> Making design engineering fascinating

Recommendations for training qualified design engineers

acatech POSITION PAPER – SUMMARY AND RECOMMENDATIONS

acatech
NATIONAL ACADEMY OF SCIENCE AND ENGINEERING

Today's design engineers act as developers, drivers and originators in the process of creating new products. They conceive new products for businesses taking account of all the phases in the product's life cycle, and they provide the documentation needed to manufacture them. As such, they have a direct influence on the success of manufacturing companies. They need to be creative and continuously rise to the challenge of using new materials and technologies. In addition to traditional design engineering know-how in areas such as machine components and materials, functional groups, production and assembly technology, design engineering methodology, systematic problem solving and spatial visualisation skills, they increasingly also require IT and programming skills as well as electrical engineering and mechatronics know-how. Systems design draws on a combination of all these skills.

However, complex modern products also call for knowledge that does not form part of the traditional mechanical engineering skill set – such as product and project management know-how – and these requirements are set to become even more important in the future. Consequently, tomorrow's design engineers will also need to be managers capable of planning, managing and supervising projects both as part of a team and on their own. Efficient use of resources and sustainability will become increasingly key to what they do. They will need to keep the whole picture in mind at all times – product, system, environment, new solutions, the competition, the economy and society – whilst thinking both analytically and systematically and bringing creativity and communication and problem solving skills to the table. In order to respond to these requirements, an academic qualification along the lines of "systems designer" would be desirable.

Job title and job profile

The specific tasks performed by a design engineer depend on the company they work for, its size and structure, the complexity of the product being manufactured and the employees' skill sets. The boundary between design engineering and development can often be fluid and the interfaces between the two vary considerably, if they exist at all. It is not always easy to identify all of the members of a business who are involved in product design engineering. They include not just "design engineers", "system designers" or "detail designers" but also "draughtsmen" (or their contemporary equivalents, i. e. "technical product designers" and "systems planners"), "product designers", "CAD engineers" and "test engineers". In other words, the job profile of a design engineer is by no means clearly and precisely defined. Furthermore, in Germany, "design engineer" is not an officially registered profession, meaning that it is possible to work as a design engineer without being certified as having the necessary specialist skills and without having obtained a specific training qualification. There is also currently a wide variety of educational pathways to becoming a design engineer in Germany, including vocational training combined with an in-house apprenticeship, continuing professional development, or studying at a university, university of applied sciences or university of cooperative education.

Public perception

There is very little public awareness of the wide variety of skills possessed by design engineers and the diverse range of tasks that they perform as part of their work. Whilst it is true that in some isolated cases, such as motor sport, design engineers do enjoy considerable standing, in everyday life they are often forced to live in the shadow of the products they have designed. In the mind of the public, there is no clear understanding of the difference between a design engineer, a mechanical engineer and an engineer. Consequently, it is hardly surprising that young people and their parents – and indeed even students – often have little idea about what being a design engineer involves and are unlikely to choose it specifically as the profession that they wish to pursue.

The academic pathway to working as a design engineer

The most common academic qualification for design engineers is a mechanical engineering degree. However, degrees in aeronautics and space engineering, mechatronics and automotive engineering are also popular alternatives. Not all of these higher education courses offer a specialised design engineering option, and there are major differences in the design engineering-related content provided by different courses and universities. Nevertheless, this is how our design engineers are currently being trained.

A career in design engineering

Young professionals who are just starting out are happy to accept a position as a design engineer with a company. However, as a long-term career option, other fields such as marketing, production, operations, logistics or sales often have better prospects in terms of status, pay or promotion. We are thus already beginning to witness a shortage of qualified design engineers. To some extent, it is up to companies to paint a more attractive picture both of themselves as employers of design engineers and of the profession itself – and to make this image a reality. They need to find ways of tackling the design engineer shortage, for example higher status, financial incentives, systematic training and development opportunities and more fulfilling specialised career paths with appropriate remuneration.

At a glance

- The job title "design engineer" and the corresponding job profile need to be more clearly defined and more vigorously promoted.
- The relevant study courses should be better at preparing students to work as design engineers, both in terms of content and teaching methods.
- Businesses have the opportunity to tackle the shortage of design engineers by offering them jobs with realistic terms of employment, status and career prospects.
- New continuing professional development formats for design engineers should be introduced.

Ten recommendations for the future of design engineering

The German economy and German business will continue to rely on the efforts of highly qualified design engineers in the future. This will not be possible without state-of-the-art, forward-looking and appropriate training and continuing professional development, working conditions that are attractive to design engineers from Germany and from abroad and a profession that enjoys greater social status.

acatech therefore makes the following recommendations:

1. The job title "design engineer" and the corresponding job profile need to be defined more clearly. For example, the project group recommends the (re-)introduction of the job title "systems designer" together with an appropriate academic qualification.

2. We need to get young people excited about engineering and design engineering from an early age.

3. The design engineering profession needs to be promoted more vigorously and more should be done to highlight its attractions.

4. There is a need for better communication of higher education courses in the field of design engineering.

5. Study courses should be better at preparing students to work as design engineers. There should be a greater focus on the design engineering skills that are required to create new products and teaching of the basics also needs to be improved. Courses should also prepare students for lifelong learning and equip them with the skills to access new areas of know-how on their own.

6. Innovative teaching and learning formats such as team projects, open-ended tasks and regular student presentations should form an integral part of courses.

7. Job advertisements should be more specific about the required skill sets in order to attract more applicants.

8. Businesses should offer design engineers higher status and better career prospects.

9. The creativity and specific methodological skills of design engineers need to be publicised more effectively. This will allow people to understand the added value they can provide vis-à-vis other applicants and co-workers, thereby serving to enhance their standing.

10. New continuing professional development formats for design engineers should be introduced.

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