

# The Vanishing Hero Engineer

Trond Clausen, *Senior Member, IEEE*

## I. AN EMPTY PEDESTAL

In my industrialized country Norway, the “classical” engineer isn’t visible anymore. Away from media focus is the hero and society builder who, with the laws of physics as a tool exploited natural resources, built roads, bridges, machines, and factories as tangible symbols of a society in growth. In the media’s doghouse do we now find the technocrat, this profit-thirsty villain who has given us traffic chaos, dry rivers, and pollutions so tremendous that they, by some, are claimed to threaten the very existence of the globe.

Something must have happened and, maybe, can the development of engineering education be used to illustrate the road to this fundamental shift of public image?

## II. ANOTHER WORLD

In the well-organized industrial society of the 1970’s the Ministry made all decisions related to undergraduate engineering education. Defining goals and how to reach these goals were the most important issues. In this setting, a clearly defined curriculum was the goal and carefully selected students the instrument to reach the goal. Some important engineering education characteristics were:

- Engineering colleges’ teaching programs were governed by timetables. The students were “chained” to their desk and laboratories 8-10 hours six days a week, plus spare time homework. This method resulted in hard-working students with little free time for extracurricular activities. Teachers enjoyed excellent curriculum reproduction, resulting in high final exam grades.
- Engineering colleges were handsomely and 100 % financed by government. There was money for equipment and field trips, as well as professional traveling.
- All planning was centralized. Committees at Ministry level secured a high and uniform national level by the production of detailed plans of study including course content approval and instructions about how to teach. Since it was assumed that a specific course content was the guarantor of quality and academic level, it could rightfully be claimed that the education was governed by the curriculum.

- Cooperation industry/academia was normally channeled through the Ministry. Other collaboration included teachers doing consultant work and a limited use of industry guest speakers visiting colleges by invitation. From an engineering education point of view, this static situation meant an almost complete isolation from real world engineering practice.

## III. SIGNALS OF CHANGE

About 1970 signals from industry, the Ministry, and the colleges themselves indicated the dawn of a new era. Simultaneously, the attacks on the engineer as The Enemy of Environment were countless. Engineering education had arrived at a divide, visible in four areas.

First, the traditional curriculum governance meant that selected knowledge represented the “system through variable.” In this system the teacher served merely as a mediator or a non-ideal system component. Today, however, the professional and intellectual development of the student represents the through variable. The teacher is no longer a system component but serves as an administrator and evaluator of student learning processes.

Second, engineering education programs were already matching the international undergraduate level pretty well. Even in the early seventies, undergraduate engineering education had a broad-scoped program including a significant portion of interdisciplinary elements. By graduation, the students should be prepared for the workforce but also for advanced studies, even in foreign countries.

The third change was pushed by the computer revolution which made it possible to automate difficult, boring, and time-consuming calculations. Computer programs and models have led to profound changes in the world of the engineer and, thereby, engineering education as well.

The fourth and last change is the internationalization of engineering education. For instance, the 1999 Bologna Declaration, signed by European Ministers of Education, will force every European country to adapt some common rules and ways to ease institutional cooperation. At the same time, the new system will gradually be known and understood by any user of an academic workforce.

## IV. A NEW WORLD

Some engineering education characteristics of today are:

---

The author is Associate Professor of Telemark University College in Norway. He is currently the Vice-Chair of the Chapters Committee of the IEEE Education Society (Trond.Clausen@hit.no)

Publication Identification Number 1558-7908-112007-02

- Engineering schools offer students a workload measured by credit hours. The learning program includes lectures, exercises, laboratory work, projects – all supported by an increased use of formative evaluation methods. Admission to colleges is seldom competitive and students find time for extracurricular activities. They are not necessarily satisfied with learning material and methods and may not always reward their professors with excellent final grades.
- Public money for running the schools is scarce and the professor is expected to contribute, for instance by external cooperative project money. In return, the professor will often be allowed to dispose a significant part of the generated revenue for educational purposes like computational equipment, travel expenses for conferences, and so on.
- Planning is no more centralized; detailed instructions have been replaced by a “frame”, listing some important educational goals with their suggested relative weights. Details are left to the colleges, which may develop themselves in different directions. To ensure academic quality, however, the liberated institutions must submit to an accreditation process.
- As already mentioned, professors are encouraged to initiate collaborative programs with external partners. Programs may vary from all level disciplinary research and development projects to student enterprises and educational research. Tangible results include a much closer industry/academia relationship, and that pedagogy is no more a foreign word.

To sum up: bygone are the days when engineering education quality meant excellent curriculum reproduction. Hereafter quality must be documented by similar criteria as disciplinary research.

#### V. THE TECHNOCRAT

The engineer of tomorrow will increasingly be a part of multidisciplinary and often internationally composed project groups for the development and application of standard, as well as tailored technology.

Consequently, the engineer will typically represent the technical expertise of the group. As the group's technically literate member the engineer must cope with both a high rate of technological development and master written and oral communication, even in a foreign language. In addition, a significant insight in, among others, social psychology, legal, economical, cultural, and ethnical issues will be a presupposition for survival in the international competitive climate.

In such an expert environment—the technocrat—the engineer both is an appreciated and a well rewarded member. Thereby, the classical hero engineer has vanished. But his well-being heir has taken over, well trained to solve even complex problems of today and tomorrow.

However, the price paid for this amazing success of transformation is, maybe, criticism and invisibility?