

Quality Assurance of Engineering Education in Sweden

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The National Agency for Higher Education

The Swedish National Agency for Higher Education is a central agency, under the Ministry of Education, responsible for various matters relating to higher education. The main activities are supervision, analysis, information and quality assurance. Sweden has 39 institutions of higher education (HEIs), some 300,000 undergraduate and some 18,000 postgraduate students.

In Sweden, as in many other developed countries, the past decade has been marked by an expansion of the higher education sector, as an increasing part of the population enrol in higher education. Higher education in Sweden can be said to be moving towards a system of mass or majority education. Also, a number of university colleges have been established throughout the country, in addition to the universities.

In 1993, Swedish higher education institutions were given considerably increased powers and responsibilities for a number of issues. With this university reform, *government by rules* was replaced by *government by objectives*. However, with decentralisation of responsibility and power comes greater accountability. The higher education sector has to show how goals are met. Not surprising, demands for accountability, follow-up and evaluation of higher education have grown. Several groups have begun demanding evidence of quality: politicians, tax payers and students burdened with study loans.

A COMPREHENSIVE PROGRAMME OF QUALITY ASSURANCE

In January 2001, a national programme for quality assurance was introduced, with the Agency evaluating subjects and programmes. All studies that lead to general or professional degrees were to be evaluated in a six year period, being the first of recurring cycles of evaluation.

The evaluations have two main aims: control and development. They can also serve other purposes, e.g. to inform or to lend authority. The control component can be described as making certain that studies meet minimum requirements. There is no attempt to rank the subjects or programmes since the Agency believes that what we are evaluating is too complex for ranking to be meaningful. There is a connection between the evaluation and the right to award degrees. If serious quality flaws are noted by the Agency, the university or university college should be aware that the right to award a degree can be revoked if no action is taken within a year.

THE EVALUATION MODEL

The so-called theory-oriented approach to evaluation has come in response to the lack of theory that was typical of earlier models of evaluation. In theory-oriented evaluation, the evaluator formulates a frame of reference for the object to be evaluated. The frame of reference serves two purposes: it expresses the assumptions made by the evaluator about the phenomenon to be investigated, and it serves as a screen for the interpretation of information gathered. Theory-oriented evaluation includes the components *conditions, process and results*. The evaluation must elucidate and critically analyse all three. By relating results to the preceding process and pre-existing conditions, the evaluator can help explain why things are the way they are.

- The evaluation model follows the internationally accepted pattern of self-evaluation, peer review by an external panel making a site visit, and a report. However, there are certain characteristics of the Swedish evaluation programme: the importance of follow-up of evaluation is stressed, and students are not only given the role of informant, but also of expert.
- The self-evaluation provides a background to the subject or programme to be evaluated. It includes a number of topics to be covered. Some of these are teacher competence, educational goals, contents and organisation of instruction and examination, as well as quality and availability of library and other sources of information.
- The external panel consists of experts from the field being evaluated, students, and possibly representatives of industry or other employers. All members of the panels are nominated by the institutions being evaluated but the ultimate choice of panel members is made by the Agency.
- The panel visits the institution offering the subject or programme being evaluated, normally for a day. During the visit, all groups concerned with the subject or programme are interviewed. Based on the information from the self-evaluations and interviews, the panel writes its report, describing strengths and weaknesses, and making its recommendations.
- A few months after the report is published, representatives of the evaluated subject or programme are convened to discuss the contents of the report as well as the evaluation process. In addition, the results of the evaluation are followed up 1 – 3 years later.

EVALUATION OF ENGINEERING EDUCATION

In Sweden, engineering education mainly takes the form of integrated programmes leading to professional degrees. There are two such degrees: the “civilingenjör” degree, roughly corresponding to a Master of Science or Diplom-Ingenieur degree, is achieved after 4,5 years of study; and the “högskoleingenjör” degree, a university diploma in engineering, is reached after 3 years. The latter is academically less demanding.

As part of the programme of evaluations, all Swedish “civilingenjör” engineering degree programmes are evaluated in 2005.

These programmes are offered at 11 universities or university colleges. They differ considerably in size: the number of programmes offered varies between 2 and 16. In total, approximately 100 programmes are offered. These cover all areas of science and engineering: information technology, engineering physics, chemistry and biotechnology, mechanical engineering as well as surveying.

Strong stakeholder influence

The evaluation of “civilingenjör” engineering education is marked by a greater than usual involvement of stakeholders. The HEIs to be evaluated formed a joint group well ahead of the start of the evaluation and this group has had ongoing discussions with the Agency. We have also had two meetings with stakeholders to have their input, once before starting the evaluation, and once after the first two meetings of the external panel. These meetings have served to define the focal points and to discuss differences of opinion. As part of the Agency’s general policy to have a student perspective, we have met with groups of students on several occasions to hear their wishes and to discuss their involvement in the evaluation process. Also, of the eight people in the panel, two are students. Furthermore, a stakeholder perspective has been assured by having two representatives of industry on the panel, of whom one is the chairman.

Benchmarking

Although this evaluation follows the general format of the Agency’s evaluations, there have been a number of modifications. There are several reasons: one is that the “civilingenjör” programmes have been quite extensively evaluated before, at their own initiative. Also, there is no reason to believe that the programmes do not meet (at least) minimum requirements. It was therefore decided that this evaluation would have more of a benchmarking character. The attempt is to compare the programmes and find examples of good practise. In order to do this, the evaluation procedure needed to be more standardised, using a more detailed and concrete self-evaluation manual. The manual was therefore changed to comprise 21 questions to be answered by the HEI centrally, and an additional 46 questions to be answered by each programme.

Inclusion of a CDIO Component

In addition to the “regular” self-evaluation manual, a separate programme evaluation form was added. This form was based on the CDIO model for engineering education development and consisted of descriptions of 12 standards, evidence of compliance, rating and actions. The reasons for including this additional evaluation include providing the HEIs with an instrument for continuous self-improvement. This part of the evaluation will be presented more in detail by prof. Johan Malmqvist.