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TEACHING INFORMATION TECHNOLOGY IN ECONOMICS AND BUSINESS ADMINISTRATION TRAINING PROGRAMS

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I. INTRODUCTION

During many years of teaching I have very often faced the problem that on the basis of debates with teacher colleagues the content of subjects taught has extended, narrowed, changed but in fact the definition of objective was missing, that was the reason why the debates lead us nowhere at all. This study has been inspired by the ambition that basic IT education should focus on the really important key competences that this special area requires, that is Economics and Business Administration Training Programs.

The first important step was made with the decision that wished to change from teacher centered education for student centered education, concentrating on the outcome side. This fundamental change of thought is supported by a wide-scale pedagogical bibliography available, which I am going to present in chapter III.1 as well as the Bologna process, determining the transformation of European higher education in the last few years presented in chapter III.2 In these chapters I am going to define base terms used in my study: competence, declarative and procedural knowledge, skills, ability, attitude, student-centered teaching.

The concrete special area that I am working with along these aspects is IT key competences that are necessary at Economics and Business Administration training programs. The economics and business administration training programs are divided into two course groups according to the Hungarian programme and graduation requirements and in the international literature, too, that is, economics and business courses. In Hungary economics courses are Applied Economics, Quantitative Economic Analysis (earlier Economic Analysis) and Public Services, business courses are Human Resources, Business Administration and Management, Commerce and Marketing, International Business Economics, Finance and Accounting, Tourism and Catering and Vocational Instruction. The study does not deal with the latter one (Vocational Instruction). I am going to revise the educational area in chapter III.3.

Since IT education is the main issue, I find it important to mention IT Body of Knowledge in chapter III.4, but first of all I put the emphasis on the meeting points of areas of sciences in chapter III.5.

The legal review of secondary school curricula is in chapter III.6 the review of the quite well-known IT users' exam system, ECDL is included in chapter III.7.

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Next to theoretical reviewing I carried out empirical examinations to be more precise regarding the topic. I am going to present the plans of research in chapter IV, the concrete results in chapter V. I turned to graduates and present students with a questionnaire. To reveal the aspects of both science and teachers, I made interviews with teachers and research of bibliography. I used document analysis for the examination of present practice.

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II. AIMS OF THE STUDY

The review of the concept of the study is provided by Figure 1. The primary aim is that students entering the labour market should be successful. The world of work is changing dynamically and the definition of where exactly the students graduating at the courses examined will turn up in this world is not obvious either. The situation is even more complicated by the current continuously developing technology, sector differences and heterogeneous requirements typical of places of work. This study cannot estimate this dynamically changing heterogeneous group of requirements completely. However, in the higher education there is a concrete static requirement system described by programme and graduation requirements. It is a challenging task to establish such an education which can meet static pro-gram and graduation requirements and it enables students to prepare for a dynamically changing environment they are going to see in the world of work.

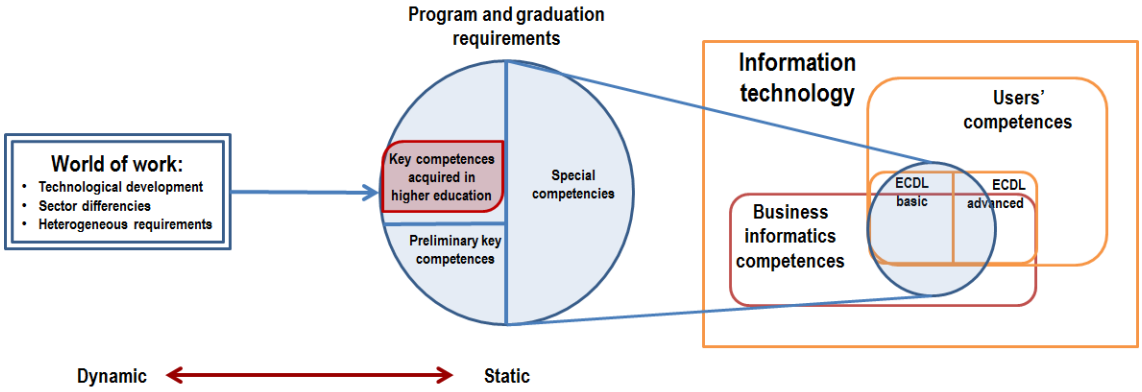

Figure 1 Informatics key competences necessary in courses of economics and business (own design)

Programme and graduation requirements contain key and special competencies, the latter ones are more involved in changes, although the circle of necessary key competencies is changing with time but more slowly. For example, nowadays competences connected to mobile technology developing fast will be unavoidable in a short time, although they did not exist some years ago. Special competences are rarely mentioned in the study, because they cannot appear in the basic IT education. The basic IT education is typically present at the beginning of the education, in the first or second term.

It is a tendency deriving from the development of the information society that students step into higher education not lacking IT competences completely. It is also essential to

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find out what the students take with them, whatever they learn either in secondary school in formal environments or in informal ways.

Concerning all mentioned above, I am looking for answers to the following questions:

(K1) What should the aim and content of basic Information Technology courses be in the economics and business administration training programs?

In order to answer the main question I am looking for answers to the questions below:

(A1) What kinds of IT competences are needed in the economics and business administration training programs, within it at economics and business educational courses, according to programme and graduation requirements as well as European Union directives?

(A2) What kind of IT education is provided for students of Economics and Business administration training programs?

(A3) What kinds of differences can be experienced between the programme and graduation requirements, European Union directives and present home practice?

(A4) What kinds of knowledge and skills can we rely on during the education?

(A5) What kinds of IT key competences are necessary for graduates of economics and business administration training programs when entering work?

(A6) In what areas is there a difference between IT key competences possessed already at starting university and at a work place?

In order to validate results of research, the practical implementation of theoretically proved statements is necessary. One possible form of it is ***compiling an up to date curricula, meeting the expectations of Bologna process, programme and graduation requirements, workplace standards, taking marginal conditions into considerations.***

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III. RESEARCH OF BIBLIOGRAPHY

III.1. Theories of Pedagogy, development of teaching material

The part of state teacher training is pedagogical preparation. It is not necessarily so for colleagues working in higher education. The general experience is that pedagogical aspects do not play an important role in higher education and mostly state education has a wider scale of professional literature regarding theories of curricula but they also have some points which can be applied in higher education. [*Ballér,2004; Báthory,2000; Szebenyi, 1994*]. Mainly due to the Bologna process, European processes of the last few years have put more and more emphasis on the pedagogical approach in higher education, too. [*Fischer – Halász, 2009; Tuning, 2009; Vámos, 2010*] As a next step I am going to focus on some more important theories and considerations of curricula and development of teaching material.

III.1.1. Whose task is to prepare curricula?

During the evolution of curricula theories it has been expressed several times that there is a need for the cooperation of the different participants, that is, the communication between science, teachers, students and labour market. [*Szebenyi, 1994*]

It is interesting to stress some of Bourdieu's basic curricula development concepts: by changing teaching materials carried out in order to maintain the standard, the material of education must be adjusted to both scientific and social changes "thriving to achieve a balance and integration between professional fields is a must." [*Varga, 1991*]

According to the curricula theory published by Ralph Tyler in 1949 (also widely known as Tyler Rationale) sources of selecting teaching material are educational requirements, interests and aspirations; needs of the contemporary society for school and knowledge, and the scope of knowledge held relevant by representatives of professional sciences. [*Báthory, 2000; Csapó, 1991; Tyler, 1949*]

In the frame of Europe 2020 strategy it appears as an outstanding aim to learn for a lifetime, within it to modernize labour markets. [*Csernovitz – Szegedi (ed.), 2012*] An important initiation is "An Agenda for new skills and jobs", one of the subpoints of which is, on a member state level: "To develop partnerships between the worlds of

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education/training and work, in particular by involving social partners in the planning of education and training provision." [*European Commission, 2010 pp. 21-22.*]

III.1.2. Bloom Taxonomy

In Bloom's work published in 1956 learning aims are divided into 3 domains; cognitive; psychomotor and affective. Out of them the cognitive domain has been revealed most. [*Báthory, 2000; Bloom, 1956; Perjés – Vass, 2009*].

The cognitive domain of taxonomy was reconsidered and revised taking the practice of teachers into consideration with the leading of David R. Krathwohl, a member of the original research team in the 90s, which was published in 2001 with the title 'Revised Bloom's Taxonomy. [*Krathwohl, 2002*] (Figure 2)

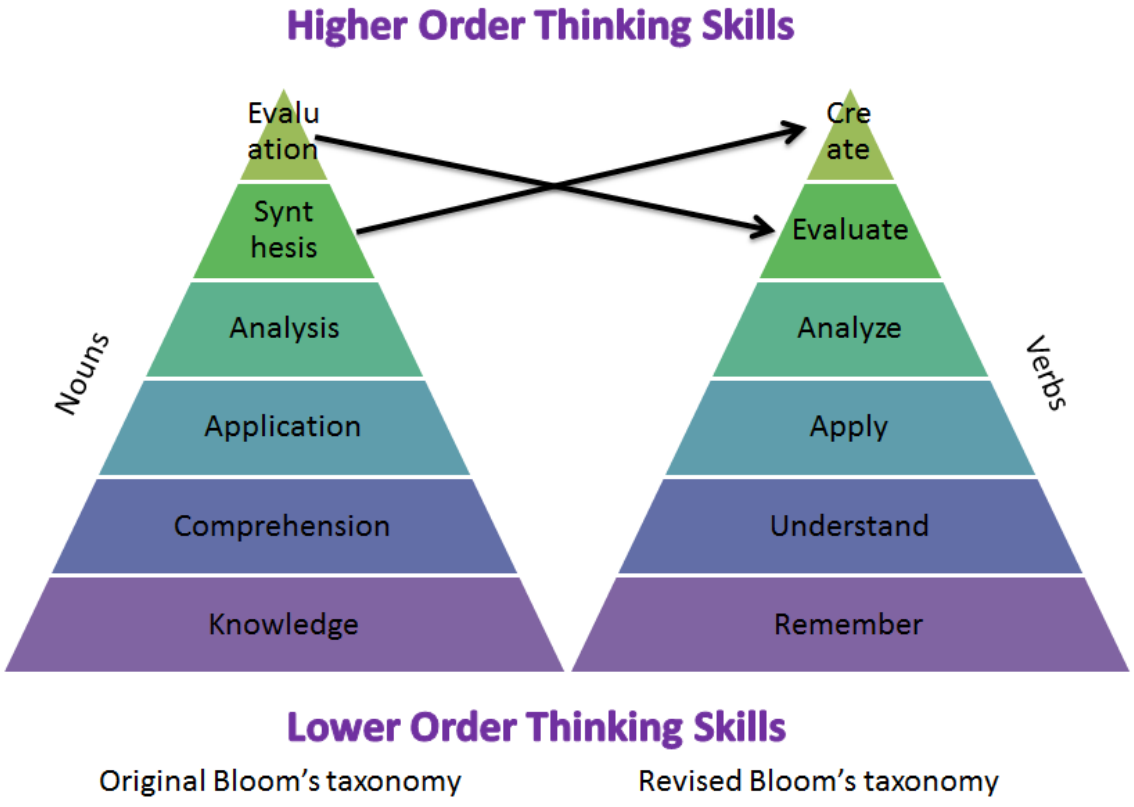

Figure 2 Bloom's taxonomy (own design)

The affective domain division in Bloom's study: receiving, responding, valuing, organisation, characterisation. [*Kennedy, 2007*]

A possible division of psychomotor domain: imitation, manipulation, precision, articulation, naturalisation. [*Dave, 1970*]

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One part of IT may belong to this domain [*Kennedy, 2007*], for example touch-typing, the use of tools of IT (for example mouse).

The interpretation of psychomotor domain was published in 2005, focusing on the laboratory work of engineer education. [*Ferris – Aziz, 2005*]

- recognition of tools and materials
- handling of tools and materials
- basic operation of tools
- competent operation of tools
- expert operation of tools
- planning of work operations
- evaluation of outputs and planning means for improvement [*Ferris – Aziz, 2005*]

The use of means of IT applications belongs to the cognitive domain, within it the users have to reach the level of application. Although Ferris and Aziz *[2005]* worked out their theory for the use of physical means, I believe, these levels can be applied for the further division of the application level of the cognitive domain except for the first two points. Providing a concrete example, the application of the means of spreadsheet programmePivot table can be basic (the user knows where he can find the means and can make a simple Pivot with it). In case of competent usage he can set a multi-level division and can change the summing function used in the Pivot. In the case of expert usage he knows and applies the different special settings, can refine the Pivot prepared. A higher level of application is that whenever a problem arises the user knows this kind of means must be used for it. On the highest level he also knows what causes the mistake in a Pivot prepared with a defect or what setting could help prepare a more informative Pivot, which can be used better.

In the rest of the study I am going to use Bloom's original taxonomy, within it, the further division of the level of application presented here.

III.1.3. The evolution of learning outcomes

It was already stated in Tyler's Rationale when designing an educational programmeit is very important that there should be a concept of the targets, the programmeis aimed at. These educational objectives provide the criterion system, on the base of which teaching materials are selected, the contexts are outlined, the processes are developing, and the

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tests and exams are made. According to Tyler's definition, education aims "represent the kinds of changes in behavior that an educational institution seeks to bring about in its students." [*Tyler – 1949 p.6.; Allan – 1996*]

The educational objectives defined by Tyler have undergone a long evolutional process, as shown by figure 2. There was one important phase of this evolution when Mager defined instructional objectives instead of educational ones (educational – instructional). [*Mager, 1962*]

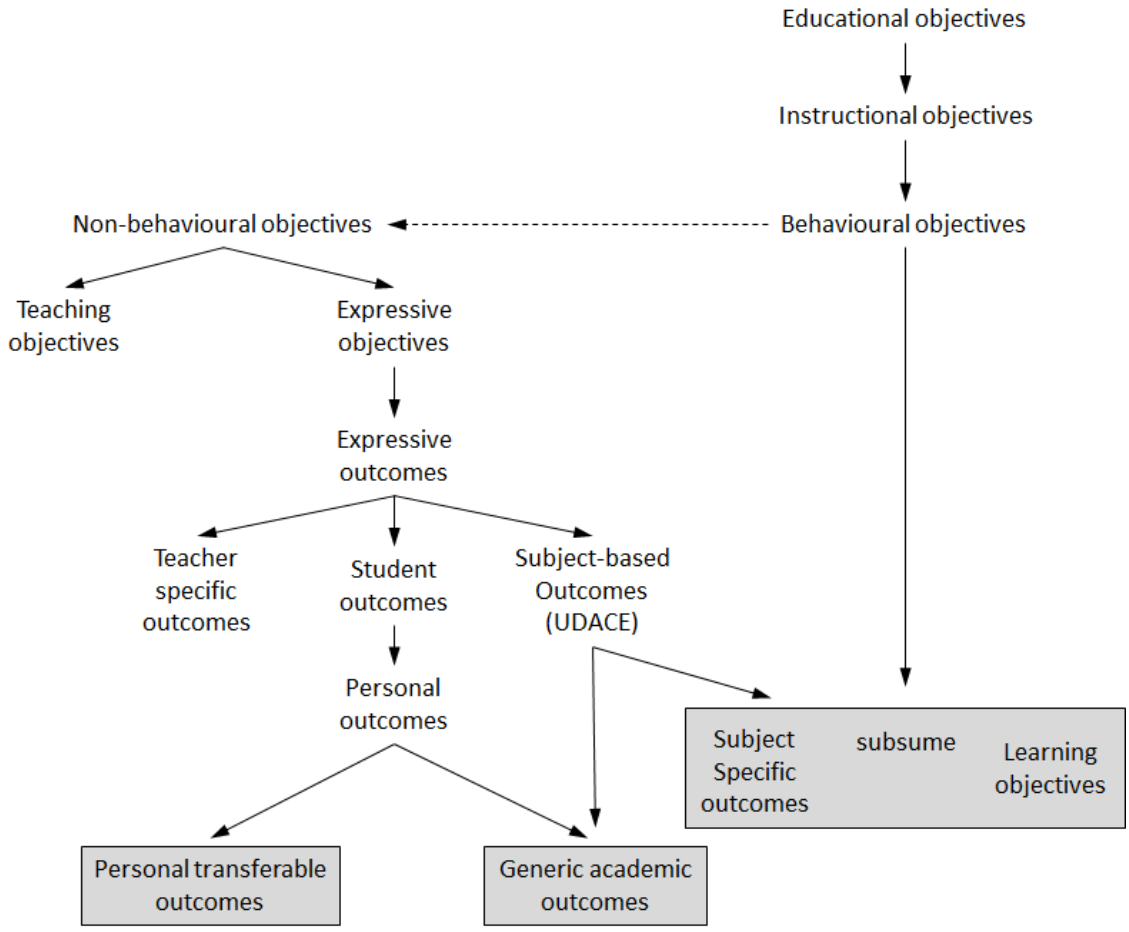

Figure 3 The evolution of learning outcomes [Allan – 1996, p. 101.]

The most widespread objective system is the definition and usage of learning outcomes, which has a number of definitions but they do not show a significant difference. The definition of ECTS Users' Guide is: "Learning outcomes describe what a learner is expected to know, understand and be able to do after successful completion of a process of learning." [*European Commission,2009a p. 11.*]

Different, still quite similar definitions agree in the 2 points below:

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- learning outcomes focus on what the student has achieved rather than merely focusing on the content of what has been taught;
- learning outcomes focus on what the student can demonstrate at the end of a learning activity.

Among the definitions of learning outcomes we can also find the kind that gives details about the way of providing the outcomes. The definition of the American Association of Law Libraries is this kind:

"Learning outcomes are statements that specify what learners will know or be able to do as a result of a learning activity. Outcomes are usually expressed as knowledge, skills or attitudes." [*quotes: Kennedy, D., 2007. p. 19.*]

Knowledge, skills, attitude division appears characteristically at the term competence, that is why I am going to examine them in detail in the next subchapter.

According to Stephen Adam's summary the main features and advantages of learning outcomes are the following:

- they set up a general requirement for precision when planning a course
- help getting rid of overlaps
- provide information for students about selecting a course
- may ensure a free move in between educational programs
- focus on outcomes
- may be compiled for one module or the whole program
- use active verbs (such as Bloom's taxonomy)
- emphasize the connection between teaching-learning-evaluation
- support quality assurance
- are generally expressed in competences
- provide a chance for joining vocational training and higher education
- improve the international acknowledgement and identification of degrees [*Adam, 2004*]

Adam highlights critical comments, too. Applying learning objectives may:

- hinder the learning process
- suits the training kind of education more than higher education left open ended
- may lead to an objective-directed culture

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- violates the liberal concepts of universities
- it is both difficult and expensive to be introduced technically
- may meet the resistance of higher education staff [*Adam, 2004*]

Table 1 The comparison of teacher–centered learning and student-centered learning based on Stephen Adam's summary [2004]

TEACHER-CENTERED LEARNING	STUDENT-CENTERED LEARNING
• Teachers serve as the center of epistemological knowledge • Students are „empty vessels" and learning is an additive process • Instruction is geared for the „average" student	• Students are not passive. They come with their own perceptual frameworks. [*Erikson, 1984*] • Students learn different ways. [*Briggs-Myers, 1980; Kolb, 1984*] • Learning is an active dynamic process. [*Cross, 1991*] • Students construct their own meaning by talking, listening, writing, reading, and reflecting on content, ideas, issues and concerns. [*Meyers and Jones, 1993*]

Regarding criticism it is important to note that resistance usually derives from different interpretations. The definitions of learning outcomes means the minimum level, which ones who complete the certain programmedefinitely have but it does not mean the maximum the certain programmecan provide. If we look at it that way, we can match the open-ended higher education with the theory of learning outcomes smoothly. [*Derényi, 2006*]

The learning outcomes approach has a leading role in the development and planning of the curricula. It is part of a change of paradigm: student-centered learning instead of teacher-centered learning. [*Adam, 2004*] The comparison of the 2 paradigms is shown by Table 1.

III.1.4. Competence

The idea of competence was created by linguist Noam Chomsky. [*Chomsky, 1965; Szabó, 2010; Vass, 2006*] He can be considered the predecessor of cognitive revolution, as he opposed the basic principles of behaviour – psychology, behaviourism accepted at that time. [*Csapó, 2002*]

The modern competence movement in the American education-psychology started at the end of the 1960s at the beginning of the 1970s. Researchers realized that traditional tests show a minimum relation to work competence and the new research was trying to reveal

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what personal traits , competences are the ones that differentiate a successful employee from an unsuccessful one. [*Spencer, 1997*]

In Europe it was in the 1990s that competence became a fashionable term. The term competence is often used when describing learning outcomes. [*Falus, 2006*]

"In a world in which the stock of factual knowledge is created, distributed and accessed ever more rapidly, people's need to memorise such knowledge is declining. Instead, they need the appropriate tools for selecting, processing and applying the knowledge required to cope with changing employment, leisure and family patterns. This accounts for the growing tendency in education to develop competencies rather than teach factual knowledge." [*Eurydice, 2002 p. 13.*]

The main problem about it is that the term competence has no single unified definition its interpretation is not unanimous in the Hungarian and in the international literature, either. [*Vass, 2006; Mihályi, 2002, 2003*]

The word competence is of Latin origin, according to the Hungarian Dictionary of Definitions it means jurisdiction and scope of authority. [*MTA, 1992*] It expresses suitability and skills in an everyday context. [*Vass, 2006*] According to the Pedagogical Lexicon "it is a basically cognitive feature but motivational elements, skills as well as emotional factors also play an important part in it". [*Báthory – Falus (ed.), 1997. p. II. 266.*]

Two approaches to the term of competence are often differentiated on the one hand from the aspect of origin, on the other hand, from the aspect of outcome. The origin approach emphasizes the individual's expertness, skills, abilities and motives. The outcome approach relates competence to the ability of competent performance. [*Szabó, 2010.*]

In the description of learning outcomes, the term competence reflects the outcome-aspect.

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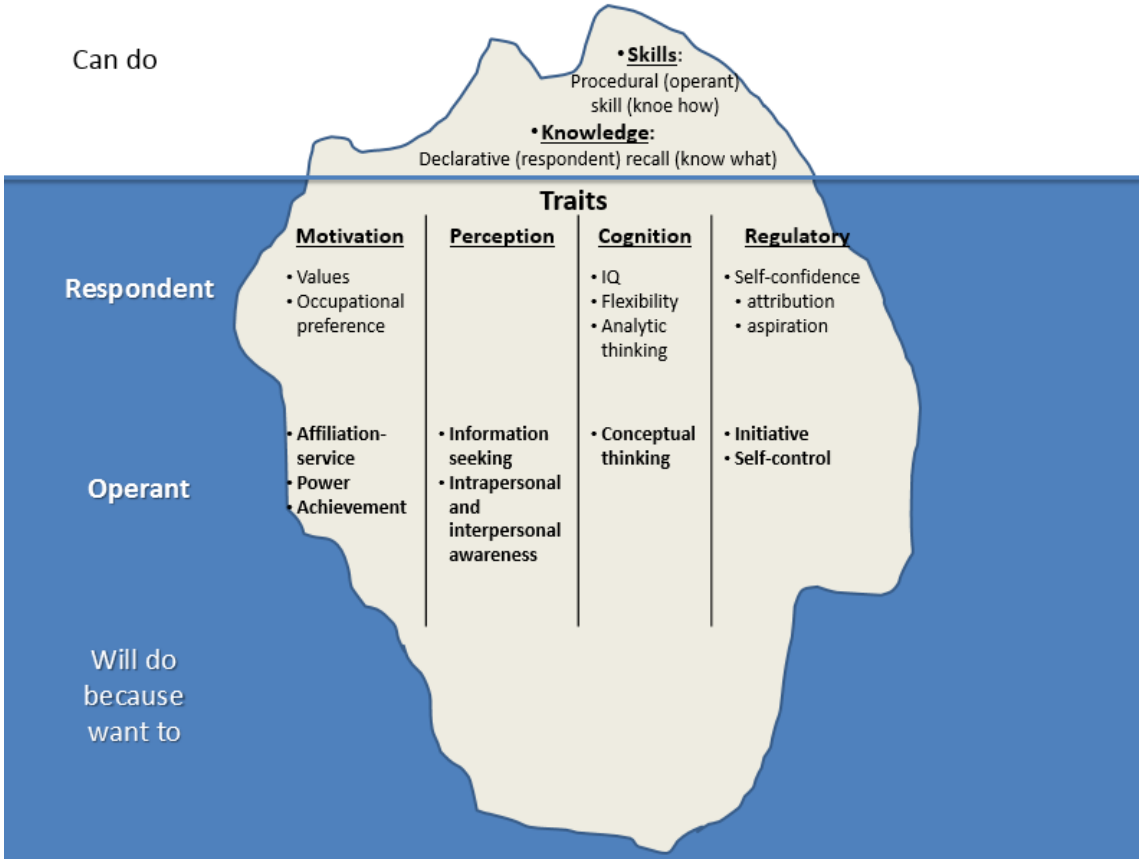

Figure 4 The ice-berg model of competences [1997 p.8.] according to Spencer (own design)

The complexity of the term of competence, which can be seen well on the so-called ice-berg model (Figure 4) underlines that the part which is measurable, visible and can be developed is only the peak of the ice-berg, basic traits can only be found under the water level and can be taught much harder. [*Spencer, 1997*]

The definition recommended by J. Coolahan expert of the European Council, is often applied. He states competence is "the general capability based on knowledge, experience, values, dispositions which a person has developed through engagement with educational practices". [*quotes: Eurydice, 2002 p. 13.*]

According to the summary of the leaders of DeSeCo programme(Defining and Selecting Key Competencies 1997-2002) launched by OECD: "A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and attitudes) in a particular context. For example, the ability to communicate effectively is a competency that may draw on an individual's knowledge of language, practical IT skills and attitudes towards those with whom he or she is communicating." [*DeSeCo, 2005p.4.*]

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I should perhaps call attention to one more approach out of the many competence approaches, the opinion of 2 economists (Frank Levy and Richard J. Murmane), who explained their standpoint within the framework of the DeSeCo project, too. They were examining competencies crucial from the aspect of successes of economy. In accordance with the literature of economy they use competencies and skills as synonym terms but they do not only mean cognitive skills by them (for example tenacity). [*Mihályi, 2002*]

The definition used in the Educational Office 'TÁMOP 4.1.3' Higher-Education Development Subproject is as follows: "Psychic systems, which make effective, successful activities possible to be performed referring to the given field task and group of tasks. Competence is considered to be the system of knowledge, skills, abilities and attitudes which is completed by values, or/and motives, autonomy or some other term according to some descriptions." [*Vámos, 2013 p. 2.*]

In the latter definition there are some terms we have met already before but perhaps it is worth making them clear.

Knowledge: Knowledge is the first level of the cognitive domain of the original Bloom taxonomy. In Hungarian two terms define it (ismeret, tudás), but the second term is broader, during its general use it contains both knowledge and skills. Accordingly, we can make a difference between declarative and procedural knowledge. If we talk about knowledge as a part of the term competence, we usually mean the declarative knowledge by it and we put the second level, next to the first one from the cognitive domain of Bloom's taxonomy, into this category (knowledge + comprehension).

Abilities and skills: Compared to the knowledge discussed in the previous paragraph they mean activity, that is, they mean the application, analysis, synthesizing and evaluation of knowledge. These activities may be of cognitive kind (the upper levels of Bloom's taxonomy) and psychomotor as well. The basic difference between abilities and skills is that abilities are elementary activities automatized, while skills are intentionally connected abilities and declarative knowledge for the solution of a task.

Attitude: The essence of attitude is the evaluating relation to a concrete or abstract subject direction. It has numerous interpretations and approaches according to the characteristic multidimensional approach of today, affective, cognitive and conative (mental and behavioral) elements also appear next to the affective one. The problem is being interpreted as a part of learning outcomes, that although it can be defined and necessary

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but it is hardly measurable and so it cannot be proved that the students have really achieved their goals set by the end of learning process. When defining learning outcomes, they still often use the one dimension approach and they use the affective domain levels of Bloom's taxonomy for the description of grades.

The diagram in Appendix 1 shows the structure of the term of competence, as used in the study.

Table 2 Comparison of key competence groups

TEMPUS (2001)	EUROPEAN EDUCATION FOUNDATION (2002)	EUROPE COUNCIL (2002)	EU KEY COMPETENCE COMMITTEE	QUÉBEC-PROGRAMME(2004)
communication	communication	communication	communication	communication
numerical skills	practical calculation	numeracy	mathematical competence and …	
team work	cooperation with others	working with others		personal and social competences (… cooperation)
problem solving skills	problem solving	problem solving		intellectual competences (… problem solving, …)
	information and communication techniques	information and communication technology	digital competence	methodological competences (information and communication technologies)
learning and performance development	taking responsibility for one's own learning and performance and their development	learning to learn	skills and abilities connected to learning how to learn	

Next to the large number of definitions the scale is seen as quite wide due to the variety of what certain researchers, research teams and organizations consider key competencies, what division of competencies they use. In Table 2 we can see that they have a lot in common and applying informational and communication technologies is almost always

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present in one way or another. The second chart shows common elements of 5 approaches. [*DeSeCo, 2005;SZIE, 2001;Bogár, 2002; European Commission, 2002;European Union, 2006; Ranschburg, 2004*]

III.2. The Bologna process in Europe

The pedagogical theories presented in the previous chapter are playing more and more important roles in the transformation of higher education. The process starting in 1999 Bologna has still been going on in all countries of Europe including Hungary and it is influencing the operation and regulation of institutions and the material of education. I would like to sum up the events that happened in Bologna and after focusing mainly on the topic of the dissertation (Table 3).

III.2.1. The beginnings

One year after the 800th anniversary of the opening of Sorbonne, the 1999 Bologna Decree set the aim of forming the European Higher Education Area (EHEA) and by doing so it intended to increase the competitiveness of the European higher education [*European Commission, 2009$_b$*]

The main points deriving from the Bologna Decree and some further meetings afterwards can be enlisted as follows:[*Kennedy, 2007; EHEA, 1999; EHEA, 2001*]

- The European Higher Education Area (EHEA) will ensure the increased international competitiveness of the European system of higher education.
- The traditional ways of describing qualifications and qualification structures need to be improved and made more transparent. A system of easily readable and comparable degrees is being adopted.
- Every student graduating will receive a Diploma Supplement automatically and free of charge, in a widely-spoken European language. This supplement describes the qualification the student has received in a standard format that is easy to understand and compare. It also describes the content of the qualification and the structure of the higher education system within which it was issued. The purpose of the supplement is to improve transparency and facilitate recognition.
- The system of degrees will be comprised of two main cycles – the first cycle lasting a minimum of three years (now defined as a minimum of 180 credits) and the second cycle leading to the master's and/or doctor's degree. This was subsequently modified

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to include the doctoral level as a separate third cycle in the Bologna Process and to promote closer links between the European Higher Education Area (EHEA) and the European Research Area (ERA).

- The introduction of a transferable system of academic credits will assist in the promotion of mobility within the EHEA by overcoming legal recognitions and administrative obstacles.
- The transferable system of academic credits assists in promoting European co-operation in quality assurance.
- The position of higher education institutions and students as essential partners in the Bologna Process is confirmed.
- The European dimension in higher education will be promoted through inter-institutional co-operation, curricula and mobility schemes for students and teachers and researchers.

The quotation from the Berlin ’communiqué’ shows that the Bologna process would like to build the pedagogical considerations detailed in previous subchapters into the practice the European Higher Education Area: ”Ministers encourage the member States to elaborate a framework of comparable and compatible qualifications for their higher education systems, which should seek to describe qualifications in terms of workload, level, learning outcomes, competences and profile. They also undertake to elaborate an overarching framework of qualifications for the European Higher Education Area” [*EHEA,2003 p. 4.*]

III.2.2. The Foundation of the European Higher Education Area

The official foundation of the European Higher Education Area (EHEA) took place at the ministerial meeting of 2010, which was held in Budapest and Vienna. [EHEA, 2010] Although not all initiations have been realized of the ones aimed at in Bologna but the Bologna process has entered a new phase with this step. [European Commission, 2009a]

As a response to the global economic crisis, the Conference of Ministry in Bucharest, 2012, pointed out 3 areas in focus as follows: assuring good quality higher education for more and more students, providing students with more and more well applicable competences at the labour market as well as increasing the mobility of students. [EHEA 2012]

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Table 3 The Bologna Process: from Sorbonne to Leuven/Louvain-la-Neuve, 1998 – 2009 [EHEA, 2012b p. 15]

1998 Sorbonne Declaration	1999 Bologna Declaration	2001 Prague Communiqué	2003 Berlin Communiqué	2005 Bergen Communiqué	2007 London Communiqué	2009 Leuven/Louvain-la-Neuve Communiqué
Mobility of students and teachers	Mobility of students, teachers, researchers and administrative staff	Social dimension of mobility	Portability of loans and grants Improvement of mobility data	Attention to visa and work permits	Challenges of visa and work permits, pension systems and recognition	Benchmark of20 % by 2020 for student mobility
A common two-cycle degree system	Easily readable and comparable degrees	Fair recognition Development of recognized Joint degrees	Inclusion of doctoral level as third cycle	QF-EHEA adopted National Qualifications Frameworks launched	National Qualifications Frameworks by2010	National Qualifications Frameworks by2012
		Social dimension	Equal access	Reinforcement of the social dimension	Commitment to produce national action plans with effective monitoring	National targets for the social dimension to be measured by 2020
		Lifelong learning(LLL)	Alignment of national LLL policies Recognition of Prior Learning (RPL)	Flexible learning paths in higher education	Role of higher education in LLL Partnerships to improve employability	LLL as a public responsibility requiring strong partnerships Call to work on employability
Use of credits	A system of credits(ECTS)	ECTS and Diploma Supplement (DS)	ECTS for credit accumulation		Need for coherent use of tools and recognition practices	Continuing implementation of Bologna tools
	European cooperation in quality assurance	Cooperation between quality assurance and recognition professionals	Quality assurance at institutional, national and European level	European Standards and Guidelines for quality assurance adopted	European Quality Assurance Register(EQAR)	Quality as an overarching focus for EHEA
Europe of Knowledge	European dimensions in higher education	Attractiveness of the European Higher Education Area	Links between higher education and research areas	International cooperation on the basis of values and sustainable development	Strategy to improve the global dimension of the Bologna process adopted	Enhance global policy dialogue through Bologna Policy Fora

"Today's graduates need to combine transversal, multidisciplinary and innovation skills and competences with up - to - date subject - specific knowledge so as to be able to contribute to the wider needs of society and the labour market. We aim to enhance the

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employability and personal and professional development of graduates throughout their careers. We will achieve this by improving cooperation between employers, students and higher education institutions, especially in the development of study programmes that help increase the innovation, entrepreneurial and research potential of graduates. Lifelong learning is one of the important factors in meeting the needs of a changing labour market, and higher education institutions play a central role in transferring knowledge and strengthening regional development, including by the continuous development of competences and reinforcement of knowledge alliances." [*EHEA, 2012$_a$ p. 2.*]

III.2.3. Tuning project

The Tuning project (Tuning Educational Structures in Europe) connected to the Bologna process is an innovation brought about by universities, its name calling attention to the fact that it is not the unification of education which is the main task but rather it is their tuning instead. It is highly desirable to maintain the European multicolour varieties, they do not intend to intervene into the autonomy of universities, they only wish to provide standpoints for the tuning of educations according to different fields. [*González – Wagenaar, 2008*]

When preparing curricula, it is important to find the balance between integration and differentiation. The different institutions provide the same within the framework of certain educations but they can also add some individual traits to the curricula. [*Perjés – Vass, 2009; Szebenyi, 1994*] Although it is also true that there is some need for a common European terminology and adapting processes in the description of educations, it cannot mean a standardization of contents, aims and organizations. [*Ministry of Science, Technology and Innovation, 2005*]

The success of Tuning approach can be clearly seen by its having been tested on several continents already and it has been declared legitimate internationally. Now it is being applied in more than 30 educational areas, several institutions in Europe , Latin-America and some Asian countries as well. It is being tested in some states of the USA, too. [*OECD, 2011*]

III.2.4. The realization of the Bologna process in Hungary and Europe

The report on the realization of the Bologna process relies on the data gathered in the first half of 2011 and it is extensive. Its main point is that the Bologna process is a European

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success story, undoubtedly, formidable and positive changes happened in the European higher education in the first 10 years.

In all of 47 countries easily comprehensible degrees were realized as well as the implementation of the 3-cycle education but it is still not general in some countries. (Figure 5)

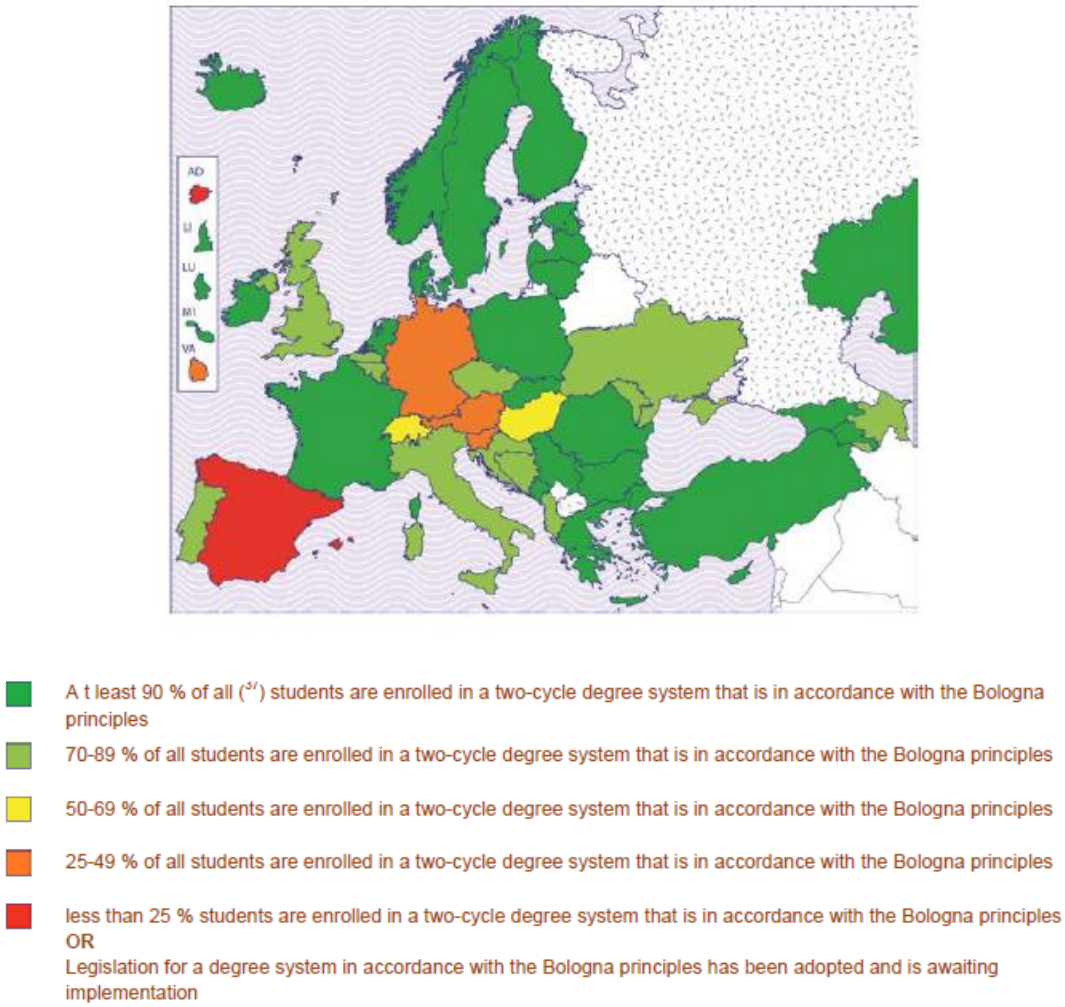

Figure 5 Stage of implementation of the first and second cycle, 2010/11 [European Commission, 2012 p. 32.]

In most countries 10-24% of the graduates of the first cycle is going to enter the second cycle immediately but in 13 countries the rate is 75-100% which means the bachelor education does not give a competent degree or the employers do not accept bachelor degrees (Figure 6). [*European Commission, 2012*]

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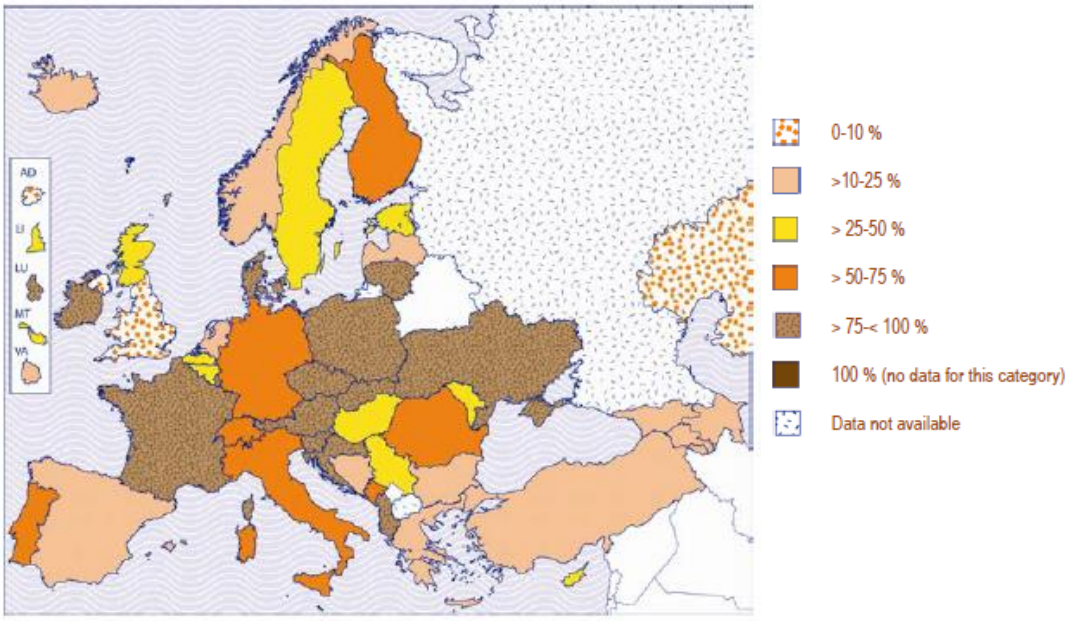

Figure 6 Share of first-cycle students continuing studies in a second-cycle programme after graduation from the first cycle (within two years), 2010/11 [European Commission, 2012 p. 39.]

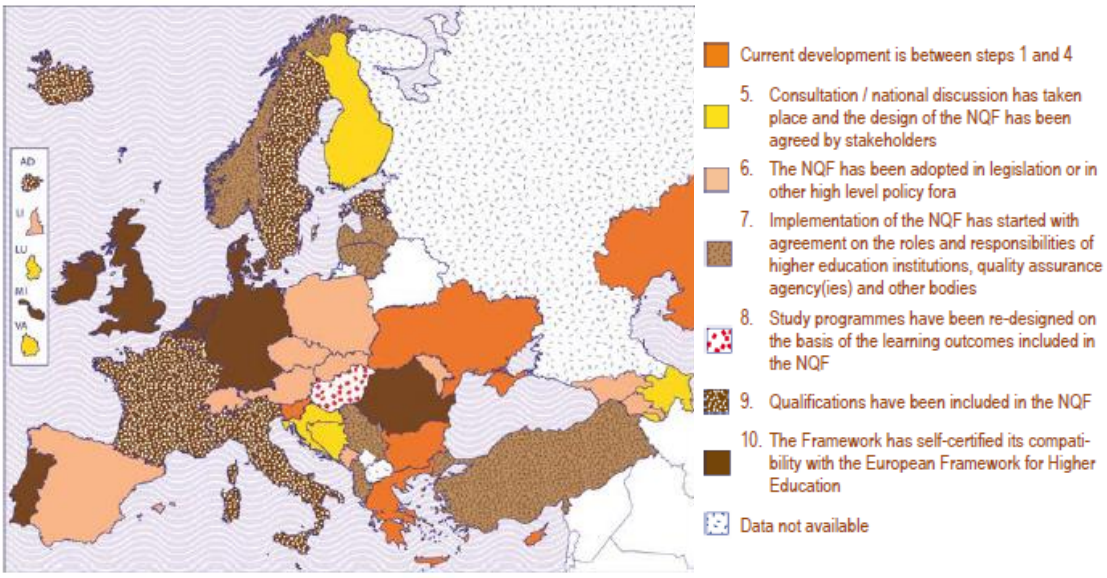

Figure 7 Progress in development of national qualifications frameworks according to the 10 steps, 2010/11 [European Commission, 2012 p. 46.]

The education framework was completed in 9 countries and some other countries are quite close to completion. (Figure 7) However in these countries educational outcomes are not connected to methods of assessments.

The Hungarian Qualifications Frameworks(HQF) is in use at present, instead of the formerly used National Qualifications Framework , according to the Government Decree a1229/2012. (VII. 6.) [Government Decree]

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Further processes are mentioned in the decree with the following deadlines:

- The harmony of the principles and structure of EQF with the levels of HQF and the described features of certain levels: 30th October 2013
- Proposal about categorizing Hungarian qualifications according to the levels of HQF, preparation of proposal to achieve acceptance of levels of HQF in accordance with the levels of EQF: 30th October 2013
- Preparing the European Union report on matching HQF levels with EQF levels: handing it in by 30th of 2013

Due to several modifications of the decree, the modified deadline of the first two points was 30th June, 2014, one report reached the government, too. The current deadline of the last point is 31st, December, 2014. [*based on András Derényi's statement*]

In HQF each level was described along 4 descriptors. These are knowledge, skills and attitude discussed in the competence chapter, completed with a 4th one: autonomy and undertaking responsibility.

An interview with Zoltán Loboda, leader of the International Department of the Educational Office, and András Derényi , leader of higher education sub-project has been published for Edupress News recently. András Derényi can give us an overall description of the situation in Hungary regarding aspects based on learning outcomes:

"Although the approach based on outcome requirements in the national education sector is rather strange in our culture, it is actually the lack of knowledge which leads to the fact that it is only accepted with difficulty. These are new means, new terms. Learning outcomes are often confused with marks and grades (the terminology is only similar in the Hungarian language) and it is really hard to understand and accept the term 'competence'. Let me add, though, that even in Anglo-Saxon countries it took 15 years to establish the system - in our case it will take even more time. Methods aiming at learning outcomes, that is to say, the kind of methods that evaluate quality preparations and results achieved have not been defined yet, have not been built in the education and have not been taught anywhere. I think there is a significant educational reform going on in front of our eyes". [*Edupress, 2013*[1]]

[1] http://www.edupress.hu/hirek/index.php?pid=egycikk&HirID=28904 last seen: 2013. 08. 28.

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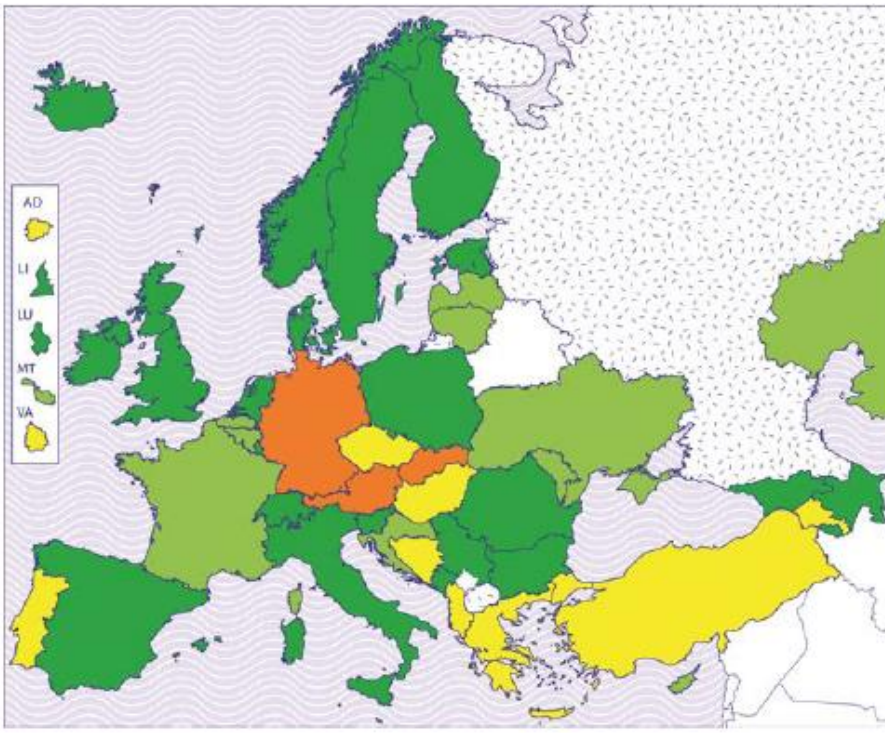
The implementation of the European Credit Transfer and Accumulation System (ECTS) can be regarded as complete in Europe as a transferring and accumulating system. However, credits are not connected to learning outcomes everywhere. In this respect we do not belong to the top, 34 countries come before us out of 47 (Figure 8); our lagging behind is rooted in the fact that in Hungary credits are not connected to learning outcomes at all. Apart from Hungary it is the same in Slovakia and Albania. [*European Commission, 2012*]



ECTS credits are allocated to all components of all HE programmes, enabling credit transfer and accumulation
ECTS credits are demonstrably linked with learning outcomes

ECTS credits are allocated to all components of more than 75 % of HE programmes, enabling credit transfer and accumulation AND ECTS credits are demonstrably linked with learning outcomes
OR
Credits are allocated to all components of all HE programmes using a fully ECTS compatible credit system enabling credit transfer and accumulation AND credits are demonstrably linked with learning outcomes

ECTS credits are allocated in 50-75 % of all HE programmes AND ECTS credits are demonstrably linked with learning outcomes **OR**
ECTS credits are allocated to all components of more than 75 % of HE programmes enabling credit transfer and accumulation, but ECTS credits are not yet linked with learning outcomes

ECTS credits are allocated in at least 49 % of HE programmes **OR**
a national credit system is used which is not fully compatible with ECTS

ECTS credits are allocated in less than 49 % of HE programmes **OR**
ECTS is used in all programmes but only for credit transfer

Figure 8 Scorecard indicator n°8: Stage of implementation of ECTS system, 2010/11 [European Commission, 2012 p. 47.]

Our being left behind is also interesting because back in 2004 we were at the top considering the use of learning outcomes, the best systems worked in the following

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countries: Denmark, Hungary, Ireland, Italy, Slovakia, Spain, Sweden, the UK and Belgium (Flandria). [*Adam – 2004*]

The Bologna leaflets show a clear picture of the Hungarian situations in details published by Tempus Public Foundation. I would like to call attention to some interesting outcomes of leaflets 2 and 6. [*Fischer – Halász, 2009; Vámos, 2010*]

In Hungary the institution applying for accreditation of its education programmemust prove that it has already asked for the previous consent of professional organizations, employers and the branch ministry interested in the education as regards to the competences to be attained in the education.

The 15/2006 (IV.3) decree of the Minister of Education contains the description of programme and graduation requirements and its enclosure defines Bachelor and Master courses educational and outcome requirements. "Regarding our topic, one of the important features of these descriptions is that there is no coherent competence definition behind them commonly accepted by all special fields, thus it is quite eclectic and not homogeneous from the aspect of the definition of learning outcomes. There is a different logics used when defining bachelor and master-level requirements and a third kind of logics appears in the field of teachers education."[*Fischer – Halász, 2009 p. 11*]

In the 2009 (LeO1) research launched by Tempus Public Foundation they had a questionnaire to survey the application of learning competences in order to examine what kind of professional matching was carried out when defining Programme and Graduation Requirements. It was only one-third of the respondents who had a talk with the employers, the potential bosses of the graduates but nobody talked to the representatives of the students at all. [*Fischer – Halász, 2009*]

In 2010 newer research called LeO2 was prepared. Next to questionnaires, analysis of documents as well as interviews were added, too.

On examining communication used while working out programme and graduation requirements, they received answers as shown by Figure 9.

The ones who marked several answers, some of them not belonging to the institution, changed the system of subjects at an outstandingly high rate; they also updated the organization of learning as well as evaluation.

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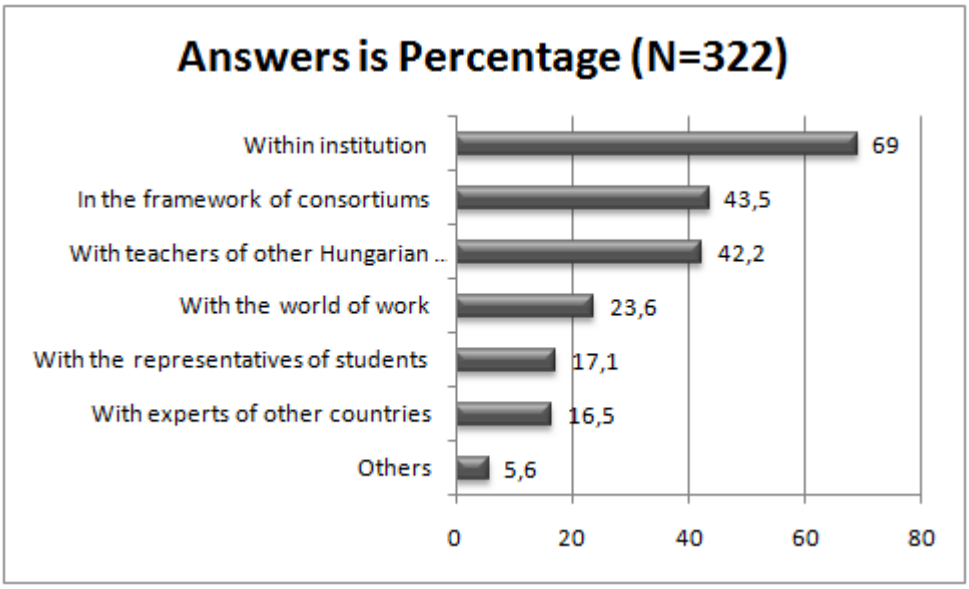

Figure 9 Professional agreement when working out programme and graduation requirements [Vámos, 2010 p. 33.]

"All in all, cooperation and accumulation of knowledge are the weak points of transferring into cyclical education. The analysis of documents and interviews support that departments of the Hungarian higher education operate as islands with loose or no contact at all." [*Vámos, 2010 p. 11.*]

III.3. The content of Economics and Business Administration training programs

III.3.1. Reviewing business and economics training programs in the Tuning program

In the Tuning programme framework, in the first and second phases (between 2000 and 2009) the educational structure of 9 specialties was examined, one of them being the field of business. [*González – Wagenaar, 2008*] Later, while expanding the Tuning project some other special areas were also involved, Economics too. There were already participants other than merely European ones. [*OECD, 2011*] The result of them is the summary below:

„Business courses aim to provide theoretical and practical knowledge and skills that lead to improved planning, organisation, implementation and control of business and economic activities – not just in the private sector, but also in the public and not-for-profit (voluntary) third sectors." [*Tuning, 2009 p. 21.*]

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It is not surprising that the demand has increased for such educations. In Europe 750 higher education institutions are offering business educations on a minimum bachelor level, the number of similar institutions in the USA, China, India and Mexico reaches at least 1000 respectively. In the USA more than half a million people receive such degrees.

The programs granting business degrees are very different all over Europe (and all around the world) and not only on the level of different countries but this difference appears within the countries or even within an institution itself. [*Tuning, 2009*] Similarly, there is no common standpoint about the content of the education of economists, either.[*OECD, 2011*]

In his study, Lars Engwall also calls attention to the uniqueness of economic education, emphasizing that there is no clear connection between degrees and positions of work to be fulfilled in the education of managers, as opposed to the position of a jurist or in the medical profession. Thus these educations show a wide scale of varieties. It points to the direction of standardization that there are some well-reputed institutions, the examples of which are followed by the smaller ones. At the same time it is also typical that certain institutions are trying to differentiate themselves by providing different educations from others. [*Engwall, 2007*]

Another branch of Economics and Business Administration is the economics. The approach and interpretation of problems, results and events from the aspect of economics starts typically with the identification of aims to be achieved and restricting circumstances. The analysis can explain distribution, the use of resource and their economic and social effects on a micro and macro level. University education must be based on the knowledge of researchers by all means and it must show the dynamic renewable feature of the science of economics. Teaching them old, classical theories is just not enough now. [*Becker, 2003; OECD, 2011*]

The bachelor education of the economics can be divided into 3 groups: general economic education, specialized education of economics and combined economic education.

Students are not likely to be able to work as economists after achieving their bachelor economist degree. They rather start working on an administrative field but the number of the ones who undertake work immediately after graduation shows a decreasing tendency, although its rate varies from country to country. However it is more frequent that they

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continue their studies at master and doctoral levels or in some other frameworks; the completion of such educations enables them to find jobs as economists. [*OECD, 2011*]

It is only in the last few years that they have started to collect competences needed for an economist graduate. The 6 competences published by W. Lee Hansen [*2001*] are the following:

- Access existing knowledge,
- display command of existing knowledge: explain key economic concepts and describe how these concepts can be used,
- interpret existing knowledge,
- interpret and manipulate economic data,
- apply existing knowledge,
- create new knowledge

In the framework of the Tuning programme the following learning outcomes were identified in the education of the science of economics in 2009:

- Subject knowledge and understanding
- Subject knowledge and its application
- Effective use of relevant data and quantitative methods
- Effective communication
- Acquisition of independent learning skills [*OECD, 2011*]

Next to the identified learning outcomes 4 special skills were emphasized as necessary inevitable for economists:

- abstraction,
- analysis, deduction and induction,
- quantification and design
- framing

III.3.2. Programme and graduation requirements in Economics and Business Administration training programs in Hungary

In Hungary establishing a course is only made possible if programme and graduation requirements are defined and accepted, launching education is only permitted according to the points defined in programme and graduation requirements of courses accredited that way. Due to that, courses of similar content in different institutions have identical

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names, although programme and graduation requirements provides considerable freedom for some institutions regarding the construction of certain courses. The courses of the educational field of Economics and Business Administration are divided into two branches, they are the educational branches of Economics and Business. The courses that belong to them are the following:

- The Branch of Economics
    - Applied Economics
    - Economic Analysis (from 2014 Quantitative Economic Analysis)
    - Public Services
- The Branch of Business
    - Human Resources
    - Business Administration and Management
    - Commerce and Marketing
    - International Business Economics
    - Finance and Accounting
    - Tourism and Catering
    - Vocational Instruction

I am going to review the programme and graduation requirements of these courses, except for the Vocational Instruction. [*The Ministry of Human Resources, nd*]

As I mentioned it in chapter III.2.4 before, there is no uniform structure for defining competences and learning outcomes in these programme and graduation requirements. It can be seen, though, that the description of the courses of the educational field of economics and business administration follows the same structure.

Some points must be stressed out of all the programme and graduation requirements.

All 9 courses are BA; all qualifications are called ‘Economists in …’. (Since 2014 school year the accredited Quantitative Economic Analysis course is BSc., has taken the place of Economic Analysis course.) The content part of programme and graduation has not changed. The general description of skills usually gives reliable information about what the certain course is about in such a way that the acquirement of particular knowledge enables students and later graduates to do certain tasks and jobs. It is also underlined that the education makes it possible to continue studies at a master education.

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There are numerous differences in enlisting concrete knowledge and skills but I should focus on certain tendencies.

While enumerating types of knowledge there are special kinds knowledge attached to the course. Only 3 courses include the knowledge of information system. Economic Analysis course – economic information system; Human Resources – the operation of organizational and information system of human resources management. Finance and Accounting – finance and accounting information system.

While enlisting skills mostly generic ones are included, course-specific skills are included mainly at the Commerce and Marketing and Finance and Accounting courses. As enlisted in most courses in some ways, the most „popular" generic skills are: independence, communicational skills, some kind of ability for analysis, teamwork. The last one is not mentioned at 3 courses, that is: Business Administration and Management, the Finance and Accounting and Tourism and Catering.

It is interesting from the aspect of informatics that at all of the courses of economics, but out of business courses, only Human Resources and Commerce and Marketing enlist the competence of making surveys and reports. Informatics plays an important role in preparation for decision making, it is mentioned at the economic courses and at Human Resources and Business Administration and Management.

The competence of presentation including making presentations on the computer appears at business courses: Human Resources, International Business Economics, Finance and Accounting and Tourism and Catering.

The word IT appears only at 4 courses, all of them being business courses: Human Resources – „up to date analyzing methods supported by informatics for applying negotiation and presentation techniques"; Business Administration and Management – „to communicate effectively in a foreign language and with the help of informatics in both home and international business environments"; Finance and Accounting – „for the usage of modern means of informatics"; Tourism and Catering – „applying the knowledge of informatics".

Within the framework of professional base material, informatics is taught only at two courses: personnel informatics at the course of Human Resources, and finance and accounting informatics at the course of Finance and Accounting.

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The detailed analysis shows that the structure of the courses of economics and business administration is quite similar to each other. The same findings were revealed by the research applying a comprehensive duo-mining methodology(the combined application of text-mining and data-mining), in 2013. The research analyzed not only the programme and graduation requirements document of courses of economics and business administration but all bachelor courses. On the basis of the curricula all courses of economics and business administration sciences can be found on the list of pairs of closely related courses except for Human Resources. The 3 courses of economics are present in all possible pairings. Out of 6 business courses 5 are also noted but the courses of economics and those of business are not so close to each other. [*Kruzslicz, 2014*]

The programme and graduation requirements provide quite a free way for institutions introducing courses working out at a certain subject structure. In chapter Curricula analysV.1, according to research shown I already analyzed how IT appears in the education of certain institutions.

III.4. Principles of Ontology

So far I have been examining the theoretical considerations, pedagogical and legal approach of designing the teaching material. From a technical aspect ontology construction can be a means of designing, too.

Several ontology-construction methods have already been worked out but even at their best they contain the complete process only on a level of enumeration. They contain only the real construction of ontology detailed. However, stating the first step precisely is still missing, the definition of the context of ontology and the process of the maintenance of ontology have not been worked out, either. [*Fernández-López,2002; Vas,2007*] The pedagogical theories detailed in chapter …. provide standpoints for these missing parts.

The Sure-Studer kind of On-To-Knowledge methodology uses a modified version of CommonKADS development standard. The phases are the following:

- Feasibility study
- Kickoff
- Refinement
- Evaluation
- Application and evolution.

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The last 3 are in a cyclic phase. [*Fernández-López, 2002; Staab et al., 2001; Vas, 2007*]

III.4.1. IT Body of Knowledge, Ontologies

In international bibliography they try to collect the content of IT education on an ontological basis, too. [*Chin at. al, 2007*].

Lots of international institutions are known for a complete disclosure of the informatics field. Some examples mentioned are:

- European e-Competence Framework [http://www.ecompetences.eu/],
- EUCIP (earlier EPIC): European Certification of Informatics Professionals [http://www.ecdl.org/eucip/index.jspwww.cepis.org/media/EUCIP_Version_31.pdfhttp://www.cepis.org/index.jsp?p=1120&n=1121http://www.cepis.org/index.jsp?p=1120&n=1122],
- SWEBOK: Software Engineering Body of Knowledge [http://www.computer.org/portal/web/swebok/home].

They usually deal with software engineering, design, introduction and maintenance of information systems and IT security and they have a much wider scale than needed in the education of general economists.

III.5. Frontiers of Educations

In the chapters so far the design of teaching material has been shown generally approached and the design of the complete education content of the education fields, too. However, these special fields meet in several areas. At the meeting points we have to use the means of narrowing, so that the relevant contents connected to the main special fields should be included in the higher education.

I mentioned here, that in the business special field of the Tuning project discussed in my chapter III.2.3 it was stated, where and in what depth business contents were available apart from educations that are really meant to be specialized in business.[*González – Wagenaar, 2008; OECD, 2011*]

They also paid attention to the other side, too claiming that quite a few fields of science are available in business education, such as philosophy, psychology, mathematics, statistics, information technology, sciences of engineering. [*González – Wagenaar, 2008*]

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In the survey of 2008, the order of importance of profession specific competences was examined in 4 groups concerned: academics, graduates, students and employers. There were bigger differences revealed than in the case of general competences. Regarding the role of informatics, the situation of 2 competences is interesting:

Design and implement information systems: employers ranked it as the 7th out of 25, the other 3 groups granted them a random rank somewhere to one of the last four places, graduates: 22nd, students: 25., teachers: 24.

Identify and operate adequate software. The difference here is smaller, it is interesting that teachers rank them as much more prior, but graduates and students place them as kind of the last ones on the scale: further rankings are: employers the 8th, graduates the 16th, students the 22nd and teachers 7th [*Tuning, 2009*]

In the field of economics the fourth one of the 6 competences defined by Lee Hansen is worth special attention: interpret and manipulate economic data. The author reveals here that how to understand and interpret numerical data found in published tables, identify patterns and trends, construct tables from already available data to illustrate an economic issue. [*Hansen, 2001*] These are all tasks of methodology, requiring the knowledge of statistics and mathematics but their performance also needs applying information technology as an inevitable means.

Technical development ought to effect the content of the education of economics. With the help of modern IT the science of economics can become a much more empiric science, although it appears in the bachelor education to a less extent. [*Becker, 2003*]

From among the learning outcomes identified in 2009 the effective use of relevant data and quantitative methods and related to this, from among the outstandingly important competences for economists it is the defining of quantification and design which is to be followed. “Data and their effective organisation, presentation and analysis, are important in economics. The average student will be somewhat familiar with the principal sources of economic information and data related to industry, commerce, society and government. They should also have had experience in organising and presenting such data informatively. Skills such as these are important at all stages in the decision-making process. An employer will expect an economics graduate to be able to structure, analyse and explain information presented in some numerical form. The raw data are frequently presented as tables (or datasets with a tabular structure) and the processed data as a graph,

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an average, a correlation, etc.. Numeracy, statistical and computing skills are required to handle this type of information. Presentation skills are needed to communicate such quantitative information in usable ways, and particularly to give critical and coherent summary representations of data that cannot be readily absorbed raw." [*OECD, 2011 p. 29*]

From the side of computer scientists we find less analysis on what they can provide for the representatives of other special fields. There are revelations and deep research can be found in some special fields of information technology for example healthcare informatics [Mantas at. al., 2011], orbusiness informatics which has an annual conference in Hungary.

Business informatics professionals are experts who are "able to solve business problems with information and communication technologies and they can cooperate with experts of economics and business administration and economic partners and system developers even in a foreign language. They also design software applications to help business process performances. They fulfil tasks of databases design, development and management. Their task is to manage IT units within the organization manage risks of operation design and plan and organization of smaller development and maintenance projects."
[*http://www.felvi.hu/felveteli/szakok_kepzesek/szakleirasok/!Szakleirasok/index.php/szakleirasok/szakleiras_konkret?szak_id=31&kepzes=A*]

The ontological description of the business informatics domain can be seen in Appendix 2. [*based on András Gábor's statement, Corvinno Technology Transfer Center*]

Fewer words are said about the IT education for non-IT students. We can find examples in the medical education here [*Almási at. al., 2011., Bari at. al., 2011.*], and there are studies made about teachers' training in a larger number, too. [*Bakó, 2008*].

However, regarding what kinds of user's knowledge are needed for a practical economist or where and how such knowledge can be acquired, I found presentations only at 2 special areas (finance, and accounting [*Honfi at. al., 2008; Barna – Honfi, 2008*]. The content of informatics education of general economists is only discusses at smaller special meetings,

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such as The Methodology Professional Days organized by Budapest Institute of Methodology, the University of Applied Sciences (2012. Mártély[2], 2013. Kismagos[3]).

It is interesting to look at the education of mathematics in parallel. The teachers of the Department of Mathematics, Budapest Corvinus University, examined mathematics education practice in the Bologna type economic educations. [*Kánnai at. al., 2010*]

It is also to be examined whether within the economicsand business administrationsciences education field the difference between the informatics requirements of certain courses can be identified at all. It may occur that the outcome requirements may be identical at different courses but in the method of teaching there might be a difference, for example concerning the practical tasks used connected to certain courses. In parallel I would refer to the presentation of KatalinSós on Physics in high education for non-physicists at MAFIOK XXXIV. conference. [*Sós – Nánai, 2011*]

III.6. A review of IT curricula in secondary school

If we want to define what the task of IT education in higher education is, it is unavoidable to survey what kinds of incoming knowledge are supposed to exist. There are two ways to find the answer.

One way is to review lawful regulations, to see what is compulsory to learn for students in secondary school. The other way is the empirical research which helps us to ask about real knowledge with a questionnaire. The latter one has been attempted with the research presented in … chapter. In this chapter I am going to examine the legal background.

The National Curricula is regulated by different governmental laws. The first of them is NC -1995 having been made operative since September 1998,which was introduced in the first and seventh grades. Regarding full time training students starting their studies, this regulation is relevant for two more school years. The following enumeration shortly reviews governmental laws regarding National Curricula, which makes it possible to calculate in which year, which national curricula enabled students to continue their studies in higher education at the largest rate. [*National Curricula, 1995; 2003; 2007; 2012*]:

[2] http://www.bkf.hu/hirek/7830/modszertani-napok-martelyon.html, last seen 28. October 2013.
[3] http://www.bkf.hu/hirek/7973/modszertani-napok-kismagoson.html last seen 28. October 2013.

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- NC-1995, operative since September 1998 in the first and seventh grades (In this school year its regulation is relevant regarding students starting full-time education.)
- NC-2003, operative since September 2004 in the first grade
- NC-2007, the modification of NC of 2003, presently operative, it is already in the ninth grade in an ascending system (the only school year is going to take matriculation exam in 2015)
- NC-2012, operative since September 2013 in the first, fifth and ninth grades (the first school year is taking matriculation exam in 2016)

In the NC of 95' the eighth education area is information technology. Its chapters are:

- Computer science
    - Foundations of computer science
    - Application of operating systems
    - Algorithm design
    - Problem solving aided by computer
    - Word processing and chart editing
    - Spreadsheet
    - Database management
- Library Information Systems

Accordingly, content oriented competences at matriculation are the following: [*Matriculation requirements, 2002;*]

(1) Information society
    a. communication (medium level)
    b. information and society (medium level)

(2) Foundations of computer science– hardware
    a. transforming signals and encoding (medium level)
    b. construction of computer (medium and advanced level)

(3) Foundations of computer science– software
    a. operating system (medium level)

(4) Word processing
    a. usage of word processor (medium level)
    b. basics of word processing (medium level)
    c. text correction functions (medium level)

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d. tables, graphics in the text (medium level)

(5) Spreadsheet

a. managing spreadsheet (medium level)
b. construction of tables (medium level)
c. data in the tables (medium level)
d. forming tables (medium level)
e. tables, texts, charts (medium level)
f. problem solving with spreadsheet (medium level)

(6) Database management

a. database management basic terminology (medium and advanced level)
b. database management system interactive usage (medium and advanced level)
c. basic database managing operations (medium and advanced level)
d. screen and printing formats (medium and advanced level)

(7) Information network services

a. communication on the Internet (medium level)
b. website designing (medium and advanced level)

(8) Presentation and graphics

a. presentation (medium)
b. graphics (medium level)

(9) Library management

a. directories (medium level)
b. documents (medium level)
c. information systems (medium level)

(10) Algorithm design; data modelling, knowledge of programming (only on advanced level)

(11) devices of programming (only on advanced level)

From the aspect of the present study the requirements on the medium level are the relevant ones, as it is the students sitting for an advanced level informatics matriculation exam are the ones who intend to continue their studies in this direction.

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III.7. ECDL

To find out more about user's knowledge, the ECDL requirement system created by CEPIS is a good starting point, which can be found on the website of the organization in details (http://ecdl.hu). ECDL defines itself as a certificate verifying IT knowledge. Its great advantage is that it is independent of manufacturer, quality-assured, attainable in a decentralized way and it is quite widespread all over the world. Its requirement system harmonizes with the secondary school IT curricula in Hungary, it is possible to receive an ECDL certificate with IT matriculation on the suitable level (with mark 5 – in Hungary/grade A – English system on medium and advanced level). [*ECDL, nd*$_a$]

The content of the base modules of ECDL shows what the basic knowledge that students can attain before university education is like. Naturally it is not clear that students are in possession of this knowledge in reality when they start university. I still believe that the task of higher education starts where the requirements of ECDL base modules have finished.

The base modules of ECDL until the 15th October 2013:

- ICT Essentials
- Operating Systems
- Word Processing
- Spreadsheets
- Using Databases
- Presentation
- Internet and communication

Between 1996 and 2013, more than 13 million people received ECDL certificates in over 100 countries, in Hungary more than 430 thousand people passed their ECDL exams.

The change of user level approach of informatics is shown by the fact that ECDL modules have changed since 15th October 2013. The aim of ECDL being renewed is to keep pace with the technological and labour market changes.

In the case of most modules it can be experienced in terms of names only as well as new exam tasks. The most significant change is that a new model called Computer Essentials is arising from the union of ICT Essentials and Operating Systems modules. The former ICT Essentials and Operating Systems modules will be cancelled. The new module will

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be more practical and will be built on the use of operational systems, containing the most important theoretical points. [*ECDL, 2013*]

Accordingly Module goals are defined as follows: “Successful candidates will be able to:

- Understand key concepts relating to ICT, computers, devices and software.
- Start up and shut down a computer.
- Work effectively on the computer desktop using icons, windows.
- Adjust the main operating system settings and use built-in help features.
- Create a simple document and print an output.
- Know about the main concepts of file management and be able to efficiently organise files and folders.
- Understand key storage concepts and use utility software to compress and extract large files.
- Understand network concepts and connection options and be able to connect to a network.
- Understand the importance of protecting data and devices from malware and of backing up data.
- Recognise considerations relating to green IT, accessibility and user health.” [*ECDL, nd$_b$*]

Among requirements the following are emphasized less:

- the user must know what hardware is, what factors influence the performance of the computer and must be familiar with devices;
- must know what software is and can illustrate some generally used applications and operating systems with examples;
- must know what is meant by information and communication technologies and must be able to mention some practical usages in everyday life; [*ECDL, 2009$_a$*]

Moreover two new modules are created, following technological development: IT Security and electronic authenticity, electronic signature. [*ECDL, 2013*]

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IV. THE AIM OF EXAMINATION, RESEARCH PLAN

IV.1. The aim of examination

On the basis of the theories described and the historical review of the previous topic it has become clear, that the education of IT plays an important part in the field of economic sciences however, there is a scarcity of available guidelines for creating its content and defining its aim. My research is aiming at composing a proposal about how the basic education of IT in the field of the education of economic sciences should be constructed, taking into consideration numerous aspects involved, according to the basic principles of Bologna process and competence approaches. According to this, I am looking for the answer for research questions put in chapter II. by carrying out the processes of empirical research

IV.2. Research plan

I already showed in chapter III.1.1 that during curricula development what responsible persons are involved, whose opinion is important. According to this, the survey relies on several sources. I asked for students' and graduates' opinion with the help of questionnaires. I tried to assess the requirements of the labour market by using graduates help, too. The aspect of teachers and science was revealed with interviews I made with teachers as well as the research of bibliography. I applied document-analysis for examining the present practice. In the following chapters I am going to present the outcome of certain areas of research.

The Corvinus University of Budapest (referred to as BCE on the following pages, earlier called as the University of Economics and Public Administration, BKÁE) is the only Hungarian institution, which starts all 9 bachelor courses, the independent professional founder of courses of economics (the only starter of Economic Analysis which is called Quantitative Economic Analysis from 2014) course) and member of one part of consortium establishing business courses (Business Administration and Management, International Business Economics and Finance and Accounting course). The whole construction of consortium is shown by Table 4.

In my research I mainly asked students, graduates and teachers of BCE. Moreover, I pursued research at two colleges, which both have, economics and business

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administration training programs. These are Budapest College of Management (BCM) and University of Applied Sciences, Budapest (further referred to as BKF). Questionnaires and interviews are not representative in the respect of the whole economics and business administration higher education but because BCE starts education on every course and it is in a top position regarding the number of students of courses, consequences referring to the university can be extended to other institutions.

Table 4 The consortia establishing business courses [*reported by Judit Négyesi course referee, Hungarian Higher Education Accreditation Committee*]

BASIC COURSE NAMES	MEMBERS OF CONSORTIUM
Commerce and Marketing	[KVK]: BGF/MÜTF/SZF
Business Administration and Management	[KVK]: BGF/BCM/BDF/BKF/***BKÁE***/BME/BMF/DE/DF/EJF/EKF/GDF /HJ/HFGTSZF/KE/KRFKJF/ME/MÜTF/NÜF/NYF/NYME/PTE /SZE/SZTE/SZIE/TSF/PE/ZMNE
International Business Economics	[KVK]: BGF/BDF/BKF/***BKÁE***/SZE/SZF
Finance and Accounting	[KVK]: BGF/***BKÁE***/KRF/NÜF/TSF/ZMNE
Human Resources	[KVK]: BGF/KRF/SZIE/PE/ZSKF
Tourism and Catering	[KVK]: BGF/HJF/HFGTSZF/KRF/ KJF/NYME/ SZF/PE

IV.2.1. The present practice – with document analysis

As preliminary research in the summer of 2010 I analyzed IT subjects of nearly two-third of Hungarian higher education institutions that started economics and business administration training programs. In doing so, I applied text-mining and means of statistics. The education was operating in 34 institutions at 188 economics and business administration training programs, 109 functioning as bachelor and 79 as master courses. In research I examined only the subjects of bachelor courses because I found more precise data in that area.

In the fall of 2013 I compared the operative curricula of BCE and BCM completely regarding IT education.

In 2014 I examined the practice of 2 European universities, too.

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The procedure and results of the 3 kinds of research are presented in subchapter V.1.

IV.2.2. The preliminary IT competence of new students – a questionnaire survey

I examined the preliminary IT competence of first year students on different dates. The empirical analysis of the competence of newcomers seems to be essential out of 2 reasons. On the one hand, so far experience has shown that although there is a regulation by law (which I reviewed in chapter III.6), secondary school IT education is below standard. On the other hand, students are collecting knowledge on IT from sources out of school.

The first examination happened in the school year of 2005-2006 in the circle of BCE students before Bologna process started. In the research I worked together with Zoltán Németh, a colleague from the department. The research took place in two terms, with 2 slightly different questionnaires, so certain information is available for the whole lot asked (n=930, nearly 100% of the then first year students) some other information is available for the students asked in the second term (n=406, 40% of the then first year students).[*Baksa-Haskó, 2007*]

The second research concentrated on the competence of new students of the school year of 2012-2013 in 3 institutions. The first year students filled out the questionnaire on the computer at BCE and BKF in their IT lesson, at BCM filling out was made on a paper at the time of registration. At BCM answers were of complete scale on both full-time and correspondent faculties (94% giving answers), at BKF 95% at the full-time faculty, at correspondent faculty 37%, at BCE business administration and economics full-time faculty 46%, based on all that due to the high rate of selection, results can be taken as representative regarding the students of certain institutions. In the whole field of business administration regarding a large number of students entering higher education the sample is not representative thus conclusions will be drawn only for 3 institutions named here.

Even questionnaire research cannot give assuring answers on the whole because it is based on self-confession and the results do not always show a true picture regarding real knowledge. It does not necessarily depend on the honesty of the ones giving answers or perhaps it reflects a false self-judgment. When preparing for research 3, I tried to take this aspect into consideration, in fact the questionnaire that had to be filled at the beginning of 2013-14 was an expanded version of the questionnaire of the previous year, questions

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being added to the second part asking about the real knowledge existing in certain areas. I present the results of the 3 kinds of research in chapter V.1.

IV.2.3. Experiences and Practice of teachers of special and methodological subjects - interviews

I made a series of group interviews with colleagues at BCM between December 2011 and February 2012. I turned to departments responsible for courses in the school year of 2013-2014 in BCE. The conversations will be written down in chapter 0.

IV.2.4. Work experience of graduates – questionnaire survey

When compiling higher education curricula, we cannot neglect the expectations of future places of work.

At present there are no guaranteed methods of how the labour market can present its requirements towards higher education. The many sidedness of the problem is rooted in the fact that the task of higher education is to prepare students for the future demands of the labour market, not for the present ones. Moreover the labour market relevant to the courses mentioned is heterogeneous. On higher levels the present situation could be assessed at branch coordinating councils, professional organizations and round tables. To find out some more about the future situations, predictions of different economic researchers about the future level of the qualification labour force, the importance of IT qualifications, mobility, filling gaps of labour force through migration. We should not forget about technological and infrastructural development, either. The processing of the data of all of it goes beyond the capacity of this study.

However, in order to get some insight into the present situation, I have chosen the alumni research as employees are usually middle or large companies, where it is difficult to find that particular person who could really answer our questions. We could perhaps try to ask human resources department staff, who are responsible for selecting new colleagues, but on the basis of personal conversations with them I experience that they have some ideas about IT tasks arising daily, in their own work field.

In higher education keeping contact with the alumni is quite frequent, the aim of which may be to support practice-centered education. Former graduates can tell us what they have experienced in the positions at work where they could start having received their degrees at our university.

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With the cooperation of Career Office I carried out questionnaire research among BCM graduates in February 2012. It was experimental research helping me find out what should be included in the further research. In the questionnaire there were lots of questions, as a result, I could look for patterns among the answers. Based on the conclusions, in 2013 I compiled the shorter questionnaire I planned for graduates of economics and business administration bachelor training programs. On the basis of the results of 2012 I designed the questionnaire to be found in chapter V.1 regarding the preliminary knowledge of IT of new students. I asked the graduates of 2013-14 the whole year around through different electronic means. Conclusions of the experimental research are presented in chapter 0.

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V. FINDINGS OF RESEARCH

V.1. Curricula analyses

V.1.1. The procedure of research 2010

In the curricula analyses of the summer in 2010 I could involve 244 subjects of 65 majors within 21 institutions (11 universities, 10 colleges). Apart from identical subjects taught at different majors, data of 131 different subjects were made available for me (number of lectures and practical classes, credits, the kind of testing, department in charge) I collected operative curriculum and subject descriptions from the websites of institutions, that is why my data are not complete, unfortunately. When gathering data, I applied simplification.

On enlisting the subjects I only used compulsory, optional and special subject categories (at the latter one I made no difference whether it is compulsory on the specialization or it is optional there, too). At some institutions I could not find optional subjects at all, which does not necessarily mean that there are not any at all but the information on the website is not complete.

I had to decide according to what criteria I consider a subject belonging to IT subject, too I made my decision by looking at the name of the subject, its description or the department advertising it.

I found descriptions of 83 subjects at 17 institutions, although in different lengths. On the basis of subject descriptions I analyzed the content of subjects with the help of text mining and compared them. [*Tikk, 2007*] I created a term document matrix (TDM), in which dimensions are certain terms (I collected 510 terms, which I put into 51 categories) the certain subjects are the vectors, the coordinates are 1 and 0 according to whether the given category appears in the description or not. Relying on that I examined the similarities of subjects.

V.1.2. Outcomes, conclusions from the operative curricula and subject data sheets

At a course the number of compulsory subjects varied between 1 and 6 with students having a compulsory IT subject averaging 2,01. Within school there was a bigger similarity than within courses, in the institutions the compulsory subjects were usually

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the same at different courses but there was a difference in the number of subjects: at Business Administration and Management, and Finance and Accounting courses, compulsory IT was taught more (averaging 2,5). The fewest subjects were at Public Services course (1,4 on average). Within Business Administration and Management at some places there is IT management, as specialization. Here more IT subjects are taught as specialization subjects. The credit number of compulsory subjects varied between 1 and 5, there were maximum a 2-hour lecture or a 4-hour practice per week, sometimes lectures and practices were mixed.

Using cluster analysis (the method of nearest neighbor) the following groups came into being between subjects:

1. beginner IT subjects (n=8): obligatory subjects on the first year, typically basic knowledge regarding content, hardware, operation systems, a lot of theoretical education, less office application practice (word processing, spreadsheet, making presentations)
2. basic (more advanced) IT subjects (n=2): obligatory subjects on the first year, there is no operation system in the theoretical material but there is data protection, data security, there is no practical word processing and presentation but there is spreadsheet, emphasizing tasks of statistics
3. Net, web subjects (n=29): a big and very mixed group, typical content: internet appliances, internet data collecting, web-design, networks, multimedia, publication design. Subjects detailed variously. Compulsory, optional and special subjects are all present among them.
4. ERP and other information systems (n=28): it is also a big group but with more unity. Different, often course specific (accounting, human resources, logistics) subjects presenting information systems. Mostly optional or special subject only 1 quarter is presented as obligatory subject.
5. Modeling subjects (n=5): usually advanced spreadsheet, statistical, mathematical, financial models, real economic application. 2 compulsory and 3 optional subjects were placed into this group.
6. data-base management (n=10): some subjects are under the name of information system but actually their content is also data-base management. Next to the theory of data-base design it provides practical knowledge and often SQL language usage. 4 compulsory, 4 optional and 2 special subjects.

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7. one compulsory subject was inserted into a separate group because it is very complex it is almost about everything (I marked 24 out of 51 categories, whereas at the other subjects the average was 6,29 , the most frequent value was 4)

From the names of subjects it is difficult to find out the content of them, within the same group numerous, totally differently labeled subjects are available and at the same time subjects with similar names had contents completely other than expected.

As I believe the following alterations will be experienced compared to the above outlined ones after the curricula is composed as a result of the whole research carried out:

1. The majority of the content of the subjects in the first group is not necessary, partly secondary school, basic intelligence, partly also secondary school practical material (word processing, presentation making) through some subject descriptions refer to more advanced material, partly computer science engineering, which is not relevant for economists. Practice will be closer to the subjects of the 5th and 6th groups, the theoretical material will be closer to the subjects of the 4th group.
2. The depth of the subjects in the 3rd group shows a very varied picture partly secondary school material (HTML), so one part of it is not necessary, partly, however, it is useful, special teaching material, which is to be included with more emphasis.
3. The fourth, fifth, and sixth groups contain most of course specific knowledge going further than secondary school material, so the emphasis will be laid on these contents.

V.1.3. IT subjects at the University of Corvinus Budapest and at the Budapest College of Management

During my empirical research I collected information about the two institutes mentioned in the subtitle. BCE is the only institute, which starts all 9 courses. BCM is one of the colleges, which starts some economics and business administration training programs. Thus I have the chance to present what differences can occur in the frame restricted by programme and graduation requirements of certain courses. There are 3 courses at BCM: Business Administration and Management, International Business Economics, and the Public Services leaving the education system (I could examine the operative curricula of

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this year of the first two course and the model curricula of 2009 in the case of the third course).

The IT subjects at university are taught by departments of the Institute of Informatics, that is, the Department of Computer Science, the Department of Information Systems and the department of Infocommunication. At college the subjects of IT belong to the department of methodology.

V.1.3.1. Business courses

At BCE education is the same with only slight differences at 5 business courses. All 5 started at Faculty of Business Administration. The 6th course (Human Resources) is held at the faculty of Economic Sciences and it is more similar to courses of economics from the aspect of IT, thus I am going to present it in the following subchapter:

Compulsory subject: In the first term, in the value of 4 credits , with the name 'Basic of IT' (Department of Computer Science) its content is taught in the form of theoretical lectures and computer lab practice, where students learn about spreadsheets. On Finance and Accounting course there is Excel programming, too.

Compulsory optional subject: In the fourth term, in the value of 3 credits with the name Business Information Systems (Department of Information Systems) in seminars the goal is to provide an overview of the strategic importance of information technology for different organizations, and to discuss the management challenges of IT systems. Out of 4 subjects in the operation curricula 3 must be chosen by the students, so theoretically there is a 75% chance for a student to learn this subject.

Special compulsory subjects and specialization subjects:

- Business Administration and Management course: special compulsory IT subject in the 6th term for 4 credits, called E-business (Department of Infocommunication) Only 1 specialization, the German language DSG contains IT subject: 4th term, 3 credits, 'Wirtschaftsinformatic'
- International Business Economics course: no IT subject at all
- Commerce and Marketing: no IT subject at all
- Tourism and Catering: no IT subject at all
- Finance and Accounting: compulsory special subject in the 4th term for 3 credits, Accounting information systems I., and compulsory optional special subject in the finance and accounting specialization as well in the 5th term for 3 credits:

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Accounting information systems I.. Both are taught by the Department of Financial Accounting.

Optional subjects: at all 5 courses students can equally choose between several IT subjects. Wirtschaftsinformatik (3 credits), Applied Informatics - Spreadsheet Models in Business (4 credits), Database Management in Practice (4 credits) and Internet (4 credits) under the control of Department of Computer Science and Cases on Business IT Management (5 credits) and Company management support with SAP large company solution (3 credits) under the control of Department of Information Systems.

As a comparison BCM has 2 business courses; Business Administration and Management, and International Business Economics.

Compulsory subjects: In the second term, for 3 credits, with the name Basics of Information Technology for Business, which contains an introducing lecture followed by presentation preparation, spreadsheet and word processing in practice. In the third term also for 3 credits the subject called Applied IT for Business is taught: a lecture of introduction, then practical database usage, connection between office applications, Excel macros.

Specialization subjects

- International Business Economics course: no subject with IT content
- Business Administration and Management course: out of 7 possible main specializations 3 contain IT but all of them are held by the course department: Human resources management specialization has HR Information Systems in the 5th term for 3 credits (Department of Applied Behavioural Sciences) Controlling specialization: Controlling Information Systems, 6th term, 5 credits (Department of Finance and Accounting) and Logistics management specialization: Logistics Information Systems in the 6th term, 3 credits (Department of Business Management) Out of 8 possible sub-specializations 2 have IT subjects: E-business management specialization offers Internet Strategies and Internet and Business Management, both are taught in the 6th term, 2 and 4 credits respectively. On Media Communication they have Desk Top Publishing in the 6th term for 2 credits (Department of Marketing and Communication).

Optional subject: from the 4th term, Excel on an advanced level for 3 credits and ERP Systems.

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Faculty subject: Internet for 2 credits. It can only be attended after fulfilling the requirements of compulsory credits for paying fee.

V.1.3.2. Economic courses and Human Resources course

At BCE 3 courses of economics and Human Resources course are at the Faculty of Economics. Their operative curricula is quite similar from the aspect of IT, that is why I arranged them into groups like that, too.

Compulsory subjects: in first term, providing 4 credits called Basics of IT I. (Department of Computer Science). It teaches theoretical knowledge at lectures, computer lab classes where students learn spreadsheet and Excel programming, and at Economic Analysis they learn about Maple instead of programming.

Only at Human Resources course there is Business Information Systems in the second term for 3 credits (Department of Information Systems). In its seminars IT business application categories, system types, basic managing and organizational question circles, work done with IT applications in group work environment, search for info and presentation, basic problem solving ability in questions of IT.

Compulsory special subject: it is taught only at Human Resources , in the 5th term, with 3 credits called Personnel Informatics (Department of Information Systems).

Optional special subject: It is available only at Economic Analysis and Public Services courses, in the 4th or 6th term with 3 credits called Basics of IT II. (Department of Computer Science). The content of the subject at the 2 courses is not the same. At Public Services course there is only a lecture about the application of IT systems in company environment, whereas at Economic Analysis there is only practice included in the subject, where Excel programming and further Maple knowledge are available.

Optional subjects: at different courses certain subjects are put into different groups, thus one part of subjects written about earlier appears as optional at some courses. For example, Business Information Systems at Applied Economics, Economic Analysis and Public Services courses; Basics of IT II. (lecture version) at Applied Economics and Human Resources courses. It is only at Applied Economics course where MATLAB and LaTeX, a practical subject appears for 6 credits (Department of Mathematics).

Apart from the ones mentioned above, at all 4 courses there are 3 optional subjects mentioned at business courses: Applied Informatics - Spreadsheet Models in Business,

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Database Management in Practice and, held by Department of Computer Science not for 4 credits as it was originally claimed but in 2 parts advertised, for altogether 6 credits. For example, Database Management in Practice I. and Database Management in Practice II. The two parts can be studied only together but students will be given marks separately.

Compared with that, at BCM there is only Public Services course and it is already leaving the education. They have 2 same compulsory subjects as Business Administration and Management, and International Business Economics students, that is Basics of Information Technology for Business and Applied IT for Business for 3-3 credits in the first and second terms.

Moreover they have a compulsory methodology subject, called Research Methodology, Thesis Presentation for 3 credits.

ERP Systems, as the only optional subject, is available from the 4th term, for 3 credits.

It can be stated that like in the survey of 2010, there is an evidently greater similarity within an institute (even two faculties can be regarded as separate institutes) than between courses. At university, obligatory practical IT education is less, at the same time the scope of optional subjects is much wider. However, at Business Administration and Management course in college a bigger stress is put on teaching specialization specific IT, which can be directly applied at work.

V.1.4. Revising European examples

At the beginning of the chapter I must emphasize that the examples provided here show only two examples from the quite wide range of chances applied at the universities of Europe. Comparison with the Hungarian practice is made more difficult by the fact that, although graduates have probably similar aims, students entering higher education have different levels of knowledge of IT. To show a complete picture of that would go beyond the scope of this writing.

V.1.4.1. Aston Business School, England

Aston Business School launches the following bachelor courses: [http://www.aston.ac.uk/study/undergraduate/courses/school/aston-business-school]:

- Accounting for Management
- Business & Management
- Business Computing & IT

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- Economics & Management
- Finance
- Human Resource Management
- International Business & Management
- International Business & Economics
- Marketing

With the exception of International Business and Economics all courses have at least 1, typically 2 basic/introductory IT subjects in the first year. At economics and business administration management course they have 3. At Economics and business administration IT course there are naturally more IT subjects, too, which can be reached as an optional subject from other courses as well. All courses have 5 credits.

The subject available at all courses is: Information technology in business (BN1160)

From the following 2 subjects usually one, while at Business & Management course 2 can be found among the subjects of the first year: Foundations of business analytics (BN1115) and Introduction to business analytics (BN1116).

Further subjects recommended to the ones interested:

- Doing e-Business (BN2285)
- Systems Analysis (BN2228/9)
- Decision Support Systems (BN2231)
- IT & Web Development (BN2234)
- Databases (BN2237)
- Advanced Spreadsheet Systems (BN2226)
- Operational Research 1 (BN2290)
- Operational Research 2 (BN2288)
- Management Science Methods (BN2288)

I am going to give a short review of the learning outcomes of compulsory subjects (Module Learning Outcomes)

Information technology in business (BN1160):

Professional skills:

- Use appropriate tools to locate, select and present business information effectively

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Intellectual skills:

- Be able to determine appropriate technological solutions to common business problems.
- Use appropriate terms and concepts to explain how and why information systems are used in business.
- Explain the impact of information systems on society using appropriate moral, ethical, legal, professional and environmental concepts, terms and examples.

Knowledge and understanding:

- The nature of data & information and its importance to organisations in areas such as decision making
- The role of information systems in competitive advantage
- How software applications are developed
- Legal, moral and ethical Issues related to the use of technology in organisations

Transferable skills:

- Be able to use of a variety of software applications for business purposes e.g. model and analyse simple management decisions using a spreadsheet package

Foundations of business analytics (BN1115):

Professional skills:

- Using and interpreting tables, charts, and graphs.
- Analysing numerical data, identifying trends, and using analytical tools to support decision making processes.

Intellectual skills:

- Explain the meaning of various summary measures of different data.
- Analyse and interpret data from a range of sources.
- Apply adequate mathematical and statistical methods to a well-defined problem and draw relevant conclusions..

Knowledge and understanding:

- Comfortable with data and able to recognise different types of data.
- Create an adequate mathematical model to solve some simple and well-defined problems

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- Calculate the probability of an event using the rules of probability, and apply these to the business situations using decision trees.
- Calculate the net present value and explain the principles of interest-rate calculations
- Formulate and test hypotheses using the appropriate statistical techniques.
- Understand the principles of simple linear regression and able to interpret the key statistics from regression equation

Transferable skills:

- Demonstrate numerical and statistical skills in simple business contexts
- Basic use of Excel and online tools to perform various mathematical and statistical calculations

Introduction to business analytics (BN1116):

Professional skills:

- Demonstrate basic skills in the formulation and solving of mathematical models of simple business situations

Intellectual skills:

- Identify appropriate statistical methods and apply them to the collection and analysis of data
- Identify where different probability distributions can be used to model business decisions and apply them to calculate the probabilities of various outcomes

Knowledge and understanding:

- Draw and interpret graphs and charts of functions and statistical data
- Calculate the probability of an event using the rules of probability, and apply these to the business situations using decision trees
- Formulate and test hypotheses using the appropriate statistical techniques and the SPSS statistical Package

Transferable skills:

- Present data for a business audience

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V.1.4.2. The University of Maribor, Slovenia

In the first year the compulsory subject at economic and business sciences course on the bachelor education: Introduction to Business Information Systems (5 ECTS) – At course, after finishing the compulsory subjects of the first year, students can choose between 8 possible specializations. Among them, there is E-business, too where naturally there are more subjects of IT among subjects of specialization. Among the rest of subjects of specialization I only found Management Information Systems with 7 credits in the last term of Business Management and Organisation. I have not found any information about optional subjects.
[http://www.epf.uni-mb.si/default.aspx]

The content of the compulsory subject:

Iintroduction to information systems, types of information systems, information systems from the viewpoint of business processes, information systems from the viewpoint of management processes, introduction to computerized data processing, solutions (applications) on operational level, solutions (applications) on management level, solutions (applications) for electronic business, introduction to computer systems (servers and workstations), introduction to systems software, introduction to computer networks, introduction to information systems analysis and design, enduser-computing.

Objectives: The course has two main sets of objectives - to present the basics of informatics and to obtain skills for use of personal computer. The course is in the first part focused in the role of information systems in organizations, in basics of information systems architecture, in basics of characteristics of selective information technologies and its usage in organizations, and in basics of methodologies for information systems building. In the second part it is focused in learning about the most important personal computer tools.

Transferable/Key Skills and other attributes: Information systems fundamentals and skills for personal computer use.

Intended learning outcomes: Knowledge and Understanding: Basics of information systems, basics of computerized data processing, basics of information technologies, basics of information systems analysis and design, use of the most important personal computer tools.

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V.1.5. The summary of curricula analyses

During the survey of 2010, the curricula reviewed quite a variable picture. The difference between courses is important and the difference between schools is also justifiable because the target group of workplaces is often different. The contents aiming at the introduction of IT science were obviously present, which might as well be left out taking the current secondary school material into consideration and instead subjects should be filled with more advanced and more specialization specific contents.

One interesting conclusion of the examination made in 2013 is that at BCE, the 3 IT subjects appearing at all courses as an optional subject at the courses of faculty G mean 4, whereas at courses of faculty K mean 2x3 that is 6 credits. However, the content and testing of subjects and the work spent on them show no difference. It is a perfect example demonstrating that in the Hungarian Higher education the meaning of credits is not what it was meant to be.

The foreign examples show that the unified managing of including IT competences into curricula has not taken place. At the 2 universities examined by me IT subjects are taught in different numbers of lessons, credit values and contents. I found modules containing basic knowledge, which are similar to the Hungarian practice, at the same time I found a solution where the analysis of data, mathematical models and calculations of statistics were stressed more. Inserting ERP systems into the curricula is also characteristic.

V.2. Testing new students

V.2.1. The process of research

Asking new students was done in 3 school years, Table 5 shows the features of 3 kinds of research in comparison. It was not only the students of the education of economics and business administration sciences who took part in the survey, which I also considered at the comparative analysis.

V.2.2. The results of the research in 2012 and 2013

In the questionnaire I asked about some part sections of user's knowledge on two kinds of scale. The students asked had to answer about all fields on what level they were taught in secondary school and what students thought about the level of their own knowledge.

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Table 5 The comparison of the new students' 3 surveys 2013

	2005-2006	2012	2013
Institutions	BCE	BCE, BCM, BKF	BCE
Educational areas and courses	**Business administration** course **Business Informatics**	**Economics and Business Administration:** Applied Economics (BCE) Human Resources (BCE) Business Administration and Management (BCE, BCM, BKF) Commerce and Marketing (BCE, BKF) Public Services (BCM) International Business Economics (BCE, BCM, BKF) Finance and Accounting (BCE) Tourism and Catering (BCE, BKF) **Social sciences:** Communication and Media Science (BKF) International Studies (BCM, BKF) **IT:** Business Informatics (BCE) **Trading manager higher level vocational training:** International Forwarding and Logistics Assistant Studies (BCM) Post-secondary Advertising Studies (BCM) Post-secondary Business Management Studies (BCM)	**Economics and Business Administration:** Applied Economics Human Resources Business Administration and Management Economic Analysis Commerce and Marketing Public Services International Business Economics Finance and Accounting Tourism and Catering **IT:** Business Informatics
Form of education	full-time	full-time and correspondent	full-time and correspondent
Rate of filling out	92% (one part of the questions was asked only in the second term, 40%)	BCE full-time 46% BCM full-time 94% BCM correspondent 94% BKF full-time 95% BKF correspondent 37%	BCE full-time 61% BCE correspondent 58%
Areas of exam.	1. term: whether fields of IT were taught 2. term: whether fields of IT were taught and what level they think their knowledge is at	whether fields of IT were taught and what level they think their knowledge is at	whether fields of IT were taught and what level they think their knowledge is at + test for evaluating the level of knowledge
The way of filling out	electronically in class	answered electronically in class or at home (BCE), electronically in class (BKF) and on paper at registration (BCM)	electronically at home, with credits granted for encouragement

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Table 6 Topics asked about in research 2012-2013

TOPICS ASKED ABOUT	MATURA EXAM REQUIREMENT	ECDL BASE MODULE REQUIREMENT
1. Preparation of a simple text with word processor (writing, modification, spellcheck, character format, paragraph format, bullets and numbering, tabulation, table, page setup, page numbering, printing)	Yes	Yes
2. Making long document with word processor (headings, table of content, sections, columns, foot notes)	No	No
3. Making of publication with word processor (for example poster invitation) (templates, style set, text boxes, borders, margins, pictures, drawings)	No	Yes
4. Advanced usage of word processor (mail merge, forms, cross reference, index, password protection, macro usage)	No	only the mail merge
5. Spreadsheet used for making tables (data input, number and date formats, arrangement, copying, filling out, cell format, printing)	Yes	Yes
6. Spreadsheet used for applying simple formulas, functions (absolute relative reference, functions of statistics, autosum, IF, COUNTIF)	Yes	Yes
7. Advanced function with spreadsheet (usage of lookup, date, text, financial, logical functions, functions embedded into each other)	No	No
8. Data analysis with spreadsheet (diagrams, conditional forming, autofilter, Pivot table)	Yes	Yes
9. Advanced usage of spreadsheet (cell validation, Solver, macros)	No	No
10. Presentation making	Yes	Yes
11. Use of Internet (correspondence, social media, forums, information search)	Yes	Yes
12. Web design (HTML, PHP etc.)	Yes	No
13. Multimedia editing (picture editing, video editing)	No	No
14. Database management	Yes	Yes
15. Programming	No	No

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Among the fields, word processing and spreadsheet were available divided into parts because our experience shows these two fields are the most important and most frequently taught in higher education. The division of these two fields was performed according to the result of earlier experimental research, which is shown in chapter 0. [*Baksa-Haskó, 2012*] At making the other topics, on the one hand we considered the modules of ECDL exams [*ECDL, 2009*$_{a,b,c,d,e,f,g}$], on the other hand the categories of 2005-2006 research, due to comparability. Accordingly, the topics asked about are shown by Table 6.

Possible answers in connection with teaching: taught in details (2), referred to only the surface (1), not taught at all (0). Possible answers in connection with knowledge: without any help, I can solve a task out of routine (2), gaps in my knowledge, I can solve a task only with help (1), I don't know (0).

For us (teachers of IT in higher education) levels of knowledge are the most interesting, so first of all I included these 15 variables into the examination. The research also provides a chance for identifying factors influencing knowledge. Probably such a strongly explanatory factor is whether the given area has been taught at all but it may be interesting to highlight the effect and indicating power of some other factors, too.

V.2.2.1. The analysis of subsamples

As the samples used in certain surveys can be divided into several subsamples according to different aspects, before carrying on further analyses, I examined the identity – difference of subsamples. The students asked in the survey of 2012 attend 3 different institutions and study at courses belonging to 4 different areas of science. The 4 areas are Economics and business administration, social studies, IT and I put students attending trading manager courses of higher vocational education into a separate category. (In the 5th agricultural area there were only 7 students answering questions, so I left it out of the analysis due to the low number of elements. There are full time and part time students among them. The rate of the students filling out the survey is shown by Table 7.

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Table 7 Rates of filling out the preliminary knowledge questionnaire of 2013-2013 in some institutions in some areas of education, part-time (P) and full-time (F)

AREAS OF EDUCATION		ÁVF			BCE		BKF			FINAL SUM
		P	F	SUM	F	SUM	P	F	SUM	
economics and business administration	filling	90	84	174	431	431	50	393	443	1048
	total	92	87	179	936	936	137	406	543	1658
	rate	98%	97%	97%	46%	46%	36%	97%	82%	63%
social studies	filling	9	40	49			23	182	205	254
	total	15	40	55			60	201	261	316
	rate	60%	100 %	89%			38%	91%	79%	80%
trading manager higher vocational education	filling		44	44						44
	total		51	51						51
	rate		86%	86%						86%
IT	filling				88	88				88
	total				197	197				197
	rate				45%	45%				45%
Total	filling	99	168	267	519	519	73	575	648	1434
	total	107	178	285	1133	1133	197	607	804	2222
	rate	93%	94%	94%	46%	46%	37%	95%	81%	65%

As testing was carried out among the students of BCE in 2013, I compared the subsamples of full-time and part-time students only in the area of economics and business administration. There were no students attending evening courses among them only corresponding ones (For the time being I completely left out economics and business administration IT specialists from the analysis).

The condition of comparing subsamples is the normal distribution of variables. In a row state our variables show a mostly uneven distribution, thus neither analysis of variance nor independent t testing is applicable for them.

Since the assessing of level of knowledge was based on self-confession, it seemed to be reasonable to transform values to divert from individual averages, so the individual general self-judgment differences can be filtered. The distribution of transformed

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variables can be regarded normal. Since identity of standard deviation is still not achieved, I applied independent t testing for matching subsample pairs.

In the analysis I worked with a 5% significance level everywhere.

When analyzing differences, we should not forget about analyzing the difference from the unique average, not the original raw variables.

The analysis of the subsamples of education areas (2012)

I found the following differences regarding education areas: business informatics students were significantly different from the students of all the 3 other education areas.

They are weaker than the others on making simple texts with a word processor (1) the advanced usage of spreadsheet (2) and using internet (3), however, they are better than the students of all other scientific areas at making simple formulas with spreadsheet (6) using advanced functions (7) and making analyses (8). They are also weaker than students of economics and business administration and social studies in multimedia design (13) but better at data base management (14). In the other areas, such as making presentation (10), web design (12) and programming (14) there was no significant difference.

In higher vocational education students judge their knowledge better at analyzing data with spreadsheet (8), than students attending economics and business administration and sociology. However, they are lagging behind economics and business administration science course students in making tables (5) and presentations (10) and they are also weaker than sociology students in multimedia design (13). At the other areas examined, there are no significant differences between course groups.

When comparing students of economics and business administration and sociology, I found that Economics and Business Administration students have an advantage in making tables (5) and using simple formulas (6) while sociology students are better at word processing and table managing on an advanced level (4)(9) and multimedia design (13). In the answers given to the other questions, the difference is not significant.

In fact, it can be concluded that students of IT show the majority of differences as opposed to other courses.

As I found a significant difference between all education area pairs and in different institutions students of not all educational areas participated in the examination, I am

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going to take only the answers of Economics and Business Administration course students into consideration in the further analysis.

Subsamples of full-time and part-time students (2012)

As a next step, I compared the knowledge of full-time and part-time students. At 6 answers given to out of 15 questions I also found a significant difference. Full-time students do better at making presentation (10), web design (12) and multimedia design (13). However in the 3 other areas: the advanced usage of word processor and spreadsheet, (4)(9) and at advanced usage of functions in spreadsheet (7) part time students thought they were doing better.

The reason of the difference may be that there is a bigger rate of part-time students, who had less or none of IT knowledge in secondary school but gained some routine in some types of tasks at work.

Subsamples of full-time and correspondence students (2013)

Compared to the survey of 2012 I found some similarities and differences, too. This year in the confession of full-time students making presentation (10) and web design (12) were significantly better, but multimedia design (13) did not show any significant difference. Similar to the results of 2012, they also acknowledged the higher level of the advanced usage of word processor and spreadsheet (4) (9). At the usage of spreadsheet of advanced functions (7) there was no significant difference but compared to the situation one year ago, regarding the analysis of data with spreadsheet (8), students put themselves on a higher level.

The explanation of differences can also be found in the different experience of correspondence students, 4 out of 6 significant differences stated in 2012 have been made explicit this year, too.

Analysis of subsamples according to institutions (2012)

When comparing institutions, I only compared the answers of students at the full-time economics and business administration area because I only had available data of it in all 3 institutions. Here I also found several significantly different answer groups.

There is hardly any difference between the 2 colleges, regarding internet use (11), the rates of students of Budapest Trading College are higher, whereas rates of data analysis with spreadsheet (8) students of BCM reach better results.

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The answers of BCE students show several differences from those of the two colleges. According to their own judgment, they are better at designing simple formulas with spreadsheet (6) and making presentation (10) than the students of the 2 colleges. They are worse than both at the advanced usage of word processor and spreadsheet (4)(9). On the basis of their answer they are better than BKF students regarding long document design (2) and making tables (5) but weaker at internet use (11) and web design (12).

Further analyses refer to only BCE economics and business administration full-time students.

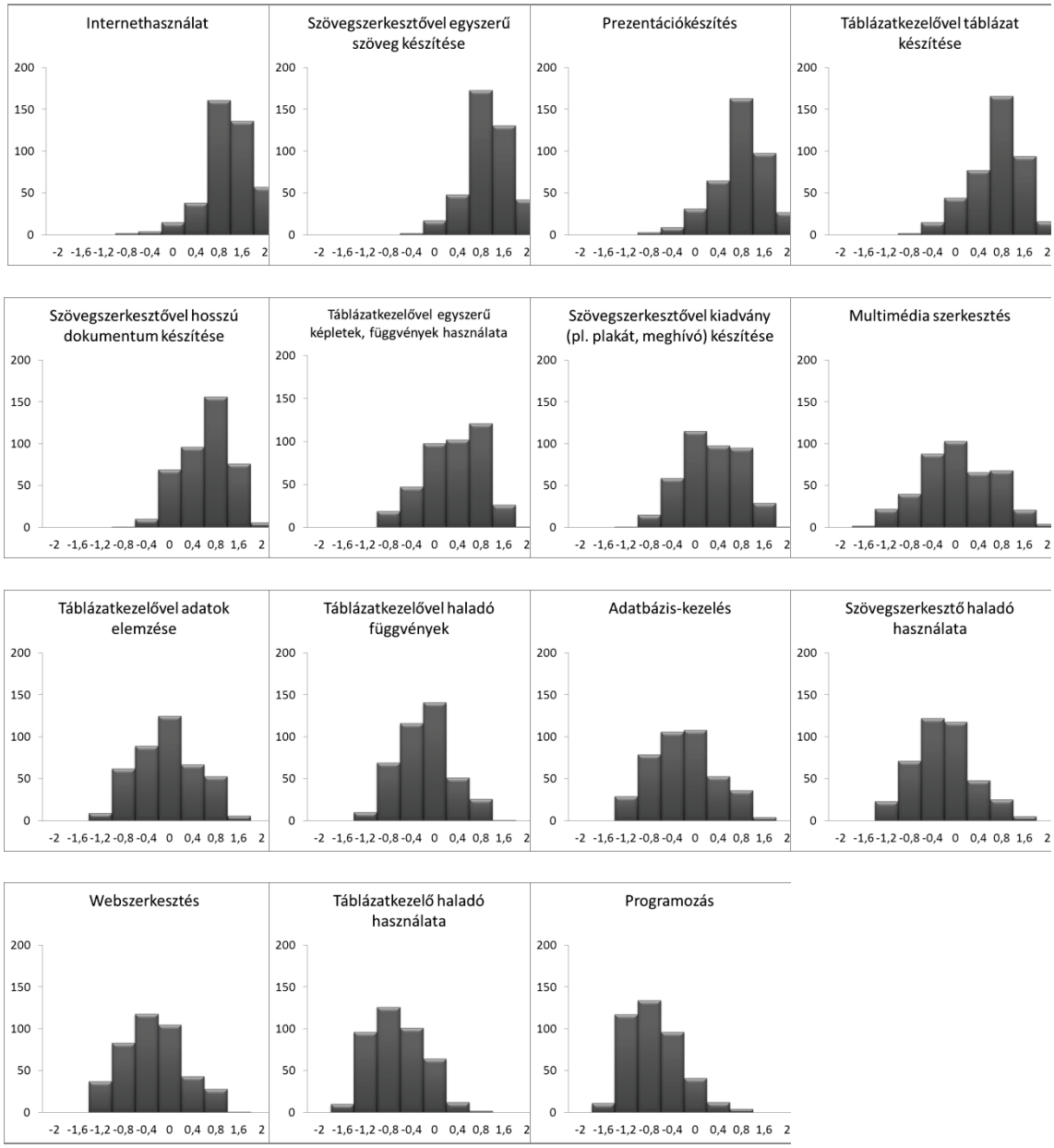

Figure 10 The knowledge level of full-time Economics and business administration course students of Budapest Corvinus University based on their own confession related to their own average. (own design)

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V.2.2.2. Data analysis

Since we transformed values to the difference taken from the average of their own answers, positive numbers show that students know the given area better than their average knowledge, while negative figures show that they know it less. The diagrams of Figure 10 show the distributions of the answers of first year students of BCE in 2012, learning at full-time economics and business administration training programs in the regressive order of averages, **Hiba! Érvénytelen könyvjelző-hivatkozás.** shows the indexes of certain variables based on data of both 2012 and 2013.

Table 8 The indexes of full-time students of BCE economics and business administration course (own design)

	2012			2013		
VARIABLE	N	AVERAGE	ST. DEV.	N	AVERAGE	ST. DEV
Use of Internet (from own average)	414	0,81	0,41	560	0,86	0,40
Making single text, with word processor (from own average)	414	0,77	0,37	562	0,80	0,37
Presentation making (from own average)	396	0,62	0,44	544	0,73	0,43
Making table with spreadsheet (from own average)	414	0,55	0,45	562	0,64	0,41
Making long document with word processor (from own average)	414	0,47	0,42	564	0,43	0,42
The use of simple formulas and functions (from own average)	414	0,18	0,50	562	0,16	0,49
Publication (eg. poster, invitation making) (from own average)	413	0,12	0,50	563	0,12	0,50
Multimedia design (from own average)	414	-0,13	0,64	565	-0,07	0,59
Data analysis with spreadsheet(from own average)	411	-0,21	0,53	563	-0,28	0,51
Advanced functions with spreadsheet (from own average)	414	-0,33	0,45	562	-0,33	0,47
Database management (from own average)	415	-0,36	0,54	563	-0,40	0,54
The advanced use of word processor (from own average)	412	-0,37	0,50	565	-0,45	0,46
Webdesign (from own average)	415	-0,43	0,51	564	-0,42	0,52
The advanced use of spreadsheet (from own average)	411	-0,80	0,47	563	-0,86	0,42
Programming (from own average)	415	-0,87	0,46	565	-0,90	0,41

It is clearly seen that the order is the same (the only difference is that the advanced usage of word processor got to the one more downward place on the list) and the values of the

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two surveys are not significantly different from each other, either. The use of internet received the highest positive values, followed by designing a simple text with word processor and making presentation. Designing long document and publication with word processor and making tables and simple formulas with spreadsheet received mostly positive values but closer to 0 . The lowest values were received by programming and the advanced usage of spreadsheet.

Connection with the secondary school curricula

It is interesting to examine the connection between the teaching and knowledge learnt in certain areas. Table 9 shows the correlation in certain areas. Except for the use of internet, the connection is significant everywhere but the strength is different from one area to another and it cannot be regarded too high anywhere. There may be two reasons for the weakness of connection. On the one hand, there are some areas (for example programming) where lots of students feel that in spite of being taught they do not know them, on the other hand, in some areas knowledge acquired from other sources fill the gaps left by school shortcomings (typically, such an area is the use of internet). It also turns out from the overall research of several institutions regarding the internet use of higher education students for several years, that the rate of students actively using the internet before starting higher education is increasing from time to time. [*Vig,2005;2008*]

In the research of 2013, I also examined the connection with the secondary school teaching material in the case of corresponding students. I had the pre-concept that the connection would be less. My concept was justified in the aspect that areas mostly regarded as basic knowledge category did not show any connection with to what extent these areas were included in secondary school teaching material, moreover the use of internet showed even a negative connection, however making simple text and long documents with word processor, making table and presentation proved to be independent. According to Table 10, the other 10 areas showed a similar picture to what could be seen in the case of full-time students.

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Table 9 The connection between the level of knowledge of full time economics and business administration course students at Budapest Corvinus University and the presence of the area concerned in the secondary school teaching material according to the closeness of the connection in a decreasing order (own design)

	2012		2013	
VARIABLE	PEARSON CORR.	SIG. (2-TAILED)	PEARSON CORR.	SIG. (2-TAILED)
Database management (from own average)	0,615	0,00	0,612	0,00
Data analysis with spreadsheet(from own average)	0,550	0,00	0,494	0,00
The use of simple formulas and functions(from own average)	0,496	0,00	0,505	0,00
Web design (from own average)	0,464	0,00	0,448	0,00
Advanced functions with spreadsheet (from own average)	0,412	0,00	0,468	0,00
Programming (from own average)	0,380	0,00	0,273	0,00
The advanced use of word processor (from own average)	0,361	0,00	0,441	0,00
Publication (eg. poster, invitation making) (from own average)	0,360	0,00	0,390	0,00
Making table with spreadsheet (from own average)	0,356	0,00	0,300	0,00
The advanced use of spreadsheet (from own average)	0,314	0,00	0,293	0,00
Presentation making (from own average)	0,285	0,00	0,272	0,00
Multimedia design (from own average)	0,208	0,00	0,306	0,00
Making long document with word processor (from own average)	0,149	0,00	0,239	0,00
Making single text, with word processor (from own average)	0,138	0,00	0,102	0,02
Use of Internet (from own average)	-0,050	0,31	-0,049	0,28

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Table 10 The connection between the level of knowledge of full-time, Economics and Business administration course students at Budapest Corvinus University and the presence of the area concerned in the secondary school teaching material according to the closeness of connection in a decreasing order in 2013 (own design)

	2013	
VARIABLE	PEARSON CORR.	SIG. (2-TAILED)
The advanced use of spreadsheet (from own average)	0,57	0,00
Database management (from own average)	0,50	0,00
The use of simple formulas and functions(from own average)	0,46	0,00
The advanced use of word processor (from own average)	0,44	0,00
Programming (from own average)	0,44	0,00
Data analysis with spreadsheet(from own average)	0,43	0,00
Web design (from own average)	0,39	0,00
Publication (eg. poster, invitation making) (from own average)	0,37	0,00
Advanced functions with spreadsheet (from own average)	0,34	0,00
Multimedia design (from own average)	0,29	0,01

What do certificates show?

In several higher education institutions partial or complete exemption is granted from learning IT subject if the students have an ECDL certificate or matura exam of IT. In order to supervise whether at certain part areas there is a significant difference between groups having or not having ECDL base module examinations or between groups having or not having the matura exam of IT, I carried out an independent t test. As Figure 11 shows, having the two kinds of certificates is not independent of each other. There is a higher rate of students having the mature exam among the ones who also have an ECDL certificate.

In 2012 the group having ECDL basic exam showed significant connection only at 3 areas with the self-confessed knowledge level of some areas. One of them is the use of internet (11), which is known better by the ones who have no ECDL examination. There are two positive differences in the use of simple formulas with spreadsheet (6) and database managing (14).

In the survey of 2013, I got somewhat different results, there was a connection in 7 areas here but 5 out of this were unfavorable for the knowledge of the students with

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examinations (1, 9, 11, 13, 15) and here I found only two positive differences the same way. Similarly, one of them was database managing (14) and the other one was the analysis of data with spreadsheet (8).

We could see that ECDL base modules contain a lot more areas but students with certificates were not significantly better either in 2012 or 2013 (1, 3, 4, 5, 10, 11)

Students with matura exams differ already at more areas from the others in 2012. The difference is of negative direction in making simple texts (1) and in the advanced use of word processor (4), in the advanced use of spreadsheet (9) use of internet (11) and multimedia design. (13). The difference is positive in making table with spreadsheet (5) and data analysis (8) webdesign (12) and database managing (14).

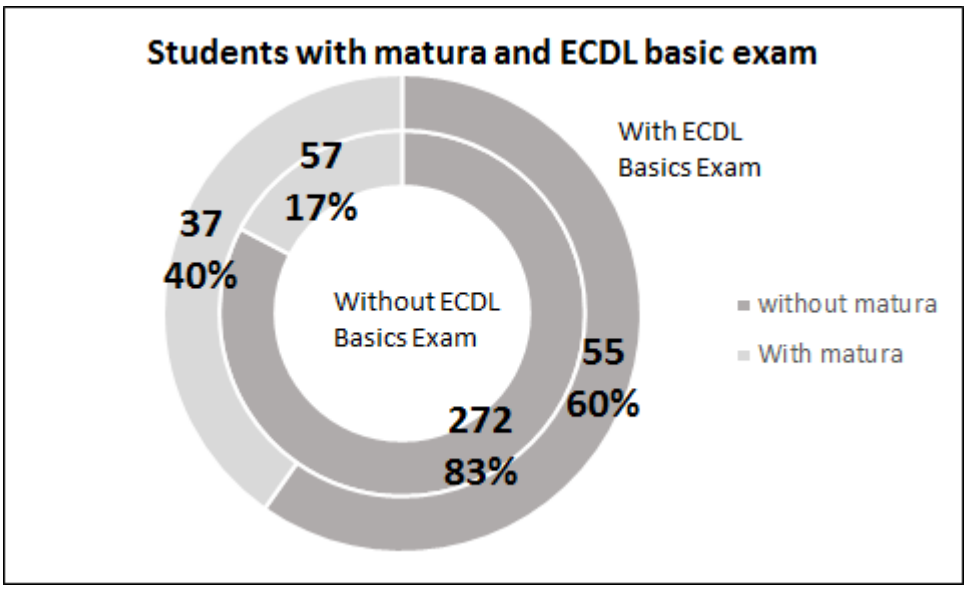

Figure 11 The division of full-time, economics and business administration course students according to ECDL basic exams and matura of IT based on the data of 2012 (own design)

In 2013 there was a difference in several areas. In the negative direction compared to last year, the advanced use of word processor is missing (4), there was no significant difference, however, in addition, making table (5) making presentation (10) and programming (15) appeared. In the positive direction difference data analysis (8), web design (12) and database managing (14) will stay, making table with spreadsheet was left out (it turned into negative) (5), however, the use of simple formulas and advanced functions with spreadsheet was added (6, 7).

Regarding matura, we can see that positive difference appears in fewer areas than as many areas are involved in medium level matura exam. In spite of the fact, that it is part of the

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requirements, students with the matura exam are not significantly better at areas 1, 10, 11.

The grade received at the matura had to be provided on the questionnaire, which proved to be very good in the circle of students being examined: there was no 2 (equivalent to D) in any of the years, 3 (equivalent to C) only 3-3, there were 24 of 4s (Bs) in 2012, 18 of 4s were granted in 2013, the others were mostly 5s (As), 70 of them in 2012 and 87 students got 5s (As) in 2013.

Comparing the two certificates, having a matura exam is more reliable regarding the knowledge of students than the ECDL certificate.

Some more things of interest

Compared to earlier surveys, there was a new question added to the survey of 2013: "what kinds of office programs do you use apart from Microsoft products? (word processing, spreadsheet, presentation making) enumerate them by using commas. If you use only Microsoft products, do not fill it out."

Table 11 The number of mentionings to programs outside the circle of Microsoft products by full-time economics and business administration course students in 2013 (own design)

APPLICATION	NUMBER OF MENTIONINGS
Prezi	24
OpenOffice	12
Adobe Photoshop	11
Numbers	9
Pages	9
Keynote	8
Google Drive	5
Adobe Reader	4
GIMP	4
LibreOffice	4

84 full-time economics and business administration students answered the question (it is 15% out of 54.9), the ones answering enumerated 1.8 programs on average, although some wrote down programmegroups, for example Libre office. They mentioned 50 different programs, one of them being the word processor suggested in the question, some media players, picture and video editors and file managers were also enlisted next to

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spreadsheet and applications of presentation making. Some did not understand the question well, so they wrote down some Microsoft products, too. There were some who only did not write concrete programmenames, only general names, eg. spreadsheet and picture editor.

The list of programs mentioned most frequently can be found in Table 11 There is Prezi for presentation-making at the beginning of the list, but related to complete sample the number of mentionings is very low, only 4,37%.

Table 12 The number of mentionings to programs outside the circle of Microsoft products by correspondance economics and business administration course students in 2013 (own design)

APPLICATION	NUMBER OF MENTIONINGS
AdobePhotoshop	6
Prezi	6
SAP	4
AdobeReader	3
AutoCAD	3
OpenOffice	3
ArchiCAD	2
InDesign	2
itunes	2
LibreOffice	2
Lotus Notes	2

I also examined the answers of corresponding students. 31 of them answered the question (it means 30% out of 103 students) on average, mentioning 2.4 programs. Prezi (5,82%) and Adobe Photoshop (5,82%) are among the most favourite mentionings, too. SAP, as 1 of the most well-known company management softwares got 3 mentionings from full-time, and 4 mentionings from corresponding students. On both lists there were further company programs, for example, invoicing programs and CAD programs were also referred to, as it can be seen in Table 12.

In the questionnaire I also asked where else they had learnt about IT apart from secondary school. Based on the answers of full-time students in 2013, 78.21% learnt it already in elementary school, 43.76% of students learnt from friends, family, 40.7% learnt it on their own. The rest of the chances were referred to at a much smaller rate: at college, university

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(5.1%) at work (2,28%), from a private teacher (2.28%, (at course (1.93%). The same options for corresponding students show a totally different picture. The percentage of those who learnt about it in elementary school is only 48%. Learning from friends, family (39%) and on their own (59%) also shows a relatively high percentage, but in their case workplace obviously shows a higher rate (37%), just like college or university studies, too (35%). In their case a course occurs only at a low percentage too (1% and 12%).

Based on answers given in 2013 both groups asked spent a considerable amount of time doing computer related activities, as shown by Table 13.

Table 13 Time spent on computer related activities of full-time and correspondance students of Budapest Corvinus University in the first year of economics and business course (own design)

	FULL-TIME		CORRESPONDANCE	
	STUDENTS	PERCENTAGE	STUDENTS	PERCENTAGE
More then 4 hours a day	157	27,59%	71	68,93%
Some hours a day	363	63,80%	28	27,18%
Some hours a week	43	7,56%	2	1,94%
1 hour a week	0	0,00%	1	0,97%
Less	2	0,35%	1	0,97%

V.2.3. The comparison of the research results of 2005-2006 and 2012

I only examined the full-time, economics and business administration course students in the comparison. From the earlier research I also left out the then students of business informatics students. The earlier research was carried out in 2 terms with not completely the same questionnaire, so certain information is available for the whole lot of the students asked. (n=930, 92% of the then first year students), some other information is available only for the students asked in the second term (n=406), 40% of the then first year student.

I had to transform some data in order to compare it with the results of 2012. On the one hand, we asked about the teaching of certain areas on a two-level scale (yes-no) in the earlier survey, so I re-counted the new data again in such a way that I took answers numbered 1 and 2 as yes. On the other hand, in the questionnaire 7 years earlier word processing and spreadsheet were included as one question about each, so I had to make 1 for each respectively out of the 4 and 5 variables of the newer results. At teaching I took the maximum of the value of variables. When judging knowledge I did not include all this years' variables into the comparison because with a maximum calculation I would

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have over-estimated, but with an average calculation I would have under-estimated the answer we would have received if there had been only 1 question this year, too. Instead, at word processing, I took the average of simple text making and long document design, at spreadsheet, I averaged simple formulas and data analysis. At comparison, I took the 2 base /raw values (not deviances from the average) into consideration.

The differences between the two years are shown by Figure 12. We can see that the rate of those being taught has increased significantly. The only exception is programming, the rate of which has decreased from 28% to 23%. Word processing being present at an earlier higher rate, too has increased from 88% to almost maximum, 98%. The highest rate of increase can be experienced at webdesign and database management, where the number of those who had them in their secondary school IT has increased from 23 and 24% respectively to 61% that is, by two and a half times.

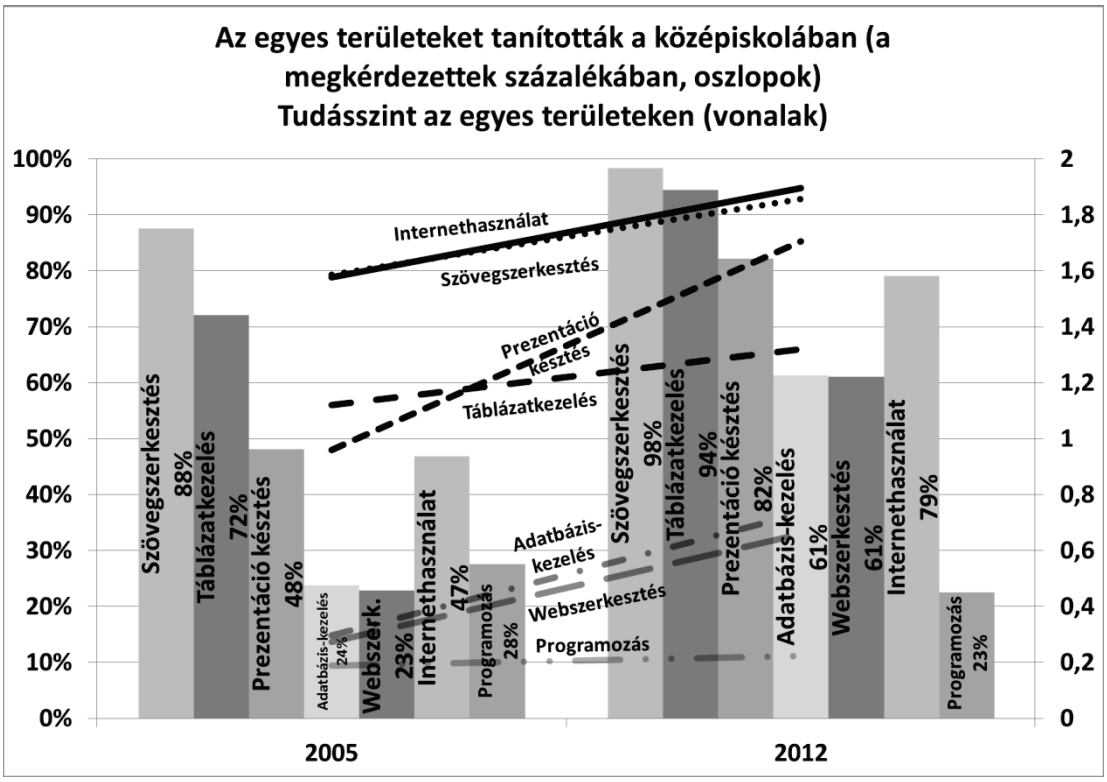

Figure 12 The level of knowledge of full-time students starting the school year of 2005-2006 and 2012-2013 and the rate of certain areas taught in secondary school (own design)

According to previous expectations, next to suitable increases, the decrease of occurrence of programming can also be reasoned quite easily, since IT moves into the users' direction more and more. In the next few years a further decrease of programming in secondary school material will be expected.

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The lines of level of knowledge show increase in all areas but at different rates. Coming before spreadsheet in rank, the knowledge of presentation making has obviously increased most. The use of internet and word processing used to take the first 2 places side by side and they preserved that, too. Programming is at the end of the line here, too, staying on almost the same level between the two dates of time.

V.2.4. The results of research of 2013 regarding the comparison of supposed and real knowledge

At the end of the questionnaire of 2013 there were some test questions about how self-confessed knowledge is related to real knowledge. As there was no risk of filling the test out, it is possible that it was filled out on the basis of their real knowledge. The questions of the test do not cover either of the areas examined, they rather ask about some details as a test on trial. I do not dissect all the questions in the dissertation, I would like to highlight only some more interesting results.

As here I am interested in how good the self-confession is, I am going to use the original variables in the analyses and not the deviations from the average, like in the previous ones and I am examining the full-time and corresponding students.

The first question was: “Which key can be used to delete the character on the right side of the cursor?” As the question was open, it contained no help whatsoever regarding the answer. I created the following categories for the answers: the right answer in some form (Del, Delete), creative solutions (arrow to the right + backspace), the ones confessing not knowing the answer (crossed it out/left it blank put a question mark there) and the ones who gave completely wrong answer (for example: backspace, tab). There were altogether 526 students who gave answers at all and they gave 42 different answers. Next to 440 correct answers (83.65% of the responders and 65.09% of the ones who filled out the questionnaires), 4 of them solved the question creatively, 37 confessed not knowing the answer and 45 gave completely wrong answers. Giving correct answers does not show a significant correlation to what kind of answer is given to the question how well they can use the word processor for making a simple text “(writing, modification, spell check, character format, paragraph format, bullet and numbering, tabulator, tables, page setup, page numbering, printing)”. Examining answers regarding other competences the right answer on the 5% significance level shows correlation to only making presentation but if we are more lenient, on 10% significance level the correlation can be shown to the usage

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of spreadsheet for formulas and advanced functions. It generally means that it is more in connection with general IT, competences.

The second question was especially about the knowledge of word processing, which can be seen in Figure 13. The correct answer here is the third one, that is "the whole paragraph will be justified", the 4th answer can still be explained to be right, the rest of the answers was completely wrong. 45,49% gave correct answers out of the 565 responders, further 7.61% gave an acceptable answer. It is quite sad considering that according to self-confession, 87% of students can make simple texts with word processor out of routine (writing, modification, spell-check, character format, paragraph format, bullet and numbering, tabulator, tables, page setup, page numbering, printing).

Figure 13 The test question asking about the basic knowledge of word processing filled out by the first year students of BCE in 2013 (own design)[4]

[4] If I click on the icon in the cursor position shown in the picture, what will happen? Please, choose one of the following on the list:
the second line will align to the right,
the second line will be justified,
the whole paragraph will be justified,
the 1st and 2nd line will be justified,
the whole paragraph will be aligned to the right,
there will be bullets at the beginning of the lines,
the first 3 lines will be justified,
no answer

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Giving the correct answer does not show a significant correlation to how students judged their own basic word processing knowledge. We can see at this test task too, that giving correct answer shows a correlation rather to the self-confessed knowledge of harder IT task groups (long document managing, advanced functions, data analysis, making presentation, database management).

The fifth question was specifically asked about the design of long documents. (Figure 14)

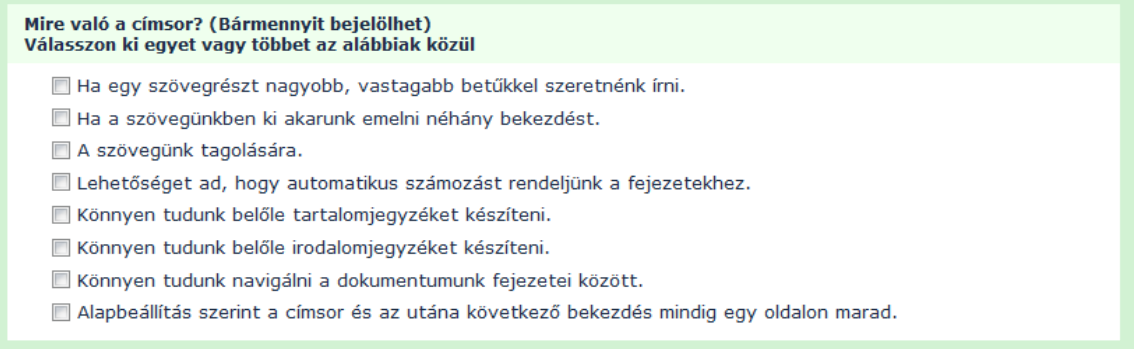

Figure 14 The test question asking about long document design, filled out by first year students of BCE in 2013 (own design)[5]

The correct answers were 3., 4., 5., 7. and 8. I only included responders who marked one answer at least. I gave them scores (1-8) according to how many correct answers they could find out. (As if there had been 8 true – false questions). While 54.73% of the ones asked confessed themselves to have routines in long document edit, only 5 students achieved 8 scores and only 40,87% of 690 responders got minimum 5 scores. 4 scores could be achieved by random guessing. It is even stranger that this rate does not differ considerably in certain categories (Table 14).

[5] What is heading good for? (several answers are possible):
If we would like to write part of the text in bigger, bolder letters;
If we want to emphasize some paragraphs;
For text layout;
It provides a chance for attaching automatic numbering for chapters;
We can make a table of content from it easily;
We can make a list of bibliography from it easily;
We can navigate between the chapters of our document easily;
According to the basic setting the heading and the paragraph next will always stay on one page

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Table 14 The knowledge of making long document (with word processor) (headings, list of content, paragraphs, columns, foot notes) based on self-confession and its relation to the result achieved at the test asking questions about it from first year students of BCU (own design)

		TESZT_CIMSOR								TOTAL
		1	2	3	4	5	6	7	8	
I do not know	pcs	0	3	3	6	2	4	0	0	18
	%	0,00	16,67	16,67	33,33	11,11	22,22	0,00	0,00	1
gaps in my knowledge, I can solve a task only with help	pcs	2	23	51	87	51	30	14	1	259
	%	0,77	8,88	19,69	33,59	19,69	11,58	5,41	0,39	1
I can solve a task out of routine without any help	pcs	3	37	45	103	67	56	24	4	339
	%	0,88	10,91	13,27	30,38	19,76	16,52	7,08	1,18	1

The examination of this question asserts the previous results, too. The score achieved shows some correlation to spreadsheet managing knowledge elements and presentation making (Table 15). It seems that students do not judge their word processing abilities well but the solution of word processing tests shows a significant positive correlation to judging their spreadsheet, presentation, and, in some cases, database management abilities, which in a way shows a general IT level of knowledge. In general, the ones who are better at word processing, are better at other areas, too.

Table 15 The knowledge of spreadsheet and presentation tasks based on self-confession and its correlation to the result achieved at the test asking about it from first year students of BCE (own design)

	PEARSON CORR.	SIG.
Making table with spreadsheet	0,13	0,00
The usage of simple formulas, functions with spreadsheet	0,13	0,00
Advanced functions with spreadsheet	0,09	0,03
Data analysis with spreadsheet	0,12	0,00
Presentation making	0,08	0,04

I examined a question referring to spreadsheet managing, too, I supposed that students could judge their own knowledge with it much better.

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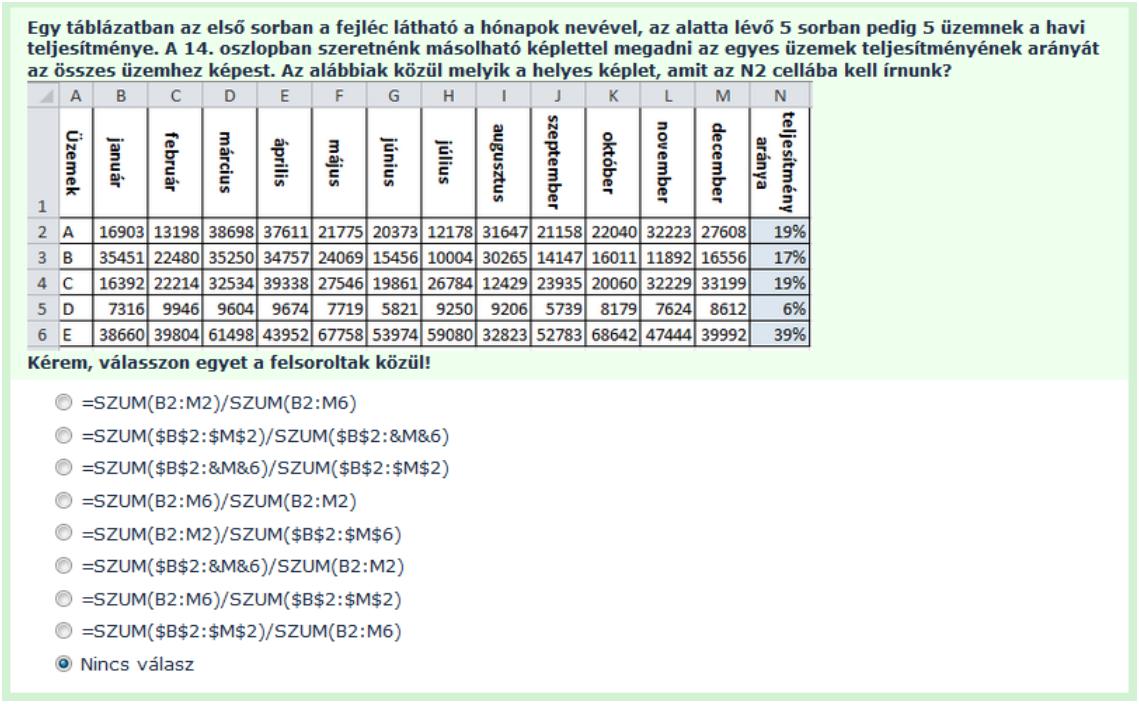
The 10th question was about using absolute and relative references (Figure 15). The correct answer was the 5th. 180 students gave the correct answer, which is 37,89%. According to self-confession 38.91% had a routine in this area but there is no close correlation. Next to the spreadsheet managing knowledge elements seeming to be logical, the correlation to publication making, presentation making and database management can also be shown. The correlation is closest to the area the test question was about, too but the Pearson correlation here was also 0.20 (It can also be read from the cross table that only 50% of those judging themselves to have the routine could give the correct answer (Table 17). However, it is also interesting that the 33.3% of the ones who stated that they did not know anything about this area, got the answer right.

Table 16).



Egy táblázatban az első sorban a fejléc látható a hónapok nevével, az alatta lévő 5 sorban pedig 5 üzemnek a havi teljesítménye. A 14. oszlopban szeretnénk másolható képlettel megadni az egyes üzemek teljesítményének arányát az összes üzemhez képest. Az alábbiak közül melyik a helyes képlet, amit az N2 cellába kell írnunk?

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Üzemek	január	február	március	április	május	június	július	augusztus	szeptember	október	november	december	teljesítmény aránya
2	A	16903	13198	38698	37611	21775	20373	12178	31647	21158	22040	32223	27608	19%
3	B	35451	22480	35250	34757	24069	15456	10004	30265	14147	16011	11892	16556	17%
4	C	16392	22214	32534	39338	27546	19861	26784	12429	23935	20060	32229	33199	19%
5	D	7316	9946	9604	9674	7719	5821	9250	9206	5739	8179	7624	8612	6%
6	E	38660	39804	61498	43952	67758	53974	59080	32823	52783	68642	47444	39992	39%

Kérem, válasszon egyet a felsoroltak közül!

- =SZUM(B2:M2)/SZUM(B2:M6)
- =SZUM($B$2:$M$2)/SZUM($B$2:&M&6)
- =SZUM($B$2:&M&6)/SZUM($B$2:$M$2)
- =SZUM(B2:M6)/SZUM(B2:M2)
- =SZUM(B2:M2)/SZUM($B$2:$M$6)
- =SZUM($B$2:&M&6)/SZUM(B2:M2)
- =SZUM(B2:M6)/SZUM($B$2:$M$2)
- =SZUM($B$2:$M$2)/SZUM(B2:M6)
- Nincs válasz

Figure 15 The tenth question asked about managing absolute relative references from first year students of BCU filling out the questionnaire of 2013 (own design)[6]

It can also be read from the cross table that only 50% of those judging themselves to have the routine could give the correct answer (Table 17). However, it is also interesting that the 33.3% of the ones who stated that they did not know anything about this area, got the answer right.

[6] In a table, in the first row the heading can be seen, in the 5 lines under it the monthly performance of 5 factories is shown. We would like to give the rate of performance of each factory related to all factories with a formula that can be copied. Which is the correct formula out of the following ones to be written into cell N2? Please, choose one out of the following.

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Table 16 The correlation of knowledge of word processing, spreadsheet managing, making presentation and database managing tasks based on self-confession to the result achieved regarding the test question asked about the use of absolute relative reference from first year students of BCE in 2013 (own design)

	PEARSON CORR.	SIG.
Making publications with word processor (for example, poster, invitation)	0,13	0,01
Making table with spreadsheet	0,13	0,01
Making simple formulas, functions with spreadsheet	0,21	0,00
Advanced functions with spreadsheet	0,20	0,00
Data analysis with spreadsheet	0,20	0,00
Presentation making	0,17	0,00
Database management	0,16	0,00

Table 17 The correlation of the skills of the simple use of spreadsheet based on self-confession to the result achieved regarding the test question asked about this from first year students of BCE in 2013 (own design)

		TESZT_HIVATKOZAS		
		0	1	TOTAL
I do not know	pcs	40	20	60
	%	66,7	33,3	100
gaps in my knowledge, I can solve a task only with help	pcs	151	56	207
	%	72,9	27,1	100
I can solve a task out of routine, without any help	pcs	103	103	206
	%	50	50	100

The reason for that may be that all the other details enumerated at the knowledge element were not known by them but they know the references concretely. (Here some statistical functions were enumerated, AUTOSUM, IF, COUNTIF.) I supposed correctly that regarding the area of table managing the correlation between self-confessed ability and test result was stronger.

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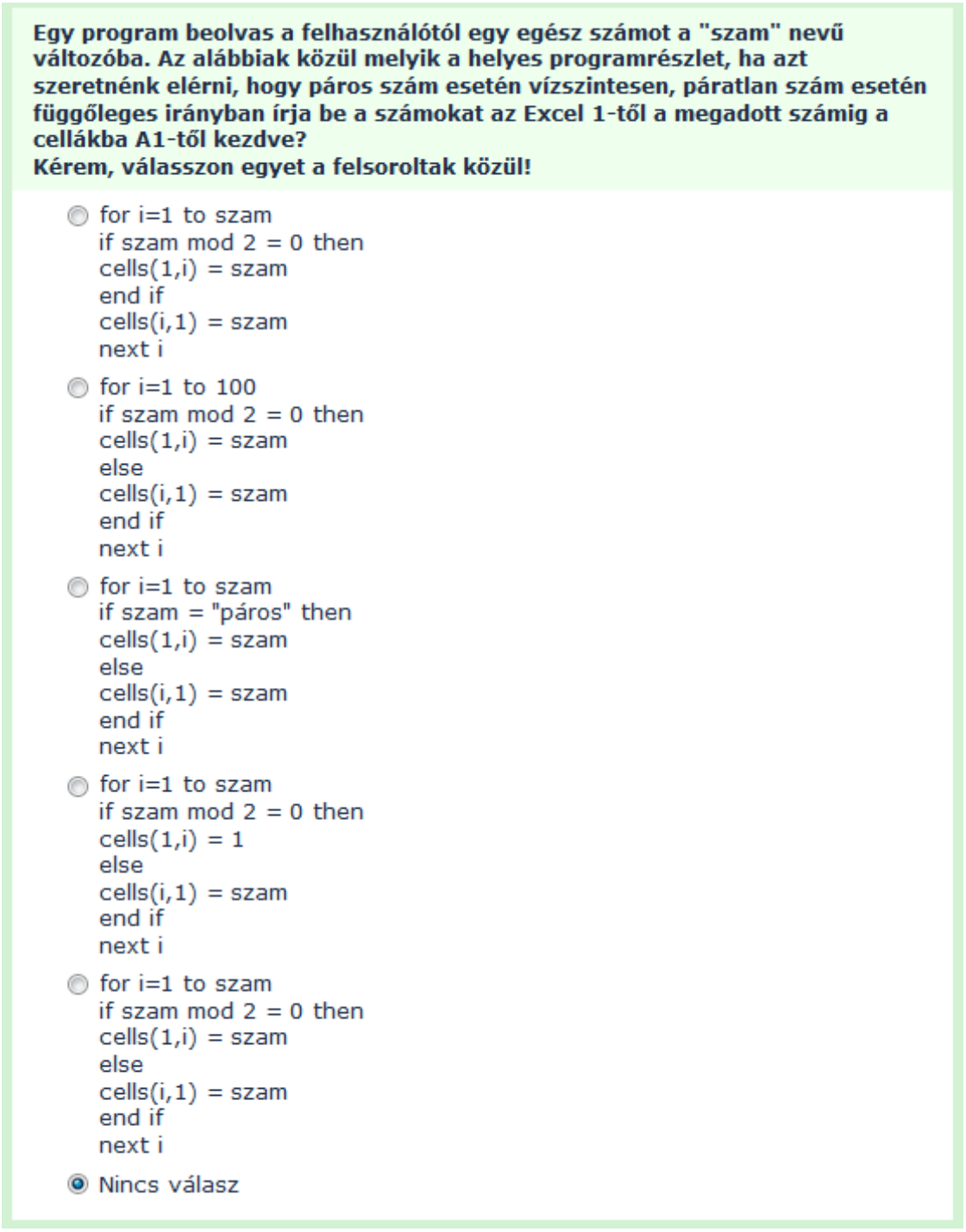

Figure 16 The test question asked about the knowledge of programming in the questionnaire filled out by first year students of BCE in 2013[7]

The last question was a programming task, which could be solved without knowing the concrete programme language (Figure 16). The last answer was correct, only 17,6% got

[7] A programme reads a complete number from a user into the variable called 'szam' (number). Which is the correct part of programme if we wanted to achieve that Excel should write the numbers in from 1 to the given number to the cells starting from A1, in case of even members, horizontally, in case of odd numbers, vertically? Please, choose one out of the following.

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it right (61 students out of 347). Nearly half of the responders (329 students) of the questionnaire did not even attempt to give an answer.

As it is expected, the correlation between judging programming knowledge and the correctness of the answer given to the question is significant. The Pearson correlation is 0.21. It can also be read from the cross table that 70% of students confessing themselves to be routine programmers answered correctly, it means exactly 7 students out of 10. However, only 22.8% of those who had gaps in their knowledge gave correct answer (Table 18).

Table 18 The relation of the knowledge of programming based on self-confession to the result achieved regarding the test question asked about this from first year students of BCE in 2013 (own design)

		TESZT_PROGRAMOZÁS		
		0	1	TOTAL
I do not know	pcs	237	41	278
	%	85	15	1
gaps in my knowledge, I can solve a task only with help	pcs	44	13	57
	%	77	23	1
I can solve a task out of routine, without any help	pcs	3	7	10
	%	30	70	1

V.2.5. The summary of the results of questionnaire surveys regarding the preliminary IT knowledge of new students

The main aim of the research series is to see it more clearly what kinds of incoming knowledge we can rely on and what kinds of tendencies can be observed in their change. The examination made in 2005-2006 was different from the examinations of the two previous years, but certain questions provided a chance for the comparison and the development of 7 years has become obvious. It has also been clearly seen it is not enough to know the regulations of law in order to judge the IT competences of students starting university. The last research attempted to give a picture of to what extent self-confession can be accordance with real competences. The results are suitable for drawing conclusions only with some restrictions but it seems to be logical to test students instead of simply asking them, however, this raises problems of resources, as performing such a controlled test is more difficult than having students fill out questionnaires.

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The analysis of different subsamples showed that the difference is minimum in characteristics of students learning at different courses and in different higher education institutions, too. The comparison of full-time and corresponding students showed the expected result, as there is a higher rate of corresponding students who went to secondary school earlier as well as the ones who acquired different IT abilities at their work.

Full-time students judge their knowledge best at designing simple texts with word processor and making presentations. They also judge their competence as somewhat above average in designing long documents and publications with word processing and making tables and simple formulas with spreadsheet. Programming and the advanced use of spreadsheet got the smallest values. They judge their own knowledge as below average in areas included in matura requirements, such as data-analysis, (diagrams, conditional formatting, auto filter, pivot table) web design and database management.

Examining relations, I can state that the best explanation for it is whether the certain skills were taught in secondary school. The only exception is the use of internet. The relation is usually not very high, which on the one hand, means that they do not know everything they were taught, and on the other hand, they collect knowledge from somewhere else, too. The highest relation can be seen at database management, data analysis and using simple formulas.

Regarding certificates, on the basis of calculations I realized that having or not having IT matura or ECDL certificates does not provide sufficient information about the IT competences of students.

On the basis of the research of 2013, the appearance of technical development can be clearly seen in students' computer use, they enumerated different open source coded and cloud applications when answering open questions; though the numbers of mentionings are rather low.

As results show, that students' knowledge does not only derive from school, I asked them about some other sources, too. As it was expected the corresponding students marked the workplace in a larger number.

More than 90% of students spend several hours in front of the computer every day, corresponding students spend more than full-time students, probably due to work

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V.3. Interviews: with special department and methodology colleagues

V.3.1. Department interviews at BCM

At BCM in the frame of IT education for 2 terms (at different courses, either in the first and second or the second and third terms) two practical classes are available per week. Lecture is held in both terms only for 2x2 hours. Curricula contains word processing, spreadsheet, database management and Excel macros.

Conversations with the departments show a mixed picture. Contradictory expectations and quite surprisingly, contradictory experience came to surface at the same time during 11 conversations (9 departments, foreign language lectorate, Final Exam center) there were recurring elements, too. Later on, I divided the topics arising into 3 groups:

- students' performance
- the content of IT subjects
- teachers' expectations

I experienced contradictions in the first topic most. There were some colleagues who praised the students of the college and found their IT knowledge sufficient, even quite good. However, some other colleagues spoke about the fact that even basic knowledge means hardship for the majority. More and more problems came to light about students being taught and tested in the frame of compulsory IT but not knowing the material some terms later at all. One standard, recurring problem is designing essays in word processing: table of content, numbering pages, not to mention some further gaps in their knowledge. In 8 out of 11 conversations the poor designing of theses was pointed out.

Search of information with the help of internet is one of the important areas of IT usages. There was more negative experience than positive one.

Regarding presentation making, colleagues experienced that in general, technically speaking students are doing well, or they take this knowledge from secondary school or they are doing better and better in college, because presentations are required to be made for several subjects, too. The problems arising about them are not of IT kind. It makes one think how much these can be included as part of IT education. It has been said in several (5) conversations that one part of gaps does not really derive from the lack of knowledge but rather from the lack of concern for quality. Teaching of concern for quality

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is a nice challenge for teachers, in my opinion it can be approached from the side of expectations.

One of the reasons was that teaching IT knowledge does not coincide with the usage of it in time and the different subject contents appear isolated in students' heads, they cannot connect them. There are two ways of solving this problem. On the one hand we have to show such tasks to the students which are connected to other subjects: However it often means such a problem that in the first year special knowledge is missing to understand these tasks. On the other hand, IT must be dealt with in the frame of special subjects, too. However, it leads to the problems of the numbers of lessons. I must mention that there is such a course in the subject offer of some departments which contains computer lab classes. However, it happens very often that these classes cannot be used effectively to pass on special knowledge because students must repeat basic knowledge with their teachers again.

The need for inserting special software has already been clearly pointed out among proposals for content. This also raises the question whether it could be realized in the frame of basic IT subjects or rather, in the frame of suitable special subjects, at specializations. At some departments the use of SPSS programme was mentioned, too. The need for the presentation of some ERP programs also emerged. In fact, in the optional subject frame this was among the subjects. The stabile use of Excel as necessary knowledge (8 conversations) was stressed by colleagues most often, at 3 departments Access database management was also held important. Both are organic parts of basic IT subject material at college.

Many emphasized visualization, too: either by teaching special software (raising financial problems) or the deeper knowledge of spreadsheet diagrams, getting to know about the Smart diagram of Word.

Actually, students are doing well at making presentations in spite of the fact that the teaching of it was not part of basic IT tasks, but there would be such additional means within it, too, which would be worth being known by students better.

At 3 departments it was also discussed that there were serious knowledge gaps on even a basic level. There would be a need for a minimum level of hardware and operational system knowledge, too. It would be really good if students could find a solution for a

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problem on their own, they could install a new software (maybe a programme which can be downloaded from the internet free), which they could learn to use on the basis of help.

It was discussed at 3 departments that programming knowledge is also included in the curricula. At all 3 departments they agreed completely that BCM students simply do not need it at all, especially that even basic IT knowledge is a challenge for many of them.

At economics and business administration bachelor course there is no IT subject in the first term at all. Either the idea of change of subject (it would mean serious difficulties) or some kind of a course that would bring students to the required level seemed to be a possible solution.

The third topic is not connected to teaching IT but it is about IT services of the college and the problems of colleagues regarding IT. Teachers require more support in connection with the introduction of e-learning system operating at college since September 2011. Most teachers welcomed the chance of turning to IT teachers with their users' problems in the frame of College teachers' meeting (some teachers already used this chance in the school year of 2012-2013).

Some ideas arose at several departments that it would be worth learning new things that seem to be impossible to learn from books and help, one reason for it being the lack of time but quite a few mentioned that they found both books and helps too complicated. Most often there seemed to be a demand for learning prezi.com.

In most departments, they also welcomed to gain some insight into what we teach in IT.

V.3.2. Department interviews at BCE

During the school year of 2013-2014 I visited the course referees of courses operating at university with Péter Fehér, the leader of BCE Computer Science department and asked them to help us renew basic IT subjects in such a way that they should tell us their opinion about what kind of IT basic education their students needed. They completely agreed that they expected their students to use spreadsheet with routine. Using algorhythm and Excel programming on some kind of level are all expectations at Economy analysis, Applied economy, Finance and accounting and at Human Resources. At Economy analysis, the importance of IT was especially emphasized and the increase of its weight was also stressed. They insisted on the increase of the teaching of the optimizing tool (Solver). Earlier at that course Maple programme was included instead of Excel programming in

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the compulsory subject but they do not insist on it anymore. The teachers of human resources thought it important to state that data managing was basic and so was the learning to think. It is also essential that the skills acquired through the use of spreadsheet should be used during the use of other applications. Teachers of economics and business administration also found spreadsheet the most important, within it the acquiring of the use of macros would also be welcomed next to the basic means. Applications helping different kinds of group work were also mentioned as necessary.

V.3.3. The summary of the conclusions of the interviews

In the conversations of both institutions the dominant role of spreadsheet, and data managing was found. Regarding what kinds of competences students would be helped with at their workplaces was not provided with information, only with suppositions and conclusions.

The basic difference between conversations at the college and the university was that at college word processing was always mentioned at almost all departments, within it long document design as a most required competence because as their experience showed it, one part of students lacked it completely. At university it was not mentioned. A further difference is that doing algorhythm at college is thought of as unnecessary, whereas at university it is a requirement.

There were opinions in both institutions that the basis of IT must be laid down well so that the teachers of special departments could build on it in the frame of special subjects.

V.4. The result of alumni research

V.4.1. Experimental research in the circle of the graduates of BCM

I carried out an online fill out electronic self-filling questionnaire examination among the graduates of BCM in February 2012, regarding what kind of connection they had with IT in their work. The survey presented here is experimental. Although general conclusions cannot be drawn, it helps the preparation for further research.

Cooperating with BCM Career Office we forwarded the questionnaire through the alumni database to 3823 graduates. Out of them 189 filled out the questionnaire either completely or partly.

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I attempted to find answers to the following questions with the help of the experimental research:

1. Is there an evident difference between the IT usages at work for graduates at certain courses?
2. Does the content of the education changing with time affect the application at work?
3. To what extent does the curricula of ECDL base modules meet workplace requirements?

I put the responders into 6 groups based on their course:

1. Economics and business administration bachelor course
2. International Relations bachelor, International Relations college course
3. Public Administration bachelor, Non-profit economics and business administration college course
4. Business communication college course
5. Higher Level Vocational training: Post-secondary Advertising Studies, Post-secondary Business Management Studies
6. Business Development master course

The 176 answered the question whether there was a part of the workplace admission procedure regarding IT knowledge and skills, and somewhat more than half (54.5%) answered with yes. Most of them were asked about their knowledge (64%) at the job interview, 25 of them even had to solve a practical task. Some had to fill out a written test (7 persons). Spreadsheet and word processing were mentioned most often among IT requirements. Use of internet (61) and presentation making (56) were also mentioned quite frequently. The knowledge of Database management was expected from one third of the responders.

Table 19 shows to what extent the pattern matches with the base lot according to courses. It can be seen from the table that graduates of Business Communication course were at a bigger rate among responders while students of higher level vocational training were at a much lower rate than average as responders.

43,9% of the responders work at a large enterprise, 22.2% at a medium one and 13.1% and 12% work at a small and micro company. 70.7% are employees and only 3.5% are chief executives.

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Table 19 The rate of filling out the questionnaire according to course groups and altogether, BCM alumni 2012 (own design)

COURSE GROUPS	N	n	RATE OF FILLING
1. Economics and Business Administration bachelor course, Business Administration	3073	130	4,23%
2. International Studies bachelor course, International Relations	679	19	2,80%
3. Public Administration bachelor course, Non-profit Management	266	14	5,26%
4. Business Communication college course	217	18	8,29%
5. Higher level vocational training: Post-secondary Advertising Studies	524	6	1,15%
6. Master education: Business Development	29	2	6,90%
Final sum	4788	189	3,95%

More than 3 quarters of the responders spend more than 3 quarters of their time in front of the computer (Figure 17). This data also supports the fact that it may be really important to deal with, because only one person said that his original qualification was an IT specialist and his work is connected to this. Everybody else with their economy related qualification does such a job which requires a lot of computer use.

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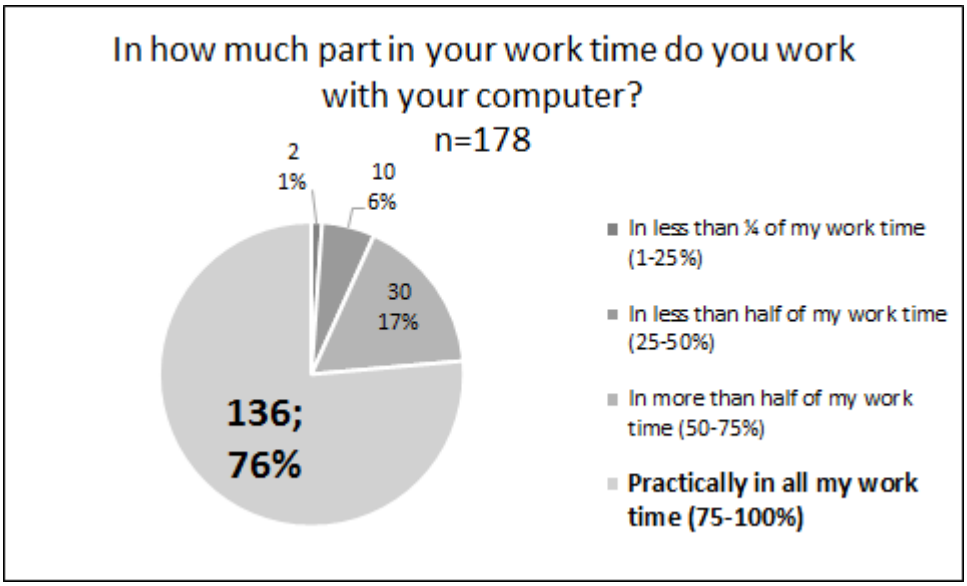

Figure 17 Work time spent in front of the computer in the case of responders of the alumni research of BCM (own design)

We wished to define computer work in its details. In Table 20 it can be seen which tasks enumerated by us were marked most often. The most frequent task is (inside and outside) communication. It is worth noticing that the use of spreadsheet comes before word processing tasks. Typical IT tasks were given to less than 10% of responders (17., 18.), which were creating the database of the firm (9.1%) or web design (7,1%).

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Table 20 The type of computer work, BCM alumni 2012 (own design)

WHAT TYPES OF TASKS DO YOU DO, WHAT PROGRAMS DO YOU USE IN YOUR WORK?	RATE OF YES-ES
1.Communication inside the company	78,8%
2. Making and managing data lists with spreadsheet	74,7%
3. Writing official letters with word processor	67,7%
4. Communication on the internet	66,7%
5. Making Pivot tables, analyses, summaries with spreadsheet	63,6%
6. Making memos	55,6%
7. Modeling and calculations with spreadsheet	33,3%
8. The use of ERP (Enterprise Resource Planning Systems)	31,8%
9. The use of TPS (Transaction Processing Systems)	27,8%
10. Company database management with database management system	26,3%
11. Making short publications (for example invitation, poster, programme booklet) with word processor	23,7%
12. Accounting with accounting program	22,2%
13. Picture editing	21,2%
14. Making long publications (for example studies, conference volumes) with word processor	12,1%
15. The use of decision support systems	11,6%
16. Invoicing with spreadsheet	11,6%
17. Making company database and its maintenance with database management system	9,1%
18. Web design	7,1%
19. Others	2,5%

Both the part areas of the workplace admission test and the areas most often used in work place support the fact that the areas of word processing and spreadsheet are worth being examined more thoroughly. We put 2 questions about tasks of word processing and spreadsheet: „Please mark it in every line how often and how stabile you use the given function when using WORD PROCESSOR /SPREADSHEET . When answering, do not think of your workplace alone but every time when you use word processor/spreadsheet!”

Due to gaps in filling-out I could analyze only answers about the frequency of usage. They had to give answers on a scale of 5: never, once I had to, rarely, often, daily. In order to use statistical means suitably, I reduced the 5-graded scale to 3 in all cases

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because the original scale showed – 2 modus frequency distributions. Following alterations, the 3 answer types regarding the frequency of usage are: 0 – never, 1 – already once or rarely, 2 – often or daily. When coding questions I marked functions with E, which are among the requirements of ECDL base modules and with P, the means which are beyond them.

In both application areas I could separate task groups which were closer to each other on the basis of answers. I examined that with the help of multidimensional scaling. The essence of the model is that the examined variables are put into a reduced number dimension space from the multidimensional space by mathematical methods. The aim of the algorhythm is that the distances between the variables in the reduced space should be the most suitable for the distances observed in the original space. In general, the final result with more dimensions has a better adjusting indicator but the final result with 2 dimensions is much more clear and easier to interpret. [*Füstös at. al., 2004*] I made the models and figures with the PASW Statistics 18 versions of SPSS programme package.

The preciseness of the 2-dimensional model based on Stress indicators measuring adjustment is medium at both task groups (at word processing 0.13, at spreadsheet 0.11) and the location forming on the map can be explained well in both cases (Figure 18 and Figure 19).

The explanation of the codes on the figures can be found in Appendix 3.

E04 (hyphenation) and P17 (password protection) are somewhat separated from their groups and regarding content they adjust well into the groups formed, it would not have been worth creating a separate category for them. On the basis of distance-matrix, the separation is the closest to the functions, which are located further on the map, for example, the Themes in design category (E10), or the outline numbering (P01), in ECDL category, but the heading, table of content and paragraphs are also close to it (P05, P06, P12) in the long document category. On the map of spreadsheet tasks, there are no points hanging out too much.

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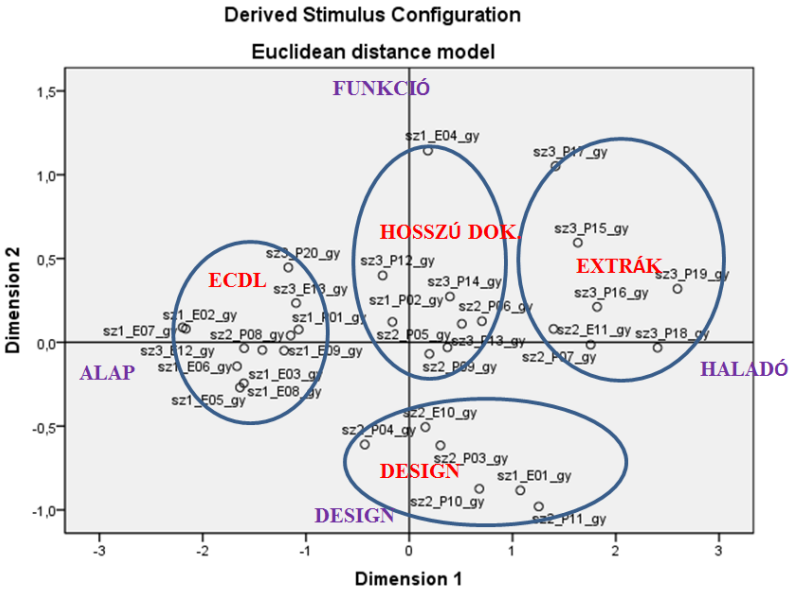

Figure 18 The result of the multidimensional scaling for the frequency of word processor use in 2 dimensions (own design)

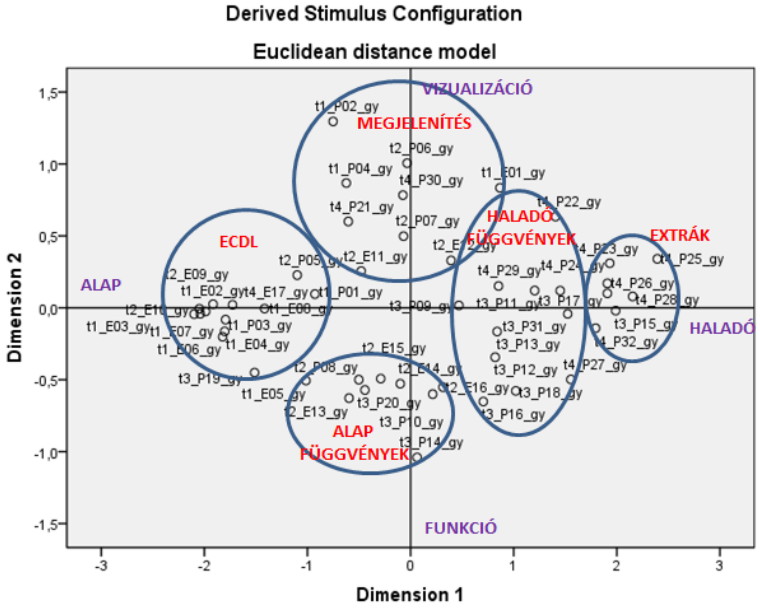

Figure 19 The result of the multidimensional scaling for the frequency of spreadsheet use in 2 dimensions (own design)

The variable groups formed are united in one-one variable by using a simple unweighted average. In Table 21, the data of united variables can be seen. Figure 20 shows the distribution of frequency of united variables.

It can be seen from the statistics of new variables, the new variable with the highest average and the lowest standard deviation in both areas were formed from ECDL category. These functions are used very often practically by everybody, so the average approaches the maximum value of 2. In these 2 groups there are mainly means, the usage of which can be learnt by preparing for ECDL exam. The question arises whether it is the

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task of higher education to teach this knowledge or students should take this knowledge from secondary school to higher education or whether filling the gaps of knowledge individually should be required at all. The seven skills knowledge missing from ECDL must be shown by all means, although most of the time they are already known by students, (they are multi-level numbering, table in the text and special printing settings in word processing, individual number formats, paste special, hiding and unhiding worksheets and auto filter in spreadsheet).

Table 21 The statistical data of united variables, BCM alumni, 2012 (own design)

	N	AVERAGE	ST. DEV.
WORD PROCESSING			
sz1_ECDL_gy	158	1,7297	0,28920
sz1_HOSSZU_gy	156	1,1754	0,46170
sz1_DESIGN_gy	159	1,0844	0,48516
sz1_EXTRA_gy	152	0,6629	0,43903
Valid N (listwise)	152		
SPREADSHEET			
t_ECDL_gy	113	1,7388	0,36080
t_FGV_ALAP_gy	113	1,1696	0,54892
t_MEGJELENIT_gy	113	1,1272	0,49269
t_FGV_HALADO_gy	110	0,6909	0,49496
t_EXTRA_gy	110	0,3590	0,35269
Valid N (listwise)	110		

With an average above 1, but we meet a value closer to 1 in long document and design-category at word processing, in base functions and visualization in table managing. In these categories standard deviation is bigger, there are more who never use these means but there are a lot, too, whose value is over 1.5, so they use it quite often. In the long document we can find all P code functions, so these skills are not part of ECDL requirements. We can find both E and P code functions in design, base functions and visualization groups. These 4 groups underline the supposition that students graduating from us need more knowledge in word processing and spreadsheet than the knowledge of ECDL base modules.

The average of the other 3 categories is a lot under 1 and its standard deviation is not so small. There are some graduates who do not use these means at all and there are only few

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who often use them. These are the extra category of word processing (apart from mail merge there are P code means) and the extra category of spreadsheet advanced functions (there are only P code means in them). It is to be thought about whether they should be in the curricula. Is it perhaps not used because it would not be useful or only because they do not even know them and they do not know whether it would be useful? We can only give an answer to that after the examination of stabile usage.

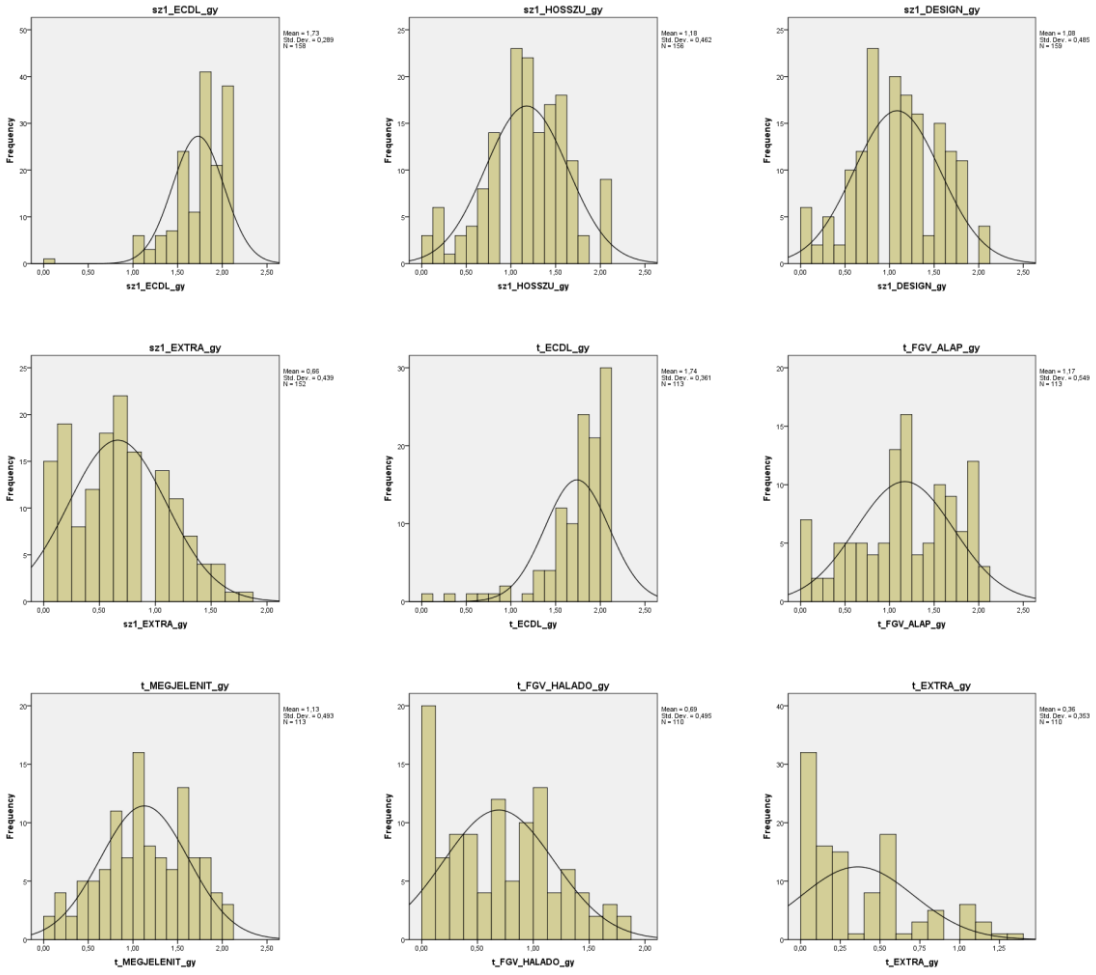

Figure 20 The distribution of frequency of united variables, BCM alumni 2012 (own design)

In the case of spreadsheet I also asked about the most frequently used functions. Table 22 shows the beginning of the list based on the number of mentionings.

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Table 22 The most often used functions of spreadsheet, BCM alumni 2012 (own design)

FUNCTION	NUMBER OF MENTIONINGS (OUT OF 91 RESPONDERS)
SUM	69
IF	41
VLOOKUP	38
COUNTIF	25
AVERAGE	18
AUTOFILTER	14
SUMIF	13
COUNT	11

V.4.2. Budapest Corvinus University alumni examination, 2013-2014

I tried to send the questionnaire modified on the basis of the findings of the earlier research carried out at BCM to lots of graduates of BCE electronically. I received 168 usable questionnaires (after leaving out rather incomplete questionnaires and the ones that were filled out by graduates of another course that does not belong to economics and business administration science). Originally I intended to have graduates of the past few years (2009-2011) already in the Bologna system fill the questionnaire out but later I extended it to all graduates of even earlier years. 168 graduates cannot be regarded as representative samples from any aspect at all but it is large enough a number to be able to draw conclusions from. An additional consequence of the research is that BCE does not have a very close connection with the alumni, calls sent through informal ways (Facebook, e-mail) attracted much more questionnaires filled out than the ones through the alumni system.

The division of responders according to their main specialization or course can be seen in Table 23. There was no responder at all from Human resources course, which is also part of courses after Bologna (graduates of 2009 or after). The names of courses before Bologna may not be completely accurate in all cases.

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Table 23 The courses and specializations of responders, BCE alumni, 2013-2014 (own design)

COURSES AFTER BOLOGNA	
Applied Economics	7
Economics and Business Administration Management	32
Analysis of Economy	5
Trading and Marketing	3
Public Services	3
International Business Economics	5
Finance and Accounting	19
Tourism and Catering	14
Total:	**88**

SPECIALIZATIONS BEFORE BOLOGNA	
Inland Trade	3
Supply Chain Management	1
EU Integration	1
Economics and Business Administration	1
Theory of Economy	1
Information Management	7
International Study Center	1
Industrial Organizer	1
Organizing and Managing Industrial Enterprises	3
Public Services	3
Foreign Economics	6
Marketing	4
International Relations	5
International Trading	1
National Economy Designer Analyser	1
Finance	7
Financial Investment Analyser and Risk Manager	4
Market Analyser	2
Accounting	7
Service Management	3
Teacher	2
Company Finances	3
Managing and Organizing	7
Quantitative Analyse Of Economy	2
Total:	**76**
NOT FITTING INTO ANY	4

At the courses before Bologna I looked at the division according to the year of graduation. Figure 21 shows 72 former students who filled out the year of graduation. The reason for the outstanding value of 2004 may be that I also spread the questionnaire through the

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personnel net and I also graduated in 2004. 5 responders graduated in 2009 and 4 in 2010, they probably postponed some years of their studies.

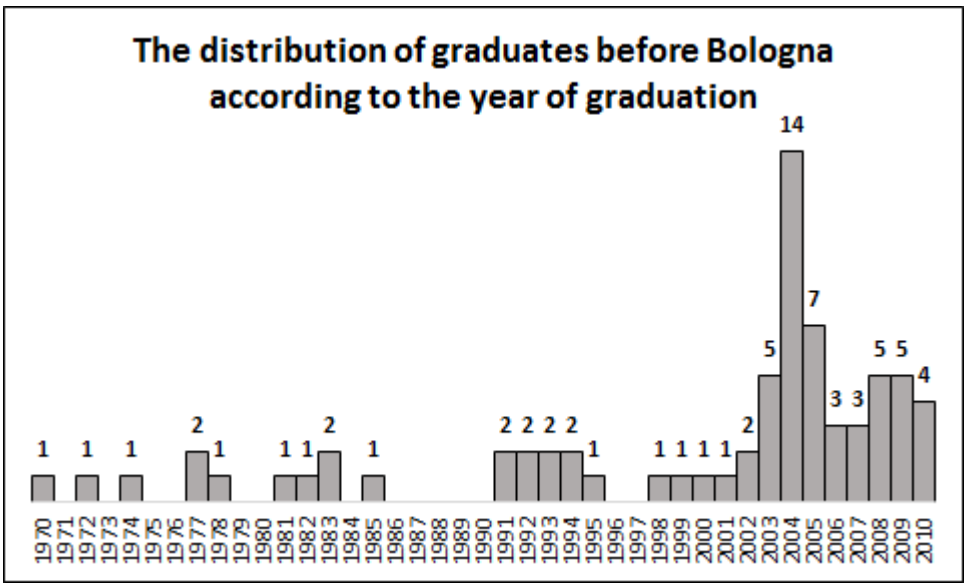

Figure 21 The year of the graduation of the responders, BCE alumni, 2013, 2014 (own design)

The majority of the responders graduated at full-time faculty, there were only 3 corresponding, (from Bologna system) and 5 evening course graduates among the responders.

V.4.2.1. The comparison of the results of the research of 2012, BCM and 2013-2014, BCE

There were some questions, which remained in the questionnaire practically without any changes. These analyses give me a chance for comparison.

Hiba! Érvénytelen könyvjelző-hivatkozás. shows the distribution of university responders according to what positions they are holding at what size company. Similarly to college responders, most of them are employees and work at a big company.

To the question how IT knowledge was checked, 165 persons answered from BCE alumni altogether, out of them 159 marked some kind of requirement (96,36%).

It was included in the job advertisement for 48.78%, it was asked about at the job interview for 47.56%, 4.88% had to fill out a written test but there was a practical test for only 13.41%.

IT competence was required at the work admission for 54,5% of BCM alumni responders. In their case too it was asked about at the job interview, only 14.20% had to fill out a practical test.

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On the basis of this data I draw the conclusion, that employers take IT competence for granted, they do not check it separately during the interview, they may ask about it at the most.

Table 24 The size of company and the positions of responders, BCE alumni, 2013-2014 (own design)

	-	CHIEF EXECUTIVES	MEDIUM EXECUTIVES	EMPLOYEE	SELF-EMPLOYED ENTERPRISER	TOTAL
-	1,79%	0,00%	0,00%	0,60%	0,00%	2,38%
micro (less than 10 employees)	0,60%	2,98%	1,19%	4,76%	2,38%	11,90%
small (less than 50 employees)	0,60%	0,60%	0,60%	10,12%	0,00%	11,90%
medium (less than 250 employees)	0,60%	1,19%	3,57%	11,31%	0,00%	16,67%
big (more than 150 employees)	1,19%	2,38%	14,29%	39,29%	0,00%	57,14%
Total	4,76%	7,14%	19,64%	66,07%	2,38%	100%

There were graduates from several decades ago among the university responders. Table 25 shows that the rate of those graduated in 2000 or after was lower regarding the lack of such a requirement, while for half of the graduates of the 70s there was no such a requirement (the subsamples of earlier years are small, but the differences are quite convincing).

Table 25 The decade of graduation and the rate of IT requirement in the workplace admission procedure, BCE alumni, 2013-2014 (own design)

YEAR OF GRADUATION	PERSON	IT WAS NO REQUIREMENT	RATE
1970-1979	6	3	50,00%
1980-1989	5	2	40,00%
1990-1999	11	3	27,27%
2000-2009	62	8	12,90%
2010-2014	56	10	17,86%
Total	140	26	18,57%

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The order of first prizers matches with the earlier college research, but the rates are higher. Database management is somewhat lower, 28.57% compared to the one third mentioning there.

Table 26 The rate of occurrence of IT requirements in the workplace admission procedure, BCE alumni, 2013-14 (own design)

EXPECTED KNOWLEDGE	NUMBER OF MENTIONINGS	RATE OF MENTIONINGS
Spreadsheet	147	87,50%
Word processing	132	78,57%
Use of internet	115	68,45%
Presentation making	103	61,31%
Knowledge of operation system	70	41,67%
Database management	48	28,57%
Knowledge of ERP systems	30	17,86%
Hardware knowledge	16	9,52%
Programming	16	9,52%
Web design	11	6,55%
The knowledge of network technologies	9	5,36%
Project management	1	0,60%
SAP BW/BI	1	0,60%
Statistical, data-mining software	1	0,60%

Similarly to college responders more than 3 quarters of responders spend more than 3 quarters of their time in front of the computer (Figure 17 vs. Figure 22).

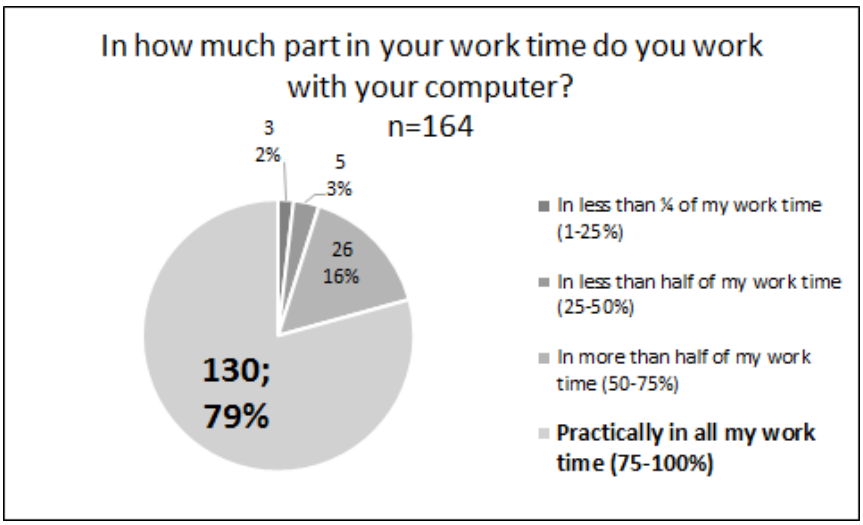

Figure 22 Work time spent in front of the computer, BCE alumni, 2013-14 (own design)

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Table 27 The type of work on the computer, the comparison of BCE alumni 2013-2014 and BCM alumni 2012 (own design)

TASK	BCE NUMBER OF MENTIONINGS	BCE RATE OF MENTIONINGS	BCM RATE OF MENTIONINGS	SHIFT
Communication inside the company	129	76,33%	78,80%	⇨
Making presentations	116	68,64%	-	
Making Pivot tables, analyses summaries with spreadsheet	115	68,05%	63,60%	⇧
Making and managing data lists with spreadsheet	114	67,46%	74,70%	⇩
Communication on the internet	101	59,76%	66,70%	⇩
Making memos	94	55,62%	55,60%	⇨
Writing official letters with word processor	88	52,07%	67,70%	⇩
Modeling and calculations with spreadsheet	79	46,75%	33,30%	⇧
The use of ERP (Enterprise Resource Planning Systems)	48	28,40%	31,80%	⇨
Making short publications (for example invitation, poster, programme booklet)	41	24,26%	23,70%	⇨
Company database management with database management system	40	23,67%	26,30%	⇨
The use of TPS (Transaction Processing Systems)	35	20,71%	27,80%	⇩
Making long publications with word processors, (for example studies, conference volumes)	34	20,12%	12,10%	⇧
The use of decision support systems	30	17,75%	11,60%	⇧
Picture editing	25	14,79%	21,20%	⇩
Accounting with accounting program	24	14,20%	22,20%	⇩
Making company database and its maintenance with database management system	14	8,28%	9,10%	⇨
Web design	13	7,69%	7,10%	⇨
Invoicing with spreadsheet	10	5,92%	11,60%	⇨

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It was an important question in the research what tasks the computer at their work place is used for. Table 27 shows the university and college answers in comparison.

We saw it in the previous research during the department interviews that teachers defined different expectations in the college and the university. We saw the difference when comparing the curricula of the 2 institutions. I was wondering whether this difference appears between college and university graduates at the work place, that is, whether it is right to have different expectations in the 2 institutions. More university graduates make pivot tables, analyses, summaries with spreadsheet, modeling, calculations with spreadsheet, (the difference was the biggest here) long publications with word processor with word processor and decision support systems. The latter 2 are only about 20% in the circle of university graduates.

Only 94 of the BCE graduates mentioned such programs they are working with, but they did not know them before starting to work at their current workplace. (Two on average per person). The most common ones are in Table 28, noting that 5 mentioned different SQL designers. A lot more concretely named programs could get into the group of company programs, banking software and self-develop programs. (At college SAP, Lotus Notes and self-developed or company individual programs were mentioned by many. They also mentioned there Key soft accounting programme several times).

Table 28 The number of mentioning used at workplaces, not known earlier, BCE alumni, 2013-2014 (own design)

SOFTWARE	NUMBER OF MENTIONINGS
SAP	25
Lotus Notes	9
Oracle PL/SQL Developer	9
SAS	7
company programs	7
SPSS	4
Banking software	3
Microsoft SharePoint	3
self-developed programs	3

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In both examinations I asked about how they could learn what they did not know earlier Table 29. The rate of mentionings of the self-taught way is relatively high especially if we take it into consideration that only 55% of university responders mentioned at all that there was such a programme that they did not learn earlier. However, the analogy of a similar programme got quite a low rate among the graduates of both schools.

Table 29 The number of mentionings of programs used at the work place, not known earlier BCE alumni, 2013-2014 (own design)

THE WAY OF LEARNING	BCE	RATE	BCM	RATE
colleagues	72	42,60%	75	63,56%
self-taught way (trying it out, with the help)	62	36,69%	64	54,24%
workplace course	33	19,53%	34	28,81%
the analogy of similar program	15	8,88%	14	11,86%
textbook	2	1,18%	2	1,69%
outside course	1	0,59%	9	7,63%
users' way of thinking from university	1	0,59%		
others			4	3,39%

V.4.2.2. The frequency of doing IT tasks and its stability

In the university alumni circle we also asked about the 15 IT tasks already known from the questionnaire of students starting university. The exact question was: " mark it in every line how often and how stabile you can do the following tasks" the possible answers were: often (2), rarely (1), never (0), or independently, quickly, out of routine (2) with lots of mistakes, experimenting (1) and I do not know (0). When judging stability, just like at the analysis of students' questionnaire, I converted the answers to the difference taken from the own average, and I carried out the analyses based on it. The averages of the answers can be seen in Table 30. The use of internet, different spreadsheet and word processing tasks and presentation making received an average more than 1 at the frequent usage. The other circle of tasks and the advanced usage of spreadsheet and word processor and publication making have an average below 1, that is, these tasks are either performed rarely or never. It is not surprising that tasks often performed are performed more stable than the average (positive values refer to it in the 3. column). Only publication making has a positive value among tasks performed rarely.

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V.4.2.3. Cluster analysis

With cluster analysis I made groups from the responders on the basis of how often the examined 15 tasks are performed. I ran a cluster analysis 12 times in 3 different sorting of order and I divided the group into 2, 3, 4 and 5 clusters. There were 105 responders who gave answers to all 15 questions, I could involve them into the analysis. It was only at the 3 cluster running that the final result was not changed by the changing of the starting order of data, so it can be accepted that the responders can be divided into 3 groups. 39, 36 and 30 persons were included into the groups respectively.

Look at the characters of the 3 groups from the aspect of the 15 examined tasks. Based on the cluster centers, I named the 3 groups as follows: data managers (39 persons), IT oriented (30 persons) and simple users (36 persons). The cluster centers can be found in Table 30. There is no significant difference between the 3 groups at 2 tasks, these are making tables with spreadsheet and internet use. Both got very high values in all 3 groups. As a reminder, the values mean: 0 – never, 1-rarely , 2- often.

In the group of simple users, a high value belongs to the making simple texts with word processor and a relatively high value belongs to the long documents (it is the second prizer with the value of 1.36% in this). There is a value over 1 (1.28) at making simple formulas and presentations making with spreadsheet.

At data managers there is a high value for making simple formulas with spreadsheet and the use of advanced functions and data analysis. A high value is for making simple texts with word processor, but it is still behind the values of the other 2 groups (1,44 next to 1.86-1.87). Only presentation making got a value over 1, but it is still behind the values of the other 2 groups (1,1 next to 1.28 and 1.70). It is the second prizer in the advanced use of spreadsheet, its value being close to 1 (0.82)

Most high values are In the IT oriented group. Values under 1 are only at tasks of web design, multimedia design, and programming, the last one is absolutely winning over the other 2 groups (0,87 next to 0.05 and 0.03). It is the winner at all tasks, or it has no measurable lagging behind at the second place (the use of simple formulas with spreadsheet is the biggest difference for the benefit of the data managers group but the difference there is only 0.06%).

I examined whether it is possible to find any difference between the groups regarding other characteristics. When the content of subject is worked out, the difference between

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the courses can be interesting. I examined at the graduates in the Bologna process how many of them got into certain clusters from economics and business courses. Since certain subsamples are very small, these results can only be treated with care, only as something interesting. In the economics special area, only 2 out of 11 enlisted responders were put into the group of simple users (18%), 3 of them into the data managers (27%) and 6 into the IT oriented group (55%). In the business special area 42 responders could be categorized, 15 of them as simple users (36%), 17 as data managers, (40%) and 10 as IT oriented (24%). It can be stated that there is a difference between the 2 groups, due to the small subsamples far reaching conclusions cannot be drawn.

Table 30 Cluster centers made on the basis of the frequency of IT tasks, BCE alumni, 2013-14 (own design)

	DATA MANAGER	IT ORIENTED	SIMPLE USER
Making simple texts with word processor	1,44	1,87	1,86
Making long document with word processor	0,72	1,63	1,36
Making publication with word processor	0,31	1,10	0,83
The advanced usage of word processor	0,26	1,17	0,69
Making table with spreadsheet	1,95	1,93	1,86
The use of functions, simple formulas with spreadsheet	1,92	1,87	1,28
The advanced functions with spreadsheet	1,74	1,77	0,50
The analysis of data with spreadsheet	1,92	1,90	0,72
The advanced use of spreadsheet	0,82	1,43	0,06
Making presentation	1,10	1,70	1,28
Use of internet	1,95	1,97	2,00
Web design	0,05	0,30	0,14
Multimedia design	0,23	0,67	0,42
Database management	0,67	1,23	0,36
Programming	0,05	0,87	0,03

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I also examined the difference between groups according to the year of graduation. Simple users graduated significantly earlier than database managers and IT oriented ones. 71.43% of the graduates before 2000 is a simple user while the rate is 31.17% for graduates after.

V.4.2.4. The analysis of answers given to open questions

At the end of the questionnaire responders had the chance to express their opinions in more details in the form of 5 open questions. The questions were the following:

- What did you think good in university IT education? Write it down in some sentences or keywords.
- What did you use most of your IT studies at university? Write it down in some sentences or keywords.
- What do you think was missing from the university IT education? Write it down in some sentences or keywords.
- What do you think is unnecessary in the university IT education? Write it down in some sentences or keywords.
- If you have anything in mind that you find important regarding the topic of the questionnaire but you couldn't write it down in the fixed answers you can write it down now.

65% of the responders used this chance ad answered at least 1 open question. I would emphasize some obvious tendencies of the answers. Graduates of earlier years wrote it down that they could not really give relevant answers to the questions.

Excel was the most frequent answer given to positive questions, while the what they thought to be good-question got the answer about spreadsheet mentioned in some ways from hardly more than 10% of responders, the what they used most question got the answer from nearly half of the responders. 20% of responders claimed not to use anything.

What they were missing were as most frequent answers: more Excel (24%), practicality (17%), database (12%), a wider view (12%), macros (12%), presentation (10%), spreadsheet (8%). 32% of responders thought theory and lectures to be unnecessary, 16% of them thought programming to be unnecessary.

In answers given to different questions by many, unnecessary, too lengthy repetition and teaching of basic knowledge was also referred to as a shortcoming.

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V.4.3. The summary of the results of alumni research

During my research I was looking for the answer to what IT knowledge is necessary for economics and business administration higher education students. It turned out from the survey carried out in the circle of BCM graduates that next to the communication inside and outside the company, word processing and spreadsheet are the most important IT areas. They are part of ECDL requirements and college curricula. During my research I surveyed both areas in details and made more homogeneous groups of the part areas on the basis of the answers. A more detailed examination of them showed that although the majority of the most frequently used means are among the ECDL requirements, but there were altogether 7 such type tasks apart from ECDL which, while being sorted, were put into the same category as the most often used tasks taught in ECDL. In addition in 2-2 word processing and spreadsheet task category there is a large number of functions outside ECDL, which are often used by many. I concluded now that the curricula of ECDL base modules meets only part of work place requirements, so their knowledge only is not enough.

The 2 kinds of research regarding some questions led to similar results. On the one hand the 3 quarters of the graduates of both institutions spend a considerable amount of their working time in front of the computer. On the other hand the requirements of work places are similar, too. The most important are internet usage, spreadsheet, word processing and presentation making.

During the work place admission procedures these requirements were included in the job advertisement or asked about in the interview itself. Employers take IT competence for granted, they do not check it separately in the admission procedure, they only ask about it.

There was a difference between tasks performed in the work place regarding college and university graduates. The biggest differences is making Pivot tables, analysis and modeling with spreadsheet, more often performed by university graduates.

Company software were mentioned among programs not known before the work place. SAP had most of the numbers of mentionings (25%). The learning of not known programs took place with the help of colleagues or self-taught. In both research, the marking of the analogy of a similar programme was low. (11,86% and 8,88%).

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The university research gave a chance for several analyses. It was shown that the rate of those expected to know about IT was lower for graduates of earlier years and a larger number of them got into the simple users' group on the basis of groups made according to cluster analysis.

In the university research among IT tasks the frequency of internet usage, different spreadsheet and word processing tasks and presentation making was outstanding. Tasks performed more often are done more stable than the average by responders.

According to cluster analysis I divided the sample into 3 groups: simple users, data managers, IT oriented users. The subsamples of students of some courses are so small that no far reaching conclusions can be drawn for them. However, the difference in time is significant, there are a lot more simple users in the circle of graduates of earlier years.

It is clear from the answers given to open questions that on the one hand, they found the teaching of spreadsheet useful, on the other hand incomplete, they would have liked to gain more, deeper knowledge. Most references were made to shortcomings, such as database management, macro, presentation making, word processing. Next to content questions, shortcomings of methodology and point of view were also mentioned, such as practicality and a wider scope of view. Most of them thought theoretical lectures to be unnecessary, at least in the form and with the content as they were held for them.

V.5. The comparison of the surveys of new students and in the circle of alumni

When designing the questionnaires, I always paid attention to including the same task groups in case of detailed questions, so there was a chance for the comparison of the competences of new students and employees. The result clearly shows which tasks are the ones, out of the tasks often done by employees, which are probably known already by the new students, too and which are the ones in which their knowledge is not complete (Table 31). Higher education must concentrate on these latter ones.

In the table, above the thick line we can see the tasks which are often performed by employees in their work places. It can be read from the table how they evaluate their own competence in these tasks and how self-judgment is in the circle of new students. We can see that for both groups there are mostly positive values above the line, whereas there

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are mostly negative values under the line, that is, both new students of university and employees are more competent in tasks often performed.

There are 2 exceptions from that. The data analysis with spreadsheet and the use of advanced functions with spreadsheet. Both are tasks often performed at work places, still there are negative values for students. It seems to be clear that there are the 2 kinds of task groups where students must learn most.

Table 31 The difference between the competences of alumni and new students, BCE alumni and new students' questionnaire 2013-2014 (own design)

TASK GROUP	THE AVERAGE OF FREQUENT USE	ALUMNI COMPETENCE FROM OWN AVERAGE	NEW STUDENT COMPETENCE FROM OWN AVERAGE	MEAN DIF.	SIG.
Use of internet	1,964	0,478	0,858	0,377	0,000
Making table with spreadsheet	1,897	0,454	0,638	0,178	0,000
Making simple text with word processor	1,745	0,461	0,796	0,342	0,000
The use of simple formulas and functions with spreadsheet	1,686	0,348	0,159	-0,185	0,000
Data analysis with spreadsheet	1,486	0,252	-0,275	-0,519	0,000
Advanced functions with spreadsheet	1,362	0,127	-0,329	-0,456	0,000
Presentation making	1,350	0,374	0,733	0,339	0,000
Making long document with word processor	1,221	0,393	0,430	0,054	0,163
Database management	0,786	-0,445	-0,397	0,051	0,416
The advanced use of spreadsheet	0,785	-0,421	-0,861	-0,422	0,000
Making publication with word processor	0,674	0,089	0,125	0,046	0,447
The advanced usage of word processor	0,667	-0,203	-0,454	-0,232	0,000
Multimedia design	0,411	-0,608	-0,067	0,527	0,000
Programming	0,310	-0,969	-0,903	0,061	0,269
Web design	0,209	-1,009	-0,415	0,553	0,000

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VI. CONCLUSIONS AND PLANS REGARDING BASIC IT EDUCATION

In my study I looked at the determining theories of the current pedagogical practice, Bloom's taxonomy, learning outcomes, competence approach. I also outlined the Bologna process determining the transformation of the European higher education. I examined the programme and graduation requirements of the economics and business administration training programs in Hungary and in the world, emphasizing IT competences. I examined the current and the recent practice of Hungary, I got a picture of the IT competence of new students with the help of questionnaires and the review of legal regulation. I made interviews with colleagues of special departments and methodology and I asked about the experience of graduates with further questionnaires..

I can provide the following answers to the sub questions of research enumerated in the first chapter, based on the information gained from the analysis:

(A1) What kinds of IT competences are needed in the economics and business administration training programs, within it at economics and business educational courses, according to programme and graduation requirements as well as European Union directives?

Courses of Economics:

IT Competencies:

- interpret and manipulate economic data (Lee Hansen):
    - explain how to understand and interpret numerical data found in published tables,
    - be able to identify patterns and trends in published data,
    - Construct tables from already available data to illustrate an economic issue,
- effective use of relevant data and quantitative methods (Tuning)
- quantification and design (Tuning):
    - data and their effective organization, presentation and analysis,
    - be familiar with the principal sources of economic information and data,
    - organizing and presenting data informatively,

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    - able to structure, analyze and explain information presented in some numerical form,
    - presentation skills to communicate quantitative information in usable ways,
    - give critical and coherent summary representations of data that cannot be readily absorbed raw,
- making surveys and reports (Programme and graduation requirements),
- preparation for decision making (Programme and graduation requirements),
- business information systems (Quantitative Economic Analysis, Programme and graduation requirements).

Further competences which are not only connected to IT but appear there, too:

- abstraction (Tuning),
- analysis, deduction and induction (Tuning, Programme and graduation requirements),
- framing (Tuning),
- independence (Programme and graduation requirements),
- communication (Programme and graduation requirements),
- teamwork (Programme and graduation requirements).

Courses of Business:

IT competences:

- design and implement information systems (Tuning),
- identify and operate adequate software (Tuning),
- making surveys and reports (Human Resources, Commerce and Marketing, Programme and graduation requirements),
- preparation for decision making (Human Resources, Business Administration and Management, Programme and graduation requirements),
- computerized, modern analysis methods (Human Resources, Programme and graduation requirements),
- presentation (Programme and graduation requirements),
- application of modern IT technologies (Finance and Accounting, Programme and graduation requirements),

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- knowledge of Finances and Accounting Systems (Finance and Accounting, Programme and graduation requirements),
- knowledge Personal Management Systems (Human Resources, Programme and graduation requirements).

Further competences which are not only connected to IT but appear there, too:

- independence (Programme and graduation requirements),
- communication (Programme and graduation requirements),
- ability for analysis (Programme and graduation requirements),
- teamwork (Programme and graduation requirements).

Obviously the enumeration does not cover the complete scope of the necessary IT competences.

In the frame of the special base material IT is included in two courses. At the course of Human Re-sources, there is Personal Management Systems, Finances and Accounting System at Finance and Accounting course.

The general competences defined for the complete higher education in the Tuning project, which are related not exclusively to IT but appear there, too:

- problem solving,
- analysis and synthesis,
- application of knowledge in practice,
- capacity to learn,
- adaptability to new situations,
- work autonomously,
- concern for quality.

It can be clearly seen from the comparison of economics and business courses that in the case of the former one we can find a more detailed guideline in the area of IT or competences closely related to it and these are in connection with analysis and data processing primarily. At business courses presentation skills and the knowledge of different information systems get more emphasis. The difference emerging in operative documents does not completely meet real requirements as data analyzing competences present at economics courses are just essential as at business courses.

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(A2) What kind of IT education is provided for students of Economics and Business administration training programs?

I could gain insight into the current home practice with the help of subject data forms and subject descriptions available on the websites. Due to lack of information I was able to compare IT, mainly knowledge and skills elements out of competences specifically.

It is typical of the Hungarian practice that institutions show a greater similarity than courses. According to data of 2010, there were 2 compulsory IT subjects on average in the operative curricula. More informatics was taught at Business Administration and Management and Finance and Accounting courses (business courses) but less at Public Services course (economics course). The credit number of compulsory subjects was varying between 1 and 5.

Out of the IT subjects of 17 institutions it was typical of 8 basic IT subjects that computer science basic knowledge as included: hardware, knowledge of operation systems. In practice, the basis of word processing, spreadsheet and presentation making was provided. In further two, basic subjects the theoretical data protection, data security appeared whereas in practice more advanced spreadsheet (data analysis) were included. In still more, 7 compulsory subjects business and other information systems were present. In 2 compulsory subjects quite advanced spreadsheet, data analyzing and modeling, whereas in 4 subjects database-management could be seen.

Moreover, the scale of optional subjects is very wide but it also differs a lot in institutions, among them we can find subjects that are analyzing and showing information systems as well as subjects about the web.

In 2013, at business courses of BCE there was one compulsory and one compulsorily optional IT subject (4 and 3 credits, respectively) at BCM there were 2 compulsory subjects for 3-3 credits. In both institutions spreadsheet was the practical material next to theoretical basics. Moreover, in college, at lessons of practice there was word processing, presentation and database management. At university, at Finance and Accounting and Human Resources courses there is Excel programming. At university the compulsorily optional subject is about information systems. Among course subjects at Business Administration and Management course there was e-business, at Finance and Accounting they taught

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Finance and Accounting System and at Human Resources, Personal Management System. At college at Business Administration and Management at certain specialization there was an IT subject accordingly. Optional subjects are available in both institutions, at university on a larger scale.

In 2013 there was one compulsory subject for 4 credits at economics courses at BCE, theoretical basic knowledge, in practice spreadsheet and Excel programming and at Economic Analysis course there was Maple. IT course subjects are not involved at such courses at all. At the Public Service course of BCM there are two compulsory IT subjects, just like at business courses. The scale of optional subjects is the same as at business courses, the course of Economic Analysis has one more optional subject including Excel programming (they did not include it into the compulsory curricula).

(A3) What kinds of differences can be experienced between the programme and graduation requirements, European Union directives and present home practice?

Identification of differences can only be accomplished in part, as only subject descriptions were available for me, from the current home practice, which did not reveal whether other competences appear in the curricula and if they do, in what way.

It is a striking difference that in the analyses of both2010 and 2013 theoretical basis of IT, different kinds if hardware knowledge, operation system, computer science were all significantly present, however, they are not included in the Programme and Graduation Requirements and the European guidelines at all, at least not explicitly. In some institutions, word processing skills also appeared in practice, which did not appear explicitly on the other side.

However, especially at economic courses there were quite a few data managing, data analyzing competences among the requirements, which were completely missing from the basic informatics teaching material (8 compulsory basic subjects) in the major part of institutions in 2010. (Since then the situation could have changed into a positive direction).

Presentation, interpretation of data, communication are all present among the requirements of both course groups. At the subjects examined presentation

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appears only rarely and only on a basic level, the communication of data does not appear anywhere explicitly.

The knowledge of information systems on the requirement side among the business courses appeared at the courses of Human Resources and the Finance and Accounting course, thus according to this, when analyzing subjects, I found course subjects with such content at these courses. In the definition of Tuning project in the business area the design and implement of information systems emerged, I did not find anything like that during my subject analysis, but in my opinion this cannot even be a requirement on Bachelor, only on some Master courses.

(A4) What kinds of knowledge and skills can we rely on during the education?

Based on reviewing laws and my empirical research, I claimed that students arrive at higher education institutions with a visibly wider scale IT competence than even some years ago and it is probably worth paying further attention to this change, so that the higher education should respond when needed. While carrying on the series of research, it will be interesting to examine at what pace the managing of new technologies will be inserted into students' competences.

Both laws and questionnaires based on self-confession show that basic knowledge of internet, spreadsheet and presentation is acquired by students before they start university. However, there are some areas where the self-confessed knowledge is under the level prescribed by law. Such a typical area is database management, web design and data analysis.

(A5) What kinds of IT key competences are necessary for graduates of economics and business administration training programs when entering work?

In order to answer the question, the union of competences defined by business informatics ontology and users' knowledge and skills defined by and even going beyond ECDL examination requirements must be narrowed so that only the competences relevant from the aspect of economics and business administration subject should be left. While narrowing, we can use the answers received to the previous sub-questions. We must also remove special competences from the competence circle in order to have the necessary key competences left. When defining competences, we must also remember that technology and expectations are changing constantly, so on the one hand the competence

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of adaptability to changes is essential and on the other hand the points written down at present must be inevitably supervised in some years' intervals.

- The knowledge and application of communication tools from the elements of computer architecture (internet and mobile)
- From the elements of information architecture:
    - Transaction processing, store of data, data input, data collection, primary processing, visualization of results, archiving documents.
    - The knowledge and application of MIS (Management Information System) pivot making, solutions to be automatized- special competence
    - Decision support – special competence
    - Groupwork Management
    - Workflow Management –special competence
    - The application of executive information service –special competence
- Business Applications:
    - The knowledge and application of ERP systems –special competence
- The skills for tasks solved with different spreadsheet and database managements and communication can be found at the cross section of business informatics and users' competences:
    - Internet and mobile communication,
    - Making table with spreadsheet,
    - Using simple formulas and functions ,
    - Usage advanced functions with spreadsheet,
    - Analyzing data with spreadsheet,
    - Making macro with spreadsheet (advanced usage of spreadsheet),
    - Database management – special competence
- Further necessary competences:
    - Making simple documents with word processor,
    - Making long documents with word processor,
    - Presentation skills,
    - Work autonomously,
    - Adaptability to new situations,
    - Concern for quality

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One part of the noted special competences of the enumeration is built into the special subjects appearing at certain courses, their other part can be learnt in the frame of optional subjects. Next to it, one part of the competences, mainly the workplace specific knowledge will be acquired by the employees already at their workplace.

(A6) In what areas is there a difference between IT key competences possessed already at starting university and at a work place?

As it can be read from the answer given to A4, one part of the non-special competences enlisted in the first point has already been acquired by the students entering higher education, for example, the use of internet or the use of basics of word processor or spreadsheet programs. With the development of the information society, the circle of preliminary competences is changing continuously, so not only the answer given to question A5 but even its narrowing must be revised from time to time. According to the present situation the following necessary key competences are still not known by the new students:

1. Groupwork management
2. The application of advanced functions with spreadsheet
3. The analysis of data with spreadsheet
4. Making macro with spreadsheet (advanced usage of the spreadsheet)
5. Visualization
6. Work autonomously
7. Problem solving
8. Adaptability to new situations
9. Concern for quality

(K1) What should the aim and content of basic Information Technology courses be in the economics and business administration training programs?

On the basis of the answers given to the sub-questions the main question can be answered already. Based on preliminary knowledge the aim of basic IT courses is to develop such IT key competences and transferable skills in students which help them find their place in the dynamically changing world of work and which they can rely on so that they can acquire the informatics special competences while furthering their studies.

To be able to acquire further special competences effectively, they need to have a firm basis. Learning the expert use of a spreadsheet programme can serve this aim. In the special field of economics and business administration examined, the majority of

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problems can, in fact, be solved, with the help of spreadsheet tools. Research has shown that employees meet these applications most often in the company environment (2., 3., 4 and 5. competences in the enumeration given to question A6). Above this, it is significant help in learning the application of specific programs if the basis of data management and data analysis has already been acquired in a familiar programme environment.

Curricula must be built on problem solving. With the help of this, problem solving and work autonomously enlisted among competences in point A6 can be developed. The approach from the aspect of the problem provides a chance for us to create the suitable connecting points towards special competences, and through this to help bring about the ability to adapt to new situations (9.).

The phases of problem solving built on each other can be divided proportionally with the increase of the level of complexity. In the case discussed, complexity can be described with the circle of kinds of data and the level of difficulty of data processing. The following levels can be defined from the aspect of the topic examined:

1. the static management of data: table making, simple calculations
2. the dynamic management of data; problems to be solved typically with spreadsheet application or ; usage of formulas, visualization
3. the integrated databases management
4. problem solving, finding different applications and integrated management matching

The education cannot obviously integrate the development of technology in time, because it is in vain that we teach the topically latest technology in a certain case, by the time the first year student receives a degree, and starts work, technology shows a further development. In spite of that, aiming at teaching development tendencies at least at a knowledge-level is quite necessary and directions that help students go further into relying on their own course must be outlined. This activity is aided by building concrete educational materials onto relatively more stable elements in the circle.

Acquiring the further 2 competences, groupwork and concern for quality enlisted in the answer given to question A6 can be aided by means of methodology.

In order to validate results of research, the practical implementation of theoretically proved statements is necessary. One possible form of it is ***compiling an up to date curricula, meeting the expectations of Bologna process, programme and***

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graduation requirements, workplace standards, taking marginal conditions into considerations.

Declarative knowledge (on the level of knowledge and comprehension): the definition characteristics and types (information, data) of IT basic terminology, the topical and future trends of IT, the information systems of economy and public sector, means of communication, nets, data security.

Skills (on the application level of the cognitive domain)

The evaluation of information on the basis of the characteristics of information. Recognizing data types and the application of data types according to operations.

Table 32 Problem arising in a complex case study about managing orders and the set of tools necessary for their solution (At the description of the problem, I referred to the problem levels in the bracket)

DESCRIPTION OF THE PROBLEM	CONCRETE TASK	TOOLS
Calculating the counter-value of order deduced from expenses (level 1)	Calculations with defined values	Simple formulas, functions, absolute relative reference
Calculating the counter-value on the basis of order forms received in different formats (level 1)	Import of data into spreadsheet, conversion, so that the calculations could be carried out	Importing, text and date managing tools
Price offer required in foreign currency (level 2)	Inserting topical current price, let us suppose, from arfolyam.hu	Importing from website updating, word processing tools
There are decision variables in the order, for example discount on quantity (level 2)	Formalizing the decision process	Conditional functions (if)
Data must be summed from some kinds of aspects in order to perform orders	writing down conditions	conditional summing functions (COUNTIF, SUMIF)
In connection with orders or some of our other data we have to give answers to different ad-hoc executive questions. For example, is there a certain product in store, which product type is ordered most frequently, etc. (level 2)	the representation of the partial set of table lines, making data clear fast	filter, sort, conditional formatting

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DESCRIPTION OF THE PROBLEM	CONCRETE TASK	TOOLS
In the order there are only product names, codes and quantities, other features (unit price, availability at store, etc.) are not provided (level 2)	The suitable data must be searched from our own data tables	Lookup functions
We must make reports for the preparation of executive decisions(level 2)	Making tables for data of orders, making summarizing drill down tables from our data tables (stock, table of costs, orders)	Pivot table
We must present data inside or outside the firm (level 2)	Visualization, making and presenting charts, diagrams	Chart, animation of chart in a presentation
We always get a recurring task, for example an order in the same, but unsuitable form for processing (level 2)	Automation of operations performed	macro recording, modification, running
There should not be a need for the continuous modification of order forms (level 2)	Making a form to be processed automatically	tools of making a form
We must support the different alternatives with calculations in order to make a pricing model (level 2)	data tables, sensitivity analysis	data table
We would like to achieve the optimal transport of orders arrived from our different stores (level 2)	Solution of transportation problem	tools for optimization, Solver
We have to make the pricing model, too (level 2)	making the algorithm of mathematical models	macro writing

The competent operation of defined tools of spreadsheet and presentation making applications. The ability of basic operation of one part of the tools enlisted here is acquired by students when starting university, in an optimal case the result of the course will be not only the competent operation alone, but planning of work operations starting out from the problem. Competent operation can be prescribed as a learning outcome (minimum requirement).

Focusing on problem solution following the concrete case study outlined in Table 32, we should provide an adequate set of means for the solution of newer problem types arising

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continuously. These means are application-independent, however, during the completion of the case study, the application of a concrete programme package is, in fact, indispensable. (It is mostly still some version of Microsoft office programme package, but students' attention should be also called to some alternative chances, open-source solutions.)

The problems shown in the case study belong to the first two problem levels. In the basic IT education it is not a requirement to reach higher levels for the time being, but through certain problems the case study enables us to present solutions going beyond the chances provided by spreadsheet applications. Such a basic course is not enough to present these in detail but I definitely find the establishment of connecting points important.

The higher levels of cognitive domain (analyze, evaluate, create): are not necessary

Attitude: learning outcomes achieved with the help of methodology to a more, in the explicit education material description, to a less extent. Adaptability to new situations, problem solving, work autonomously, concern for quality.

The problem-oriented approach of the whole curricula can ensure the cancelling of the conflict outlined in the introduction between the dynamically changing world of work and the static programme and graduation outcomes (Figure 1).

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VII. APPENDIX

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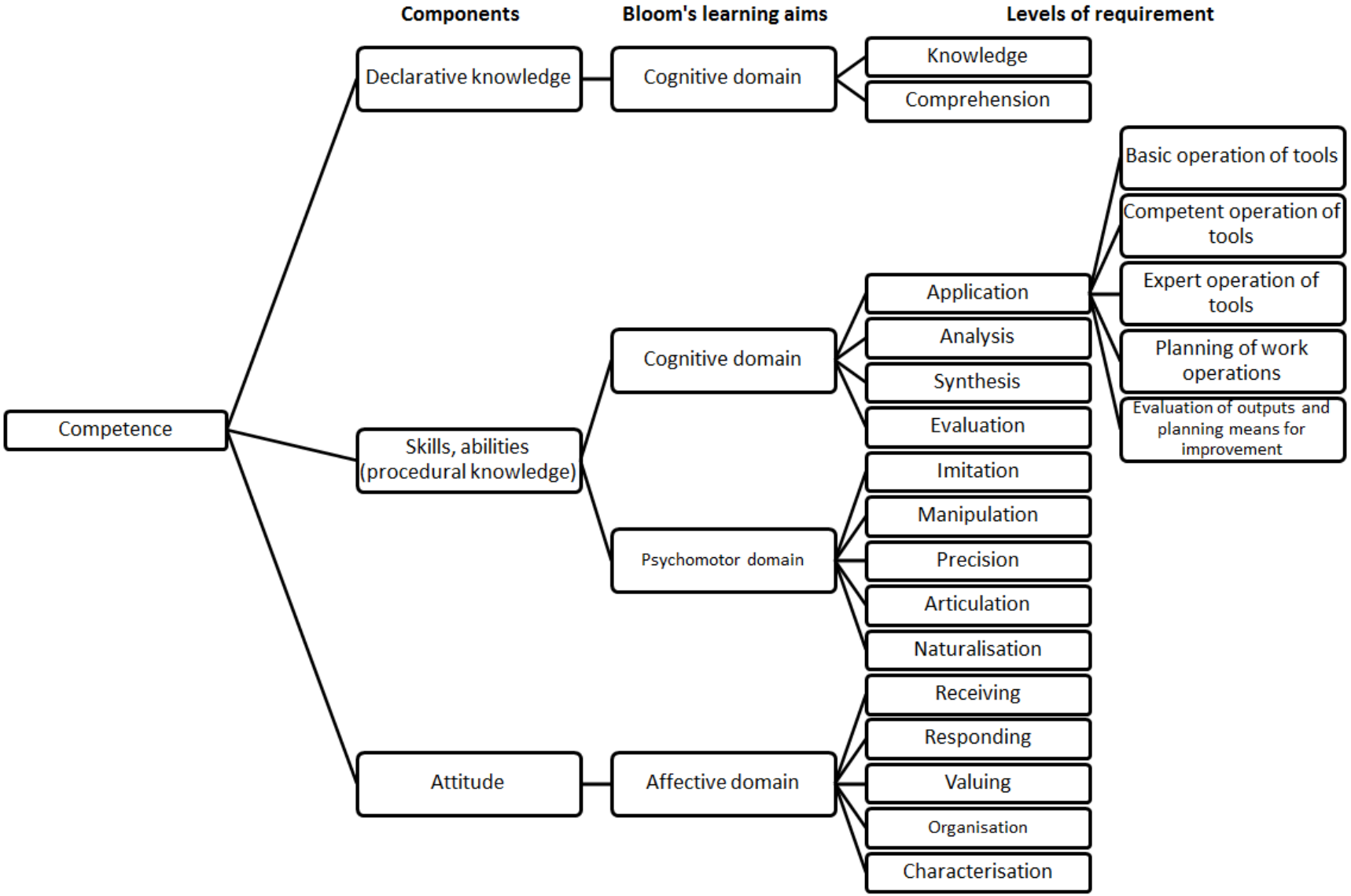
Appendix 1 The structure of the term of competence as used in the dissertation



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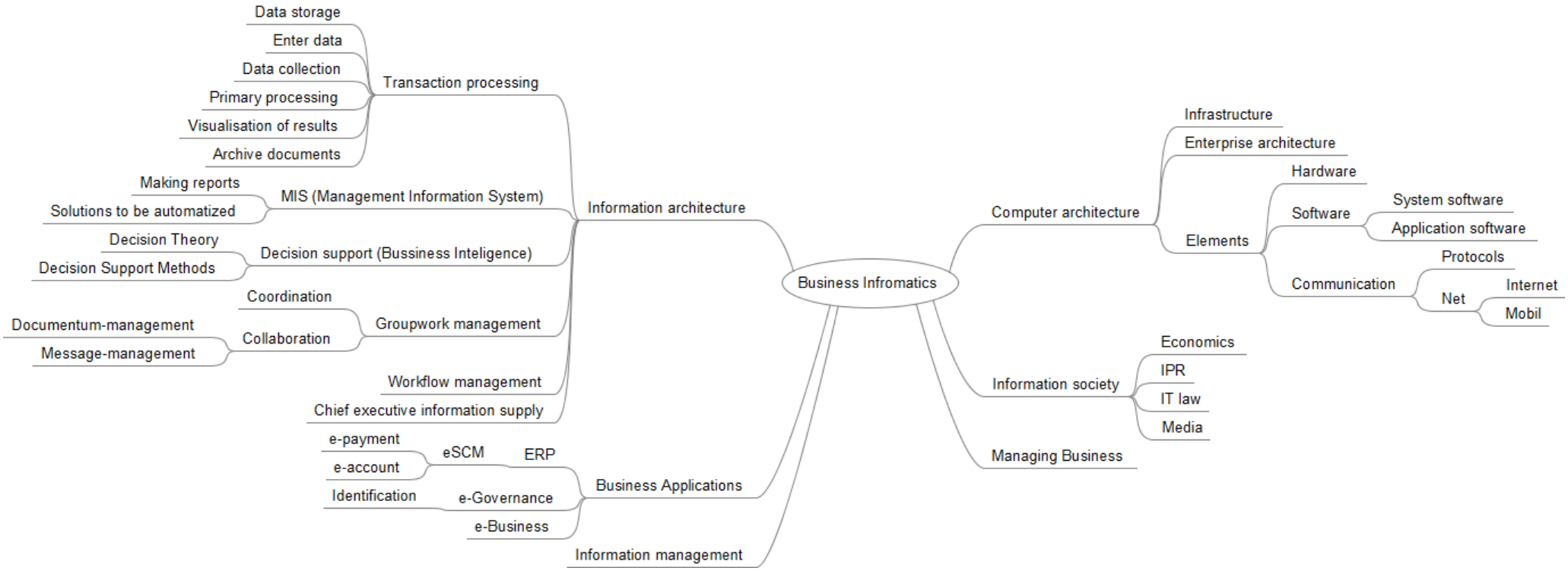
Appendix 2 Ontology of Business Informatics
[*based on András Gábor's statement, Corvinno Technology Transfer Center*]



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Appendix 3 Coding of tools of word processing and spreadsheet

WORD PROCESSING		
CODE	NAME	AVG
ECDL		
E02	Write and modify texts	1,94
E03	Find and replace	1,72
E04	hyphenation	1,25
E05	Spellcheck	1,7
E06	Change view	1,73
E07	Format fonts	1,97
E08	spacing	1,79
E09	Tabs	1,65
E12	Page setup	1,76
E13	Header and footer, page number	1,68
P01	Outline numbering	1,65
P08	Table in the text	1,64
P20	Special printing settings	1,54
LONG DOCUMENT – HOSSZÚ DOKUMENTUM		
P02	Footnote	1,36
P05	Headings	1,09
P06	Table of content	0,97
P09	Drawing or SmartArt	1,18
P12	Sections	1,36
P13	Columns	1,11
P14	Edit fields	1,11
DESIGN		
E01	Word templates	0,96
E10	Themes	1,2
P03	Text box	1,1
P04	Border	1,36
P10	Text wrapping	1,07
P11	Equation editor	0,91
EXTRA		
E11	Mail merge	0,82
P07	Own style	0,72
P15	Cross reference	0,72
P16	Index	0,65
P18	Form	0,48
P19	Macro	0,44
P17	Password protect	0,83

SPREADSHEET		
CODE	NAME	AVG
ECDL		
E02	Enter, modify data	1,86
E03	Number formats	1,9
E04	Date formats	1,79
E06	Sort	1,78
E07	Copy, move, fill	1,89
E08	Freeze panes	1,62
E09	Operations with worksheets	1,86
E10	Format cells	1,95
E17	Page setup, header and footer	1,75
P01	Custom number formats	1,38
P03	Paste special	1,74
P05	Hide or unhide worksheets	1,46
P19	AutoFilter	1,59
BASIC FUNCTIONS – ALAP FÜGGVÉNYEK		
E05	Shortcut keys	1,33
E13	Relative and absolute references	1,22
E14	Interpret error values	1,16
E15	Function IF	1,16
E16	Function COUNTIF	0,93
P08	Error checking	1,23
P10	Statistical functions	1,1
P14	VLOOKUP, HLOOKUP	1,1
P20	Subtotals	1,22
VISUALISATION – MEGJELENÍTÉS		
E01	Excel templates	0,78
E11	Column and pie chart	1,29
E12	Other type chart	1,01
P02	Define names	1,27
P04	Import text file	1,23
P06	Conditional formatting	1,07
P07	Change the structure of a chart, trend line	1,13
P21	Pivot table	1,28
P30	Rows, columns to repeat at top, left	1,15
ADVANCED FUNCTIONS – HALADÓ FÜGGVÉNYEK		
P09	Date & Time functions	0,93
P11	FREQUENCY	0,56
P12	Text functions	0,79
P13	Financial functions	0,81
P16	Logical functions	0,83
P18	Put functions into each other	0,74
P22	Data tables	0,48
P24	Goal seek	0,41
P27	Run macros	0,58
P29	Password protect	0,89
P31	INDEX, MATCH	0,49
EXTRA		
P15	Functions with matrixes	0,28
P17	Database functions	0,62
P23	What-if analysis	0,28
P25	Solver	0,12
P26	Record macros	0,41
P28	Write macros	0,26
P32	Validation	0,47

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