Some Imperfections of Czech Scholar System and Obstacles in their Avoidance

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ABSTRACT: The analysis in this paper is based on experience with scholar systems and its environment in Czech Republic, but we suppose that at least some of the mentioned problems appear also in other countries. The schools in Czech Republic have got an economical autonomy and the right to choose curricula and teaching methods. The main incomes of schools are per-student subventions. On the other hand schools as well as public have only a little knowledge on the success (either long-term or even short-term) of alumni. Under these circumstances the belief that the free market can improve the education quality does is not valid. The schools get the payments even in the case when the teaching effort of the schools is quite low. The number of "difficult" topics (mathematics, working skills, technical disciplines, and science, as well as training of language skills) is therefore reduced. The trends have special adverse impacts in secondary schools becoming the bottleneck. It is strengthened by the "modern" but wrong belief that technical professions are unusable and that technicians and craftsmen can be easily imported. We will discuss ways and tools for solving this issue.

INTRODUCTION

The popularity of engineering education has fallen down substantially. The education of mathematics and science, the basics for engineering education, was substantially reduced. Many parents were satisfied with it as mathematics and science requires exact knowledge and skills that must be trained and are therefore difficult to achieve. It is substantial for research and development in science and technology but to a high degree for research and practical work in humanities as well. Missing technical skills makes it difficult to find qualified workers, production managers, designers – an often forgotten reason of moving the production to the East.

The main reason for it is the wrong conjecture that technicians (and some craftsmen) are not required or that they can be imported from East. This opinion is widely supported by journalists and experts from humanistic knowledge areas. Surprisingly enough they do not evaluate the risks of ethnical and social tensions as manifested in France or the Netherlands last year and globally in terrorism. Note further that some professions are difficult to outsource as they need local knowledge and training.

As university teachers we have detected changes in the education and in the attitude to the study of our students. We suppose that these changes are caused by the changes in the lower levels of our school system (especially by the secondary schools) and by the changes in the society as a whole.

Although one can imagine that universities can teach their students the knowledge and skills that they did not get in the lower stages of education, it is not always so. Skills like the ability to communicate, ability to follow given procedures in mathematics and elsewhere, ability to think logically, the acceptance that there are things that can be influenced and that there are things that cannot, and the ability to recognize whether a given thing belongs to the first or second group and to handle it accordingly, must be achieved in childhood. It is known that achievement of these abilities and skills later in adult age is impossible – unless the fundamentals for these abilities and skills were achieved sooner.

If we want our students to be of a high quality, we must insist on giving them good (educational) fundamentals. It is impossible to graduate students without good fundamentals to be good alumni and labourers – especially in technical and scientific professions (without good foundations in mathematics and science they could not be performed properly). What can probably surprise, is the fact that the foundations of logic and the ability to work properly with facts is impossible to acquit oneself well even in humanities. It can be proven using journalists and "celebrities" that celebrate themselves that they do understand neither mathematics nor science and at the same moment they are unable to distinguish evident truth and evident lie.

Let us therefore discuss the problems of Czech scholar system (as they appear to us), their possible reasons, and how probably to overcome these problems. We suppose that most of the discussed problems appear (probably with some minor changes) also in other countries.

PROBLEMS OF CZECH SCHOLAR SYSTEM

Czech scholar system has experienced many changes during the last few years: every few years a new conception of scholar systems started, or it has been performed some significant intervention in the education process. These changes include tendency from science to arts (humanities), there have been opened many new (especially private) schools, the role of the schools has been changed from an institution helping the family to educate its children to an institution caring about the children so that the parents would not be affected by the scholar problems of their children (in other words: the school cannot require any help from the family; teacher surpassing this limit is usually made to leave the school). As an addition

there is a pressure from EU to fit into its tables – to increase number of pupils getting A-leave and bachelor or master diploma. At the beginning the "corresponding" degrees in Czech Republic and in some other countries was not corresponding so much – often there were higher requirements in Czech Republic (especially in comparison with US scholar system which to some sense is a model for European education).

There are also other factors influencing Czech scholar system: there is a falling interest in skilled craftsmen and people living from manufacturing. Since 1990 it is considered that the best key to prosperity is to promote studies in humanities and especially management whereas engineering education was felt to have only a little prospect and at the same time it is superfluously complicated (in the context of getting the same amount of money).

Another negative factor influencing scholar system was the fact, that teachers' wages have been too low: who had good skills to get job elsewhere tend to do so. Hence the average abilities of teacher staff at schools have fallen down then.

The general curricula were cancelled (nowadays every school can set up curriculum of its own) and there were set no reasonable standards what alumni of a given school type must know. Hence the schools themselves more or less (in cooperation with local offices) set what should their graduates/alumni know. In combination with the fact that there are no overviews of success of individual schools and study program alumni (the establishment of such overviews is prohibited by the state respective by its law) and with other factors it is clear that the average quality of education did not improve.

Some of the mentioned problems are already in a fair way, some can be influenced by us, and some can be solved only in cooperation with wide (European) public.

PROBLEM SOURCES

Let us point out some reasons probably causing the problems of Czech scholar system. The job market for engineering professions is changing but the analysis of the changes is mainly missing. The most visible changes are due to globalization and market centralization. The giant global enterprises centralize their research and development activities what can reduce the number of research and development positions but need not. The development costs and the competition steadily grow. The results presented by the personal agency Manpower indicate [Man05] that the reductions are not too severe.

The number of positions in direct manufacturing is falling down. But again at least in Central and East Europe the reduction is not substantial as there is a lack of the professionals of this type.

On the other hand there is a general feeling that the perspectives of engineering jobs are gloomy. The main reasons are:

1. Primary and secondary schools are unable to develop skills necessary for modern engineers, especially:
    a. skills and knowledge in mathematics and physics (or generally science);
    b. skills in mother language and inter-human communication needed for writing of modern documents, for the development and selling of modern products and for collaboration with users; the skills are in fact difficult to achieve; in fact, many of the skills needed for humanities are more difficult but at schools they can be talked about;
    c. foreign language skills;
    d. working skills (understanding that some actions and processes – not to speak about the laws of nature) are given and cannot be negotiated.

    All these skills are very difficult to achieve at schools in childhood but almost impossible to get for adult people.
2. The public opinion makers (journalists and celebrities) are unable to accept the idea that engineering professions are important and with a good future.
3. Missing means allowing a reliable analysis of the success of various schools alumni (how many of them as unemployed *n* years after graduation, what are their wages, etc.)

The result is a long-lasting erosion of the quality of the skills and knowledge of alumni needed for engineering and science and in fact for humanities as well.

Too frequent changes in education – the changes are often first applied then thought over – if ever. It is often forgotten that the goal for the minister of education should not be to introduce new reform of scholar system or to start some megaproject, but it should be to help the scholar system to produce graduates/alumni as best as possible and in the quantities conforming the needs of the economy.

In the enthusiasm at the beginning of the 90-ies there were opened too many new schools. Probably in the belief that wider offer would help the quality of the education. Accidentally, there were several facts forgotten: the structure of the study branches should correspond to the needs of economy – how many alumni will found work, how the need for given profession will look like in next several years (there were a population peak of secondary schools pupils in the 90-ies; hence within a few years the schools had to face to the insufficiency of pupils). The schools must act now in the interest of their own survival and to accept also very poor students. Another consequence is also the fact that if there is a conflict between a teacher and a pupil (for example the teacher gives – according the students' poor performance – a poor mark to the pupil), it often happens that the dissatisfaction of the pupil's parents is a reason of teachers leave from the school.

The basic control tools of the primary and secondary education are known and used for centuries. Unfortunately the means thanks to "new" view on school system do not work.

The schools in Czech Republic obtained a large autonomy in the choice of education plans. They are autonomous also economically – they obtain payment per pupil/student (the more students the greater income). Many various private schools requiring school charges were founded.

Many politicians were enthusiastic about this situation from ideological point of view there are better possibilities of choice of schools for pupils, the schools can more easily tune their education plans, etc. In fact the schools are not properly evaluated. The quality of their alumni is not in fact evaluated properly by formal exams applicable for all schools of a given type. But the system of evaluation is very poor. The A levels

are to a high degree designed by the schools themselves. The state level of the A levels need not contain mathematics and its requirements are moderate. Many universities (applauded by politicians) cancelled the entrance exams. The results are clear – deteriorating quality of alumni, especially in basics needed for engineering and science. As there is no good evaluation tool and public (parents inclusive) does not desire to have one, people assume that good marks are enough. Good marks/grades are sufficient for many universities to accept students, so the opinion is partly correct.

There is no overview of the success of the alumni of individual schools and school directions (like success in the further study, success in a work, wage, and average unemployment time). There are several reasons for it:

1. The private (personal) data security law obstructs the computation of information from existing data to provide the evaluations of the schools. The details how to implement it using existing e-government data is discussed in details in [KZ06]. The main problem is not technical one but legislative one (data security instead of better information security).
2. The schools of a lower quality spend less money in teaching and more money can be used for personal use of the school headquarters or school owner or for lobbying against school quality measurement and control.
3. The state does not care how its money are spent (there are cases when the school inspection report states that the student are very poor and that there are significant inconsistencies in bookkeeping, but the school can further present itself as a perfect one and the state makes no conclusions from that report).
4. The parents do not think rationally – they do not care what a given school can give to their child into its life. They are happy if their child can get into the school and get some diploma or certificate. The fact that their child will get into troubles when applying for a job, or that the child will not get knowledge and skills necessary for its success in real life seems to be out of their interest.

Insufficient training of handling and processing facts. The reasons for it are at least three:

1. The number of lessons dedicated to the subjects handling facts and where the facts are really required (and handling and requiring to master exact procedures) is falling down.
2. The facts and exact procedures are potential source of conflicts with students and the teachers want to preserve their jobs.
3. The teacher must know the facts and master the procedures to require the same from its pupils. But such teachers can usually found also better paid jobs outside education.

Insufficient knowledge and mastering of mother language. For precise mastering of mother language it is necessary that the school cooperates with the family: it is necessary to talk with little kids, read to them fairy-tales, spend a lot time with them. It is necessary to communicate a lot also with older children. It is time consuming and many parents do not have enough time to do it and sometime the do not have also the will to do that. It is sometime quite complicated, exhausting, and sometimes even unpleasant.

Similarly, it also requires maximal effort from a corresponding teacher – he or she must read and correct a lot of exercises and tests, he or she must read really many books. It is not true for many mother language teachers. It happens that students that read several books of a given author and have their own opinion and remarks are evaluated significantly worse than the ones that only parrot the teacher's "remarks" from the author's life or descriptions of his/her works from reviews and bookmarks without real reading of any of the author's books. The mastering of the language is often understand as an ability to talk a lot about the author without any need to read his/her work.

Another source of this problem is the fact that students are not guided to understand read or listened text and to be able to note the information and reproduce it using their own words later. It is not common even by older pupils/students to collect information from two or more sources and separate the kernel of the information from adornments and advertisements.

POSSIBLE PATHS TO AN IMPROVEMENT

We introduce several simply described advances probably leading to the reduction of the problems mentioned above. We suppose that these activities can help to improve the Czech educational system and probably also to the improvements in other scholar systems facing to similar problems caused by similar reasons.

For the improvement of Czech scholar system it would probably be necessary to:

- introduce a system of measurement of the success of alumni of individual schools and study directions (how many of them has got to a next level of the study, how many of the alumni posses some job *n* years after finishing given study, what is the income of the alumni e.g. after 5, 10, 20 years after finishing the study);
- introduce standards for individual school types and to keep on them – it should not happen that an A-level alumni from mathematics would not be able to solve a simple task concerning percentage;
- introduce quotas for pupils/students in individual study directions – it should not happen that 90 percent of population is studying management and finance; The assignment of the quotas for individual study types would allow to assign more money to schools giving their students high-quality education (laboratories, specific language training); such resources should be conditioned by some reached (tested) education quality;
- show that a scientist need not be only a crazy creature in a white overall threatening the world or that a technician is not any creature unable to communicate reasonably – it is necessary to change the (medial) image of technical and scientific professions in the public;
- set aside resources for additional education of teachers; it is sad if they should pay it of they own and do it in their free time only because the school board is not willing to give to this purpose any money and any time; it is important for the teachers of all subjects – it is a shame if a physics teacher knows nothing about recent parts of the subject and lets teaching of the chapters only on the talks of the students;

- start a campaign remembering that school is no babysitting institute but that it is an institution helping the parents in their effort to set the children for their life: the parents' cooperation with the school is necessary. The over exclusion of children from their duties must be cancelled. If not, they probably would not be able to overcome the test of real life – for example in the care about their parents. Similarly it is reasonable to give notice to the parents that it is better for the life of their children if they are prepared in a school inspiring them instead of the one with quite no requirements.
- Start regular research of the demand on individual professions or study types in the economy – but not only the current one but also the presumption of the demand to the more or less near future.

Our assumption that the problems are known also outside Czech Republic can be supported by an interview of a butcher in a German-speaking TV channel RTL+ in a program Spiegel TV. The man told that its meat-processing company opened positions for young people to learn to butcher and for young people of this profession. There were about 60 applicants. But the company must reject all the applicants for their significant insufficiencies in calculus and basic working habits. The applicants were not able to adapt prescriptions to a batch being 120 % of the expected amount of meat or were not able to accept that some procedures must be performed precisely and regularly (for example cleaning up the machines).

CONCLUSIONS

We have shown that there are some imperfections in Czech scholar system (and probably many other scholar systems). We have shown some potential reasons of these imperfections and their potential cure.

We must, however, point out that engineering education itself must be changed to include often many aspects of humanities especially the ones necessary for support and enabling collaboration with users. This aspect is very important in marketing and servicing of modern products and in the development and use of software systems [Mo05].

If we want to start with the improvements form a very few points (from the bottleneck in the Goldratt's sense [Go97]; note that the bottleneck is an abstract condition having the property if not changed, the properties of the system cannot be bettered), we must start by the measurement of the success of school alumni (focusing the secondary schools as the current weakest point of the Czech scholar system) and by the research of the needs of the economy. These actions would not immediately improve the system, but they allow us in the later stages of the scholar system improvements found the really most problematic issues. It can be expected that the changes need many years to cause a significant improvement. It is another weak point – it exceeds governmental term. Hence the positive results can be assigned to other people than the ones that did the main work. But we need to start as soon as possible.

It is very important that proper changes of the school system are good not only for engineers but also for science and research. The science and development is the condition for the modern society and economy to be competitive in the global economy.

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