at this level of the study is compensated by the possibility of choosing the modules. The number of major elective courses is satisfactory and it gives students the possibility to specialize narrowly. If we analyze the two-year Master curriculum of the other majors, the situation is also very bad, the same as at the Bachelor studies. Only one from 12 courses is in the field of informatics, or 8.33%, illustrated in Figure 6. Such a situation imposes the need of introducing new elective courses in the field of Informatics or, alternatively, to analyze the contents of existing courses, and, where it is possible, to build on the contents from the fields of Informatics.

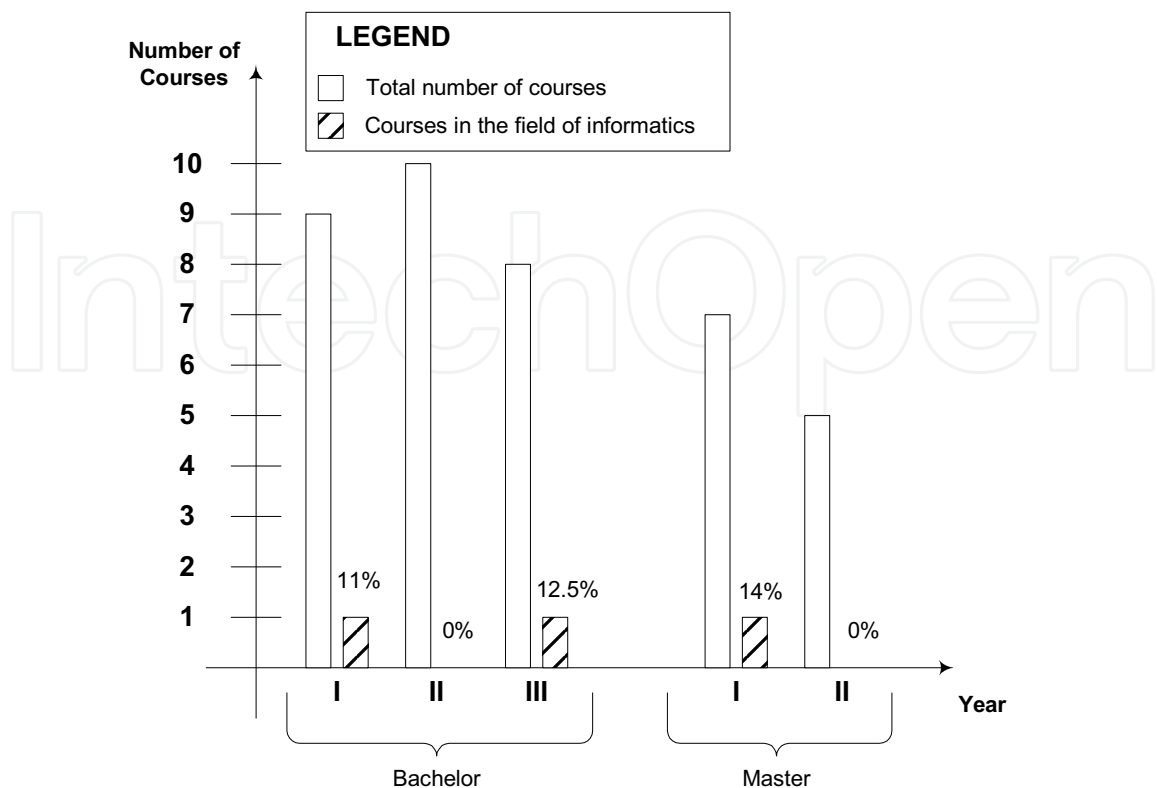


Fig. 6. Overview of the correlation between the total number of courses and informatics courses in other majors

6. Conclusion

The new Curriculum satisfies the set requirements. It is completely harmonized with the requirements of the Bologna process. Partner experiences from different European projects are built in it. At the same time, standards for curricula accreditation in the field of Business Informatics are accepted. Courses have up to date contents and they are completely in accordance with the expected and precisely defined learning outcomes. Also, set components of the new educational system established on requirements of the global economy were maximally respected. The Curriculum, regarding to its harmonization with other curricula in the environment, enables the mobility of students and teaching staff.

In general, the developed Curriculum is significantly better than the previous ones. Besides, it satisfies all the cited requirements and it is important to emphasize that the contents of all courses are up-to-date and in accordance with contemporary practical and scientific outcomes. Students perform their obligation efficiently and effectively because their activities are in accordance with students' workload. It is also important to say that easily applicative had replaced theoretical contents in the field of Business Informatics.

The study programme offers the students a professional oriented skill-set, enabling them to analyze business problems and develop information system solutions. In particular, following objectives for the course were set:

- › The course will equip students to analyze business problems from both technological opportunities and business requirements.
- › The course will equip students to develop solutions to business problems using ICT to its full potencial.
- › Students will learn methodologies that enable a clear understanding of business problems and the function of ICT in business.
- › Students will understand constraints, both organisational and technological in designing information system solutions.
- › Students will be provided experience in working in an inter-cultural work environment.

Besides the cited positive effects of the new Curriculum, it is necessary to say that some shortages have been noticed which should be eliminated in the next period. Before all, it is the need for Informatics courses in the majors of Economy and Management or, at least, including specific contents of some information technology fields in the current courses. In this way, informatics contents could get their appropriate importance, adequate to the role that ICT have in the contemporary world. Also, in Business Informatics Major, courses of Economy and Management should have contemporary contents important for implementing e-business and knowledge management.

The Curriculum, although built on the basis of determined learning outcomes, must respect, above all, learning outcomes relevant for labor markets. The learning outcomes are one of the basic elements of the study program, but their formulation is often a mere satisfaction of the form. They represent the potential for the substantial change of education process originating from, before all, the new philosophy of education that means the change of the focus of education from the process of lecturing to the process of studying.

In eliminating shortages, especially important contribution is expected from the processes and outcomes of internal evaluation of curricula, carrying out permanently and by means of which the feedback information is expected from all stakeholders about the quality of curricula, appropriate contents, missing contents, about what should be changed, and so on. Evaluation of this Curriculum is also expected by students when they graduate and begin to work. After all these evaluations, it will be clear how good the curriculum is.

Besides the concern for high-quality contents, introducing the new Curriculum needs time and resources in terms of marketing and promotion. All graduates can found roles as information system analyst or developer, business analyst, or IT consultant in various sectors, such as financial service industry, software industry, and the public sector. The excellent career opportunities of the graduates will make the program more attractive for students.

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From 3rd to 5th March 2008 the International Association of Technology, Education and Development organised its International Technology, Education and Development Conference in Valencia, Spain. Over a hundred papers were presented by participants from a great variety of countries. Summarising, this book provides a kaleidoscopic view of work that is done, all over the world in (higher) education, characterised by the key words 'Education' and 'Development'. I wish the reader an enlightening experience.

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