USING AN ALUMNI SURVEY
AS A TOOL FOR PROGRAM EVALUATION

I. Wiklund[1], E. Lindblad[1], and S. Gunnarsson[2]

1 Dean´s Office, Faculty of Science and Engineering, Linköping University, SE-58183 Linköping, Sweden

2 Department of Electrical Engineering, Linköping University, SE-58183 Linköping, Sweden

ABSTRACT

One part of the implementation of the CDIO concept at Linköping University is to develop and improve the tools for assessment of student knowledge and skills. As an assessment tool and as a quality management method at Linköping University the Balanced Scorecard is used. The method is also introduced as a CDIO assessment tool. At program level, Linköping University uses three surveys to meet demands within the Balanced Scorecard. An Introduction survey for beginners, a satisfactory survey for students in the middle of the program and an alumni-survey for engineers who have taken their degrees 10 years ago and 2 years ago are used. The satisfactory and the alumni surveys are developed and implemented during 2004- spring 2005.The alumni survey gives baseline knowledge of the engineer situation before the CDIO-concept and makes it possible to, within some years, evaluate the effects of the participation in the CDIO initiative. The alumni survey is developed from the CDIO Syllabus [1] emphasizing personal skills, interpersonal skills and the CDIO view of engineering complemented by questions concerning the engineering labour market. Questions were asked about occupation, salary, satisfaction with their education, satisfaction with the content of the program they graduated from, implementation of the program, the performance of the teachers, etc. The survey covers a broad spectrum of subjects as 9 programs are involved. Mechanical Engineering, Applied Physics and Electrical Engineering, Industrial Engineering and Management, Computer Science and Engineering, Engineering Biology, Information Technology, Media Technology and Engineering, Communication and Transportation Engineering and Electronics Design Engineering.

INTRODUCTION

During 2001 a benchmarking project between Chalmers Institute of Technology (CTH) and Linköping University (LiU) in Sweden was initiated. One purpose of the benchmarking project was to develop methods to compare similar educational programs and their processes at CTH and LiU. A part of the project was to get knowledge of how satisfied the alumni are with their education and if it fulfils the demands of the labour market.

As an assessment tool and as a quality management method at Linköping University the "Balanced Scorecard" is used. The method is also introduced as a CDIO assessment tool. To measure beginners´ expectancies, the third year students´ satisfaction and the alumni satisfaction with the educational program surveys have been used as a tool. At LiU a

1

questionnaire was developed and used for the first time in December 2004 and in January 2005.

Linköping University and the Applied physics and Electrical Engineering program (Y) have been participating in the CDIO project since fall 2000. Implementation of CDIO courses in the program started in 2002, [2]. In 2005, the board of the faculty of engineering and science at Linköping University decided on a recommendation that all engineering programs should aim to fulfil the CDIO Standards. In 2006 the first "CDIO" students from Linköping will be awarded their degrees. To measure if the CDIO initiative has improved the educational programs and the students´ future career is facilitated, this alumni survey can be used as a baseline.

METHOD

The Study Group

All students who were awarded their Master of Science in Engineering degree in 1994 and year 2002 were selected from the student administrative system in Sweden "LADOK". The ED-, KTS-, MT- and TB programs are quite new so for those programs all graduated students were selected. Since the survey covers programs within different subjects and graduates of different age it enables comparisons in several dimensions. The number of questionnaires for each program and answer rate can seen in the table below.

Table 1: Survey overview

Program	Questionnaires sent out	Answers	%
MSc in Computer Science and Engineering (D)	119	54	45
MSc in Electronics Design Engineering (ED)	98	53	54
MSc in Industrial Engineering and Management (I)	327	159	49
MSc in Information Technology (IT)	69	39	57
MSc in Communication and Transport Engineering (KTS)	115	69	60
MSc in Mechanical Engineering (M)	237	113	48
MSc in Media Technology and Engineering (MT)	135	62	46
MSc in Engineering Biology (TB)	194	124	64
MSc in Applied Physics and Electrical Engineering (Y)	250	155	62
Total	1544	828	54

The Survey

The questionnaire consists of a joint part and a part specific for each program involved. The extent joint part consists of questions about:

– age, sex, degree, time of studies etc
– the study group as age, sex, degree, time of studies etc
– employment as kind of work, size of company, salary, etc
– special requirements of additional courses
– the educational program content
– how the courses are carried out
– possibility to influence the planning and realization of the education
– achieved knowledge and skills, useful in working life
– level of satisfaction

The specific questions about the programs are about the specializations and about specific courses. When the survey questionnaire was formulated the CDIO syllabus, the National Agency for Higher Education report 2003:30R, a questionnaire regarding salary and

employment from the Swedish Association of Graduate Engineers (Civilingenjörsförbundet) and a questionnaire used at the Industrial Engineering and Management program were used as sources. The joint part of the final survey questionnaire was discussed among the program board chairmen. The program board chairman and the director of studies for each program formulated the specific program questions.

ANALYSIS

The Study Group

The main part of the alumni in the "study group 1994" is 35-40 years old and the main part of the alumni in "study group 2002" is 26-30 years old. The male students dominate all engineering programs except Engineering Biology (TB)

Table 2: The study group sorted according to program and year of graduation.

"Study group 1994"		D	I	M	TB	Y		
Male %		90	75	85	33	88		
Female %		10	25	15	67	12		

"Study group 2002"	D	ED	I	IT	KTS	M	MT	TB	Y
Male %	100	87	64	56	74	82	55	44	90
Female %	0	13	36	44	26	18	45	56	10

The median for throughput is 5 years, which means there are students who spend even more time to graduate. The nominal time is 4.5 years. It is important to know why they take such a long time. Do they e.g. take "time off" before they graduate or do they have difficulties with their studies? The result from the alumni survey shows that "time off" from studies is common. Only 55% in the "Study group 1994" did not have any time off and the corresponding value for the "Study group 2002" is 48 %. During the time off from their program the students travelled, worked, studied abroad or took other courses other than in technical subjects.

One aim for LiU is to give the students the possibility to live in an international environment in order to strengthen their ability to work internationally. The students also should have a possibility to gain knowledge and understanding for foreign cultures and to be able to communicate in a foreign language. Therefore they can apply for studies at an international university through the exchange programs at the university. 10 % of the alumni in "Study group 1994" have been studying abroad, within the program, one to two semesters and for the "Study group 2002" is the corresponding value is 22 % which is a clear increase.

Table 3: Students with 1 - 2 semesters of studies abroad (values in %).

	D	I	M	Y
Study group 1994	17	8	6	12
Study group 2002	17	34	21	24

In the survey, there are questions about all kind of activities that may influence the throughput time. Most of the activities are important to the student´s personal development. Many students have lots of different activities going on. Most frequent is participating in the student union (35% of the alumni in "Study group 1994" and 41% in "Study group 2002"). 31% and 36% respectively were active in sports and 17% and 22% respectively have been teaching assistants in courses.

The following table shows the salary for alumni who have followed the four main programs. 54 D-alumni, 158 I-alumni, 112 M-alumni and 153 Y-alumni answered the question about salary. For the persons graduating 1994 the I-program seem to have reached the highest salaries. Noticeable is also that for the group graduating 2002 the Y-program has the biggest percentage in the lowest interval. A possible explanation is the relatively high percentage of students from this program entering PhD studies.

Table 4: Salary distribution (%). When the sum of percentages in a column is less than 100 this means that some persons have chosen not to answer this question.

	D 1994	D 2002	I 1994	I 2002	M 1994	M 2002	Y 1994	Y 2002
< 300000 SEK, %	0	29	3	24	0	18	3	38
300000 to 500000 SEK, %	63	63	34	71	52	76	63	53
> 500000 SEK; %	33	0	59	4	48	3	32	6

Many of the students have academic studies in addition to their MSc in Engineering. 15% of the alumni from the Y-program have postgraduate studies, which is perhaps one explanation for the low salary showed in the table above. 18% of the IT-program students have further courses in economics. Studies in foreign languages and/or technical subjects are also frequent.
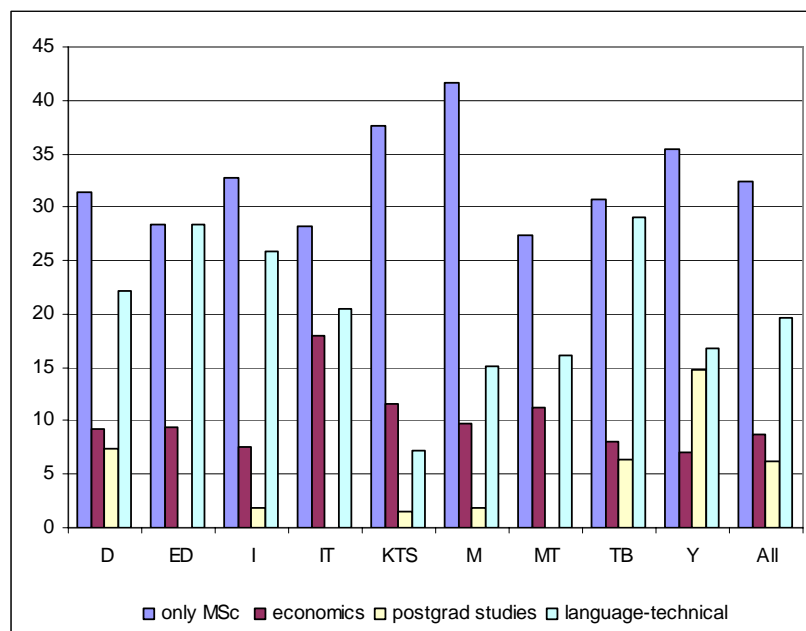

Figure 2: Alumni with some kind of further education in addition to MSc in engineering.

Alumni opinion about educational content
The next set of questions is about the design and implementation of the programs. The CDIO concept was implemented after these students graduated and therefore the answers on this survey can be compared with later surveys, in a couple of years. Is there a need for CDIO or other actions in the program? Has the program been successful to take actions against lack of, e.g. CDIO?

4

"I got sufficient knowledge and skills in…:" To what extent do you agree in the statements? I do not agree =1, I completely agree =5.

Table 5: Opinions about the contents of the education.

	D	ED	I	IT	KTS	M	MT	TB	Y
Mathematics	4.6	4.1	4.6	4.5	4.3	4.4	3.9	4.3	4.8
Technical Subjects	4.2	3.6	3.8	3.9	3.6	3.9	3.5	3.7	4.2
Economics	2.5	2.8	4.0	3.0	2.8	2.7	2.6	1.9	2.5
Conceive, Design products systems or services	3.3	3.5	3.1	3.2	2.6	3.2	2.7	2.2	2.6
Implement and Operate products, systems and services	2.5	2.4	2.7	2.5	2.4	2.6	2.3	1.9	2.2
Problem solving	4.3	4.0	4.4	4.7	4.2	4.3	4.1	4.1	4.4
Individual work	4.2	4.1	4.4	4.6	4.4	4.3	4.1	4.1	4.2
Teamwork	3.7	4.5	4.5	4.8	4.6	4.0	4.5	3.9	3.3
Leadership	2.3	3.5	3.0	3.5	3.4	2.5	3.3	2.2	2.1
Creative thinking	3.5	3.6	3.5	4.1	3.6	3.7	3.7	3.2	3.5
Critical thinking	3.3	3.7	3.8	3.4	3.9	3.6	3.4	3.6	3.5
Foreign language	2.4	2.7	2.8	3.0	2.8	2.5	2.8	2.5	2.5
Oral Communication	2.8	3.8	3.7	4.2	3.9	3.1	3.8	3.1	2.5
Written Communication	3.2	3.8	4.0	4.3	4.0	3.6	3.9	3.3	2.8
Project work	3.6	4.5	4.2	4.5	4.4	3.7	4.2	3.3	2.7

Students in engineering programs at LiU are strong in mathematics, problem solving and individual work. There is a need for additional knowledge and skills in economics, "implement and operate" and foreign languages. Some programs lack courses in leadership. Knowledge and skills in "conceive and design" is not sufficient. The Information technology (IT) is a program which uses problem based learning (PBL) as an educational method, and this is a possible explanation of the high rating on Teamwork for this program. This is a also the case for Electronics design (ED), Communication and Transport systems (KTS) and Media technology (MT), and this can be explained by the fact that these programs were designed with the ambition to integrate such skills in the program.

To what extent do you agree in the statements?
I do not agree =1, I completely agree =5.

Table 6: Opinions about the studies in general.

	D	ED	I	IT	KTS	M	MT	TB	Y
I enjoyed the time at the university.	4.1	4.3	4.3	4.4	4.4	4.2	4.4	4.3	4.2
I am very satisfied with the education I got within the program.	3.9	3.3	4.2	4.2	3.6	3.9	3.5	3.9	4.1
My current position is a result of the education I got within the program.	3.6	3.0	3.9	3.8	3.6	3.7	3.2	3.7	3.9
I got sufficient contact with industry during my studies.	2.5	2.6	3.1	2.6	2.3	2.6	2.0	2.3	2.4
During my studies I got in contact with a large number of students and can benefit from that in my work.	2.3	2.4	2.8	3.2	2.5	2.5	2.6	2.9	2.5
I am satisfied with my current work situation.	3.5	3.3	3.9	4.0	3.5	3.8	3.4	3.6	3.9
After having finished my studies I felt well prepared for work life.	3.5	3.1	3.7	3.5	3.3	3.4	3.1	3.2	3.4

Most of the alumni are satisfied with their time at the university and their studies but would have liked to have more contact with industry during the study time. The networks between alumni are not strong. Linköping Institute of Technology, (founded 1969) is a faculty of Linköping University (LiU) and in recent years efforts are made to build an alumni-network with invitations to many activities.

To what extent do you agree in the statements?
I do not agree =1, I completely agree =5.
The following programs have graduated students in study group 2002.

Table 7: Opinions about the curriculum and teaching and learning quality for the "new" programs.

	ED	IT	KTS	MT	TB
I think the program design was good (lectures, lessons, labs etc,)	3.5	3.9	3.8	3.6	3.75
I think the quality of the program was good	3.2	4.2	3.5	3.2	4.0
I think the teachers' knowledge of the subject was good	3.6	4.3	3.6	3.5	4.1
I think the teachers' knowledge of teaching methods and learning was good	2.9	3.4	3.2	3.2	3.3
I think the contact between teachers and students was good	4.0	4.2	4.1	4.0	3.7

Table 7 reveals the phenomenon that new programs often have initial problems. The students who graduated in the study group 2002 were among the first students who graduated from the program. Table 8 shows the corresponding data for the other programs. It contains data for students who graduated 1994 or 2002. The figures for the program quality are higher compared to Table 7.

Table 8: Opinions about the curriculum and teaching and learning quality for the "old" programs.

	D 1994	D 2002	I 1994	I 2002	M 1994	M 2002	Y 1994	Y 2002
The program design was good (lectures, lessons, labs etc,)	3.6	3.9	3.8	3.8	3.8.	3.7	3.9	3.8
The quality of the program was good	4.2	4.1	4.2	4.2	4.0	3.9	4.3	4.1
The teachers' knowledge of the subject was good	4.3	4.0	3.9	4.1	4.0	4.1	4.4	4.2
The teachers' knowledge of teaching methods and learning was good	3	3.2	3.3	3.2	3.1	2.9	3.2	3.1
The contact between teachers and students was good	3.5	3.3	3.5	3.5	3.8	3.4	3.6	3.4

The following programs have graduated students in study group 2002.

Table 9a: Further opinions about the education for the "new" programs.

	ED	IT	KTS	MT	TB
I had good possibilities to influence the design of my program	3.2	3.6	3.7	3.5	2.7
My program specialization is of great importance for my work	2.9	3.8	3.7	3.3	3.7
If I had the opportunity to chose educational program today my choice had been the same	2.9	4.2	3.7	3.3	3.3

The following programs have graduated students in study groups 1994 and 2002.

Table 9b: Further opinions about the education for the "old" programs.

	D 1994	D 2002	I 1994	I 2002	M 1994	M 2002	Y 1994	Y 2002
I had good possibilities to influence the design of my program	2.9	3.0	3.3	3.4	3.1	3.5	3.2	3.3
My program specialization is of great importance for my work	3.5	3.7	3.7	3.6	4.0	3.7	3.6	3.7
If I had the opportunity to chose educational program today my choice had been the same	3.5	4.4	4.3	4.2	4.1	3.7	4.0	4.2

Students at LiU have student representatives in the university board and in the program boards. They also have representatives in almost every working group nominated by the program board.

"To what extent do you agree in the statements below?"
I do not agree = 1, I completely agree=5

Table 10:Overall judgement of the education.

	D	ED	I	IT	KTS	M	MT	TB	Y
I am satisfied with the contents of my education.	4.0	3.4	4.2	4.3	3.6	3.9	3.4	3.9	4.2
I am satisfied with the way the education was carried out.	3.9	3.2	4.1	4.1	3.7	3.9	3.3	3.8	4.0
My education is relevant for my work.	4.0	3.6	4.3	4.3	3.9	3.9	3.4	3.7	4.0

On the whole, the alumni are satisfied with their educational programs. Some weaknesses have been recognized and steps are taken. The CDIO implementation work can strengthen the programs and the result of this work can be assessed in a couple of years.

CONCLUSIONS

Some results from a large alumni survey carried out at Linköping University have been presented. The survey covers nine different engineering programs representing different disciplines. Both the established programs and the newer programs are represented. We have identified certain areas to develop. These areas are well compatible with the CDIO project. A written survey covers only certain areas of interest. It could be completed with interviews of a smaller selected group of alumni.

ACKNOWLEDGEMENTS

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