

TRENDS AND ISSUES IN HIGHER ENGINEERING EDUCATION IN THE CZECH REPUBLIC

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Abstract - The paper will provide information and observations on the current structure, recent trends and necessary changes in higher engineering education system in the Czech Republic. Czech technical universities have traditionally provided five year engineering study (master degree), which is considered as pregraduate one. After the Velvet revolution some of the universities have implemented a new form of study in the Czech higher education system – a three year bachelor study, but only with the modest success among students.

At present time, there is a strong and growing governmental push towards shorter studies. At the same time there is a necessity to adopt recommendations of the European Union declarations, both the Sorbonne (1998) and the Bologna (1999) ones, streaming to a Europe of Knowledge. It leads also to the adoption of a system essentially based on two main cycles, undergraduate (bachelor) and graduate (master and / or doctor) at which access to the second cycle requires successful completion of the first one.

On the contrary neither the Czech society nor an industry have been satisfactorily prepared to accept fully such changes yet. The new Czech Higher Education Law, valid since 1999, promotes changes both in higher education curricula and their architecture and as a result, most of the Czech technical universities are dealing with the changes.

The Bologna declaration promotes also the establishment of a system of credits as a proper means of promoting the most widespread student mobility. The ECTS (European Credit Transfer System), recommended by the declaration, has been implemented at several Czech technical universities. The paper will also discuss experience with its implementation.

The new trends of both Europe and Czech lifelong learning stream to the diploma level of the study. Some possibilities will be discussed as well.

Index Terms - Bologna Declaration, Czech Republic, Higher Engineering Education, Structured Study

1. INTRODUCTION

Czech technical universities (TU) have traditionally provided five year engineering education (master degree) which has been considered pregraduate as one (Fig. 1a). The

system was similar in many Central and Eastern European countries. So-called “numerous clausus” used to ensure a big share of higher education (HE) students for TU (Table I). All TU were teaching according to the uniform curricula and regulations without having any real autonomy. The situation has been changed after the Velvet Revolution (1989).

2. FROM THE VELVET REVOLUTION TO THE BOLOGNA DECLARATION

The Velvet Revolution started the political, social and economic changes in the Czech Republic, which have influenced the Czech higher education sector, particularly technical universities, and brought some assets and negations:

Assets:

- Academic freedom and university autonomy
- Abolition of “numerus clausus”
- End of international isolation, new contacts
- Improving of HW and SW facilities
- Implementation of credit system of study

Negations:

- Lower interest in engineering studies
- Fall of the social reputation of technical professions
- Increasing problems of big factories, former traditional partners of technical universities
- Disclosure of a bad level of foreign languages of the Czech population

The development in the nineties can be characterised by:

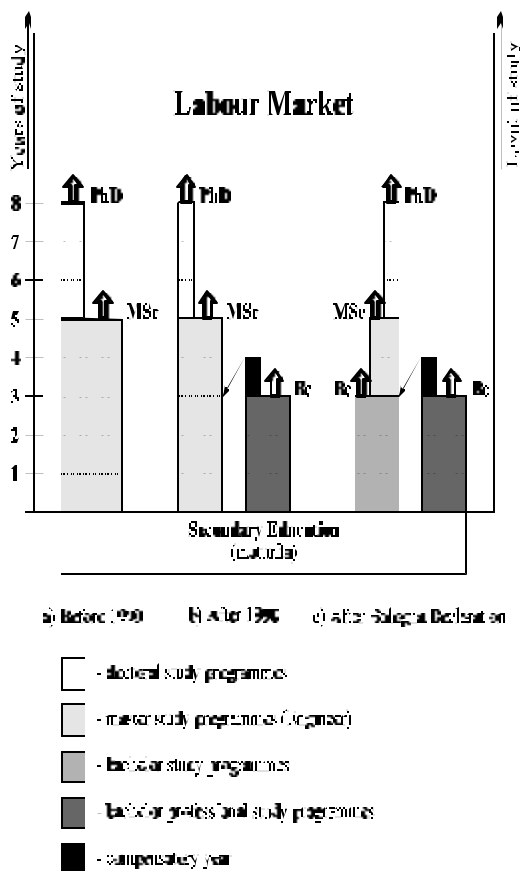
- Diversification of existing HE institutions (new faculties, new study programs of humanities and social sciences, implementation of bachelor study programs)
- Establishment of new HE institutions
- Establishment and development of a new type of HE institutions (higher professional studies) both state and private ones
- Since 1998 private HE institutions
- Increasing number of students of HE institutions (see Table I)
- Increasing number of students calculated per 1 teacher (9,2 in 1989 – 14,7 in 2000)
- Two new laws on higher education (1990, 1998)

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TABLE I
THE DEVELOPMENT OF NUMBER OF HIGHER
EDUCATION STUDENTS IN THE CZECH REPUBLIC
(AULA 1/2001)

Academic Year	1989/90	1995/96	1999/00
Number of HE Students in CR	112 980	136 869	179 465
Number of Students in Technological Programs	41 831	38 510	52 980
Share of students in Technological Programs [%]	37	28,1	29,5



Many Czech technical faculties have implemented a new form of study in the Czech HE system – the three-year bachelor degree (see Figure 1b and Table II).

FIGURE I

SYSTEM OF CZECH HIGHER TECHNICAL EDUCATION

The step was successful only partly because of no tradition in our country, only a minimal interest of the labour market (lack of information) and a short implementation time. But the step was necessary and enabled further transformation.

3. TRENDS AND ISSUES IN THE CZECH ENGINEERING EDUCATION

In spite of the fact that the total number of students studying in technical programs (See Table I) has been rising, the quality of them is decreasing and many students are not even interested in such programs. As a result, more and more students are dropping-out and leaving their studies without any certificate.

The new Higher Education Act No 111/98 has established a legislative framework for a possible diversification of HE. According to our opinion, the Act fits objectives of the Bologna Declaration very well.

The Bologna Declaration specifies the idea of the Europe of Knowledge and defines the common goal: to create European space for HE in order to enhance the employability and mobility of citizens and to increase the international competitiveness of European higher education; the European space for HE should be completed in 2010.

TABLE II
THE DEVELOPMENT OF NUMBER OF STUDENTS AT
VSB - TECHNICAL UNIVERSITY OF OSTRAVA (TUO)

Academic Year	1989/90	1992/93	1995/96	2000/01
Total Number at TUO	8 419	8 156	9 823	14 014
Number at Technical Faculties	5 273	5 107	6 688	9 615
Number at Bachelor Study Programs	-	128	903	1 416
Number at Master Study Programs	5 273	4 725	5 243	7 294
Number at Doctoral Study Programs	-	254	542	905

A set of specified objectives includes:

- Adoption of a common framework of readable and comparable degrees, “also through the implementation of the Diploma Supplement”
- Introduction of undergraduate and postgraduate levels in all countries, with first degrees no shorter than 3 years relevant to the labour market
- ECTS (the European Credit Transfer System) – compatible credit systems also covering lifelong learning activities;
- European dimension in quality assurance, with comparable criteria and methods

- Elimination of remaining obstacles to the free mobility of students and teachers

The Bologna Declaration has started a huge discussion across the Europe inclusive of the Czech Republic. It is possible to deduce several recommendations made on both international and national fields on various levels:

- Diversification of HE is necessary and a structured study arranged in series seems to be an optimum model
- Bachelor's study programs should not be shorter than 6 semesters (180 European Credits ECTS) and must include a necessary amount of theoretic and preparation courses
- Master's study programs should be opened for both vertical and horizontal transfers of students (also on international level)
- The total length of bachelor and following master study programs should not be longer than 5 years (300 ECTS)
- Graduates' profiles and employment possibilities at the both levels of structured study are of a primary importance
- Introduction of structured study will require deep changes of the existing curricula of classic study implemented at Czech TU. It implies not only a different time distribution, but also necessary interventions in the content of individual courses
- Study programs should be flexible and must be based on a credit system (ECTS) to enable students mobility
- The changes must reflect diversification based on country and university traditions and personalities
- An increase of an "employability" of graduates which is connected with their mobility, language preparation, social interactive skills, willingness to further education etc.
- Lifelong learning at special cases should be a credit-rated part of degree study programs.

The discussion in our country has been highly influenced by preparation and later adoption of the new Law No 147/2001 which will be valid since July 2001 and which changes several paragraphs of the Higher Education Act No 111/98. The new Law particularly orders the implementation of the structured study since 2004 at the latest, without a possibility of parallel existence of longer integrated curricula leading straight into a Master's degree in Engineering.

4. FROM TRENDS TO REALIZATION

The Higher Education Act No 111/98 valid since 1999 stated a necessity of a reaccreditation of all study programs and respective schedule. Faculties of Mechanical Engineering were appointed to change as first ones and so started the mutual discussion about reaccreditation very soon. Most of the faculties have decided to accreditate, in the frame of the reaccreditation, also two new level study programs (See

Figure 1c). In the process, the faculties more or less had to follow the recommendations mentioned above.

Czech technical faculties mostly accepted the scheme as follows:

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That means: **3-year** bachelor study programs

2-year master study programs for students continuing in the same or similar study program

3-year master study program for students transferring from different study program

3-year doctoral (Ph.D.) study program

As an example of newly structured study programs, the curricula of Faculty of Mechanical Engineering of the VSB – Technical University of Ostrava is adduced:

Bachelor Study Programs (180 CP ECTS)

Natural Sciences	41 CP
Mechanics	29 CP
Engineering (Basics)	15 CP
Materials Science and Technology	18 CP
Computer Science	13 CP
Electrotechnics	8 CP
Humanities	15 CP
Professional Disciplines	41 CP

Master Study Programs (120 CP ECTS)

Natural Sciences	14 CP
Mechanics and Engineering (Applied)	26 CP
Computer Science	5 CP
Electrotechnics	9 CP
Humanities	6 CP
Professional Disciplines	30 CP
Semestral and Diploma Works	30 CP

Compensatory Year (60 CP ECTS)

Natural Sciences	12 CP
Mechanics	12 CP

Engineering (Basics)	12 CP
Technology	6 CP
Professional Disciplines	18 CP

An implementation of the new structured system of study at the Faculty of Mechanical Engineering is planned since the new academic year 2001/2002. The other faculties are also in the preparation stage with the gradual implementation since the academic year 2002/2003. All the study programs are consistently based on the European Credit System ECTS.

5. CONCLUSION

A higher engineering education has been developed continually in accordance with the development of society. The process in our country was highly influenced by the two decisive events: the Velvet Revolution (1989) and the Bologna Declaration (1999). Both events started a revolutionary reform processes in the Czech HE and it was a disadvantage for us that the events followed very soon one after the other and so there was not enough time to evaluate properly the first implemented changes and we had to prepare the next ones.

Nevertheless, we realize that it is necessary to continue in the transformation of the Czech engineering education through a continual dialogues and interactive co-operation with potential employers and among academic institutions. Further development needs a co-ordination and a co-operation not only within the Czech Republic but also within the Europe.