Engineering in the Changing Environment

Today's industrially developed communities are markedly technically and mercantile-oriented, with declared desires to improve the quality of living and preserve the environment. New and improved technical products (in the widest sense, including also processes, methods, procedures, etc.) lie in the focus of economic survival and added value generation.

Faced by the changed system of values within the engineering and society, we are simply forced to consider the elements of the present paradigm in the functioning of the technical professions, which is very different compared to the previous periods of civilisation development. The personal perception of some of the new tasks and roles of the technical professions can be summarised in the following theses:

Industrial and post-industrial society are characterised by the expansion and the setting of **new requirements** in the development of products and procedures. Here are additionally **ecological, aesthetic, legal** (e.g. protection of the new), **sociological and psychological** (e.g. generating of "fictitious" demands for the new), **ethical** and **culturological** criteria (e.g. movement or setting of the production in another cultural community or production of goods adapted to a certain civilisation and culture environment).

The implementation of the concept of sustainable (integral) development requires implementation of a precisely such (holistic) approach. Therefore, optimal solutions are constantly searched for, with changed criteria of evaluation, in ever shorter time cycles.

One can notice a **lack of managerial knowledge**, first of all the economic and legal knowledge, of engineers in managerial positions who make decisions on investments, production locations, purchase of enterprises, etc. Some say that engineers needn't tackle this type of tasks, but should rather only stick to solving the strictly technical problems. However, many cases from the practice show that, unlike others, the engineering way of thinking is more systematic, oriented to the understanding of the processes, and in turn also more logical, more integral, and pragmatically and target-oriented. It should be considered whether today the economists, lawyers or politologists, as well as other professions that make decisions more frequently, should acquire additional technical education!? Many will argue that this would require more efforts and that it would hardly yield satisfactory results.

The necessity of **interdisciplinary and transdisciplinary** teamwork is closely connected with the previously emphasised need for wider education of technical and other professions as well. Complex integrated knowledge is necessary for solving a number of actual development problems. Efficient combination of natural sciences, engineering and other knowledge often represents a constraint in the realisation of ideas. The problem lies in the lack of understanding and maladjusted communication among professions – i.e. the same problem being discussed in different "languages".

Some examples can be found in the areas of medical technology, mechatronics, communication, new materials, biotechnology, nanotechnology, microtechnology, physical technology (e.g. laser, plasma, etc.).

The problem of **searching for and synthesis of knowledge** necessary to solve real problems is increasingly emphasised. The human mind is greatly limited by the need to handle fast the growing mass of information and knowledge. We are participants and generators of entropy of new facts and knowledge in all the fields of human activities, contributed by their omnipresent availability, thanks to computers and communication technology.

Creativity and innovativeness are the most desired characteristics of today's scientists and development engineers, due to the increasing saturation by products on the market. The constant pressure to which technical engineers are subjected to create new solutions in ever shorter periods of time causes their frustration.

The lack of readiness to change one's own attitudes and generally **the resistance to changes**, and also the lack of **desire to learn** represent the biggest brakes and barriers of development in all the fields, including engineering.

It may be subjective to consider that the non-technical environment is showing **insufficient understanding** or certain blindness for the technological contributions to the quality of living. The admiration for technical solutions is losing its intensity, as the constant generation of new products has been taken for granted by the environment (e.g. new makes of cars, computer models, electronics, household appliances, etc.).

It is only logical to start to adapt to such a new situation in the educational system, which is to a great extent inert regarding changes. More radical changes are needed regarding traditional educational methods. The higher education curricula need to be supplemented by an option of syllabuses from other fields, training in teamwork and project-oriented problem solving, creative approaches, methodology of information search and study, and similar.

Tomislav Filetin