Promotion of Engineering Profession and Education in Electronics

Ilmars Slaidins, Marite Treijere
Riga Technical University, Department of Radio Systems, Azenes str.12, Riga, LV-1048, Latvia
ilmars.slaidins@etf.rtu.lv , marite@etf.rtu.lv

Abstract **- In many countries with a fast growing economies shortage of engineers is observed. According to the survey made in Latvia just 30% of industry demand of the Electronics Engineers is covered by the university graduates. If nothing will change the shortage will increase in forthcoming years. Profession of the Electronics Engineer is not popular in the society and there are several reasons: a lack of information on industry growth; physics subject is an elective in schools; young people are not well informed about the job and education opportunities in Electronics.**
Several measures are proposed to promote profession of the Electronic Engineer in society. One of these is the Contest in Electronics ("Elektronikas Olimpiade") for school children organised on a yearly basis by the Faculty of Electronics and Telecommunications of the Riga Technical University in cooperation with the industry partners and the children leisure organization "Rigas Skolenu Pils". The Contest is organised as a complex activity consisting of the information visits to schools, an advertisements in mass media and web portals, virtual and face to face part of the contest, visits to companies, exhibition of electronic equipment made by school children.
Feedback from the participants of the Contest is very positive and interest on the Electronics Engineer profession has increased.

Index Terms - Electronics engineer, promotion of engineering.

INTRODUCTION

In the emerging knowledge economy an important resource for development will be innovative professionals with degrees in engineering. Increasing number of such professional in such high-tech fields as ICT and electronics are of utmost importance for sustainable economic growth for every country.
In many countries with a fast growing economies shortage of engineers is observed. In Latvia industry demand of the electronics engineers is covered by the university graduates just by 30%. It is foreseen that this percentage will drop below 20% in 2010 if no measures will be taken to improve the situation [1]. Therefore it is important to find a ways how to change the situation and attract more talented young people to the electronics field.

In this paper analysis of the situation in Latvia regards to the shortage of electronic engineers is provided and innovative approach of professional orientation of school children by using game like contest in electronics is described.

PROMOTION OF ENGINEERING

Profession of the Electronics Engineer is not popular in society and there are several reasons. There is a lack of information in the society on very successful growth of the electronics industry in the country. Electronics industry is working in a global environment and does not care on promotion in the country. As a result young people are not informed about the career opportunities in the electronics field.

Ministry of Education and Science of Latvia is promoting education in science and engineering field by increasing the state supported study places. According to the recent report from 2006, from all state supported study places 37% are in science and engineering and only 19% in social sciences, economics and law [2]. At the same time, in 2006, distribution of graduates is reverse: 56% of graduates come from social sciences, economics and law and just 11.5% - from science and engineering. It means that the students are ready to pay study fee instead of choosing the study programmes in science and engineering for free. There are also differences observed between the particular fields of science and engineering. It is observed an increased interest on studies in civil engineering field as construction industry is booming in the country and it is obvious. Students are even ready to pay study fee to study in the civil engineering related study programmes. At the same time in other engineering fields just slight increase of the popularity is observed.

Knowledge and skills level of many gymnasium graduates is not satisfactory for successful studies at the university and it leads to dropouts. According to the observations of industry and academy experts many of first year students in the Faculty of Electronics and Telecommunications have difficulties to study mathematics, physics and other subjects [3]. Mathematics is among the compulsory subjects in secondary schools and gymnasiums, but the physics for almost 10 years was elective and just small portion of school children have chosen the physics. The situation is gradually improving from year to year and this year was observed 9% increase in number of school children choosing the physics as one of the graduation examinations, but still just 22% of graduates have chosen the physics.

Distribution of applications at the Riga Technical University shows that the highest frequency is 1 to 3 graduates per school that have chosen to study in the Faculty

of Electronics and Telecommunications. It is obvious that the graduate's choice of future study field is very personal or even occasional and there is not any promotion of Electronics and Telecommunication engineering profession in these schools. In 2006 most of applicants (86%) for studies in Electronics or Telecommunications came from such schools. Just 14% of applicants came in larger groups – 3 to7 graduates from the same school. Deeper analysis shows that among these are schools with the strong traditions in teaching of physics and mathematics. It fits well to another figure – graduation examination in physics this year is chosen just by 22% of graduates.

From this analysis we can conclude that improvement of teaching of physics and making it compulsory is crucial to increase the number of well prepared applicants to the engineering study programs and the Electronics program, in particular.

Using questionnaires we collected information from the applicants and students of the Faculty of Electronics and Telecommunications on the choice of the study field. Action took place in years 2002 -2005 and covered over 700 children. Respondents had opportunity to choose several answers from the list and also add some more. It must be stressed that these are children who have already made their choice.

According to the questionnaire a choice of the study field and future profession is based on:

- 81% - good future prospects for the profession,
- 70% - personal interest to this field and expect labour market demand for this profession,
- 32% - interesting and well paid job,.
- 15% - study programmes was chosen on advice from parents, friends etc.,
- 11% - person had already touch to the profession.

Deeper analysis based on interviews show that very important is a role of physics teacher and his advice, if any. Interest of children on sciences is created in schools by physics and mathematics teachers. Well equipped physics laboratory and enthusiastic teacher is good background for the choice of study field in Science and Engineering.

Unfortunately teachers of physics in schools are not well informed and were able to name only few companies in Latvia from the field of Electrical and Electronics industry and the products they produce [1].

Well informed children on labour market demand in the field of Electronics and thematic Circles in Electronics lead by physics teacher in school is an ideal condition for promotion of the profession of the Electronics engineer.

CONTEST IN ELECTRONICS FOR CHILDREN

To make professional orientation efficient there may be different innovations introduced. It was recently announced that IEEE supports TV Reality Show for promotion of engineering among children [4]. PBS engineering reality competition television program "Design Squad" introduce students to engaging, real-life applications of engineering concepts and to present engineering as a creative, productive career. The show is aimed at 9- to 12-year old children.

In the Faculty of Electronics and Telecommunications at the Riga Technical University a game like Contest in Electronics ("Elektronikas Olimpiade") for school children is organised on yearly basis from 2005. This event is organized in cooperation with the industry partners and the children leisure organization "Rigas Skolenu Pils".

The Contest is organised as a complex activity consisting of the:

- information visits to schools,
- an advertisements in mass media and web portals,
- virtual (using LMS Blackboard) and
- face-to-face part of the contest,
- meeting the students;
- visits to companies,
- an exhibition of electronic equipment made by school kids.

Information on the Contest was distributed as adverts in newspapers, magazines, web portals and in the university and faculty web page. There were organised visits to 10 schools across the country. During the school visits was given a 40 minutes long presentation on the Faculty of Electronics and Telecommunications with insight in electronics related industry, job opportunities and the Contest in Electronics. There was also prepared printed information for school children on the Contest in Electronics and how to become a student at the university. About the same amount of resources was put into adverts in media and school visits.

The first stage of the Contest is a two weeks long problem solving and discussion on topical problems in electronics. It takes place in virtual environment for unlimited number of children. Participants become familiar with the technology enhanced learning tools used in the faculty. After evaluation of the results of this first stage 25 most successful participants are invited to the final two day face to face round.

Second round of the Contest starts with problem solving contest in controlled conditions. Then school children are welcome by students, they are introduced to study process at university. There are organized visits to companies producing electronic equipment and presentations of experts from the field.

The exhibition of electronic equipment made by the school children was organised by our partner organisation "Rigas Skolenu Pils" and supported by companies. Some exhibitors were from successful participants and winners of the contest.

According to the feedback from the participants of the contest many of them (35%) have got information about the event from presentations in schools and 22% have got inspiration from their teachers. Just 12% of them visited university in the Open Door Day event and got this information there, 9% - from web and 5% - from newspapers and magazines. It shows role of the teacher, as well as an efficiency of live face to face presentations in schools versus adverts. Unfortunately it demands substantial human resource contribution and therefore could be implemented in a limited scale.

As a most important (27% responses) and interesting (40%) event in the Contest was recognized visits to the companies. Visit to the Faculty of Electronics and

Telecommunications and meeting the students was recognized as the second most important.

Responses from participants show that the general aim of the Contest was reached as 80% of them recognize that their interest in electronics has raised and just 12% of participants responded that they had this interest already before the event. In general, feedback and comments were very positive and 85% of participants were ready to participate next year.

CONCLUSIONS

For promotion of the profession of the Electronics Engineer following actions must be undertaken:

- society, and young people in particular, must be informed about the electronics industry development in Latvia and importance of this high-tech industry development in the country;
- teaching of science subjects (math, physics etc.) in schools must be improved and status of physics must be changed from elective to compulsory;
- an advanced professional orientation system must be crated to inform and motivate young people about the job and education opportunities in Electronics.

The main result of the Contest is that interest on Electronics Engineer profession has increased.

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