

INDUSTRIAL DESIGN: A PROFESSION BETWEEN ENGINEERING AND APPLIED ART

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ABSTRACT

Competences acquired during industrial design education and competences actually required in professional design practice are sometimes diverging. This article outlines characteristics of the industrial design profession in Norway, discussing changes in the profession, different roles of the industrial designer, and skills and knowledge required. With a basis in surveys done at the Norwegian University of Science and Technology (NTNU) as well as in depth interviews of graduate industrial designers from NTNU, a set of skills, knowledge and qualifications are identified and implications for improvement of industrial design education are made.

Keywords: Industrial design education, skills, knowledge and qualifications in industrial design.

1 INTRODUCTION

Industrial design is a diverse discipline that embodies different directions within the design profession itself (i.e. design engineering, interaction design, graphic design, furniture design etc.) as well as multiple additional professional fields. As a result the curriculum of an industrial designer often reflects a large variety in content and courses. According to S. F. Liu et al. [1] industrial designers must incorporate knowledge of multiple fields, including marketing strategies, design, research and development, basic knowledge concerning production as well as integration management and communication skills. Design connects art and engineering e.g. through constructive processes, as well as aesthetics - both engineering and art utilize imagination and creativity to further explore the possible. From an educational view, Lippincott [2] signifies four basic areas of design training: Art, Engineering, Economics and Humanities [15]. Although diversity in skills and knowledge can be viewed as the strength of an industrial designer, the acquisition of abilities in these areas may pose complications. Several studies and published literature on design education also argue that there is a gap between knowledge required at school and competences required in practice [1, 3, 8, 12].

This article seeks to review competencies acquired during industrial design education in relation to competencies actually required in employment and tie this up to industrial design education. The authors analyze job market and candidate surveys from the Norwegian University of Science and Technology (NTNU) as well as in-depth interviews with practicing designers. The “Arbeidsmarkedsundersøkelsen 2010 (Job Market Query)” relates to the work situation of former students at the Department of Product Design (IPD), to what industrial designers work with after they graduate, as well as how they consider the content and relevance of the university curriculum in context of their work. The survey is part of a series that have been released biannually since 2002 (with the exception of 2012). The “IVT Kandidatundersøkelsen 2013” survey, released earlier this year (2014), has the same focus and is done by the Faculty of Engineering Science and Technology (IVT) at NTNU. The in-depth interviews were conducted with working industrial designers educated at NTNU: Two product designers, an interaction designer, an UX-service designer and a graphic designer. Based on the findings from the surveys and the interviews, the article gives recommendations for improving design education, which include emphasizing the involvement and collaboration with businesses and industry, and using working/practicing designers as mentors and supervisors for projects.

2 ROLES AND SKILLS IN THE INDUSTRIAL DESIGN PROFESSION

Industrial design's emergence as a profession can be viewed as a consequence of the industrialization in the late 19th- to the 20th century however with changes to globalization and worldwide markets and issues such as sustainable development, the designers' roles continue to differentiate. The following section gives an overview over professional roles [6].

The role of the designer as the creator refers to the designer being in full control of the design process. The inspiration and idea for the product, sketching, development and final design is all done by the designer as creator and artist behind the product. The role of the designer in a team originates from the thought of design not only being a means of product styling and aesthetics, but also a part of the product development process and part of a team consisting of different professionals such as e.g. engineers, architects, and marketing people. Today this is a fairly common way of working. The role of the designer as end-user expert comes from the necessity to understand who one is designing for. Design of products and services based on usability and the end-user has become very important in the industrial design profession. The role of the designer as a coordinator, a design manager, emerged as a result of the designer working in a team and being an end-user expert. Design management includes management of design resources in a company, but it may also include design of corporate strategy and brand experience. The role of the designer creating experiences refers to the designer being part of the overall planning scheme in a company relating to the design strategy and experience design. The designer creating experiences is about focusing on the experience for the end-user and making them connect to a brand on an emotional level. Finally, the role of the designer pushing innovation is related to design as finding new perspectives and solutions through creativity [7].

Besides 'classic' roles and skills, there are trends of industrial design practice that influences them and in turn becomes important for education as e.g. Yang et. al [4] points out. Among these is increased use of digital media due to emerging new technology, which in turn changes methods of presentation, sketching, rendering, model making and technical drawings. Further, there is an increasing need of interdisciplinary teamwork due to considerations regarding user research, lifestyle trends, social-, psychological- and ideological issues. Besides these conceptual views of designers, what an employer looks for is a designer with proficient design skills, contextual understanding, design knowledge, planning and integration capabilities, design expression and aesthetic literacy [1, 3]. These skills are all part of what one can call a professional expertise and professional behaviour. Lewis and Bonollo mention five dimensions in characterization of a professional behaviour [8], which consist of:

1. Negotiation
2. Problem solving
3. Acceptance of responsibility
4. Interpersonal skills
5. Project management

Negotiation refers mainly to negotiation with clients, this covers task clarification as well as further negotiation with clients if the client's ideas change during the project. When talking about problem solving in the industrial design profession one can say that one talks about the design process itself since problem solving is the main goal of the design process. The design process includes concept generation, evaluation and refinement of concept, detailed design and communication of results, and finally the overall skill displayed by the execution of this design process. Acceptance of responsibility refers to acting and behaving self-ruling and independently for the outcomes of your work. Interpersonal skills refer to be able to collaborate well with colleagues and clients. Lastly, project management is about organizing and planning work as well as ensuring that goals are met throughout the course of the project.

3 RESULTS

3.1 Findings in Surveys Regarding Work-Situation amongst Graduate Industrial Designers

In this section, the most relevant findings from the survey "Arbediedsmarkedsundersøkelsen (job market query) 2010" and the survey "IVT kandidatundersøkelsen" (candidate query) are presented.

3.1.1 Arbeidsmarkedsundersøkelsen 2010

In 2010 the fifth and latest survey in series of surveys regarding the work situation of former students at the Institute of Product Design (IPD) at NTNU, “Arbeidsmarkedsundersøkelsen 2010”, was conducted [9]. The survey was organized by Leonardo, the student association of IPD at NTNU. 86 out of 174 graduate students answered this survey.

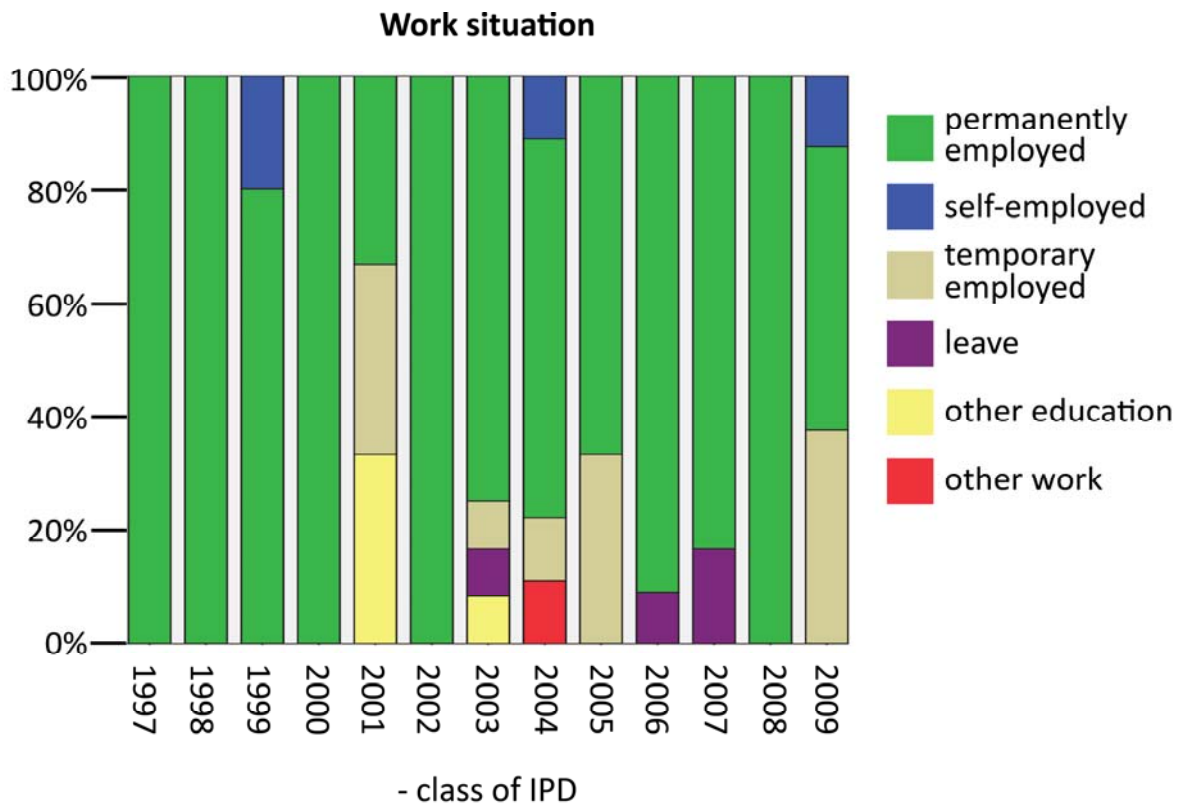


Figure 1. Work situation for graduate industrial designer at NTNU

23% of the respondents were employed in a consultancy firm, 33% were employed in industry or off-shore, 18% were employed in telecommunication, media and IT, 11% were employed in education and 15% were employed in other fields. To the question about what specialist environment they work (collaborate) with answered 85% technical, 57% economics, marked and business, 46% communication and media, 16% health, 12% social sciences and humanities, and 11% juridical. The question was asked in a way that more than one answer could be applied. On the question regarding which tasks industrial designers do as part of their work the result was as follows: about 74% do project management, about 76% make presentation material, and approximately 70% do product development. The percentage of time for tasks estimated in the 60-50% range were user-interfaces, design strategies, sketching, materials- and construction choices, counselling and interaction design. In the 50-40% range administration, aesthetic forming, graphic design, production modifications and 3D modelling. In 40-30% ergonomics, market research, physical modelling, web-design and packaging design. Below 30% were education and eco-design. On the questions about relevancy of areas and subjects from education, the results experiences from team- and group work and the design related subjects were rated very important. Other important subjects were scientific subjects (mathematics, physics etc.), design strategies, human-machine subjects and form and colour subjects. Furthermore, system design, ergonomics, communications, It-subjects and subjects regarding management were rated fairly important. Workshop work, organizational work, and economics were rated less important. Mechatronics and eco-design was rated least important. Evaluating learned methods of work, both single work and in group work were rated very good. Self-study and projects in pairs were rated good, while lectures and exercises were rated least good for learning.

3.1.2. “IVT kandidatundersøkelsen 2013”

In 2014 the results from the survey “IVT kandidatundersøkelsen 2013” were released [10]. The participants of the survey were graduate engineers from the Faculty of Engineering Science and Technology. Regarding industrial design graduates, 23 of 45 graduate students from industrial design participated in the survey. 87% of the participants were at the time in permanent employment. 22% were “very satisfied” with their current work, 63% were “satisfied”, 10% were “either or”, 4% were “unsatisfied” and 1% did not know. On the question about if their education were relevant for their current job the answers were; 31% “very relevant”, 56% “relevant”, 8% “either or”. Figure 2 below shows an overview of answers from IPD students.

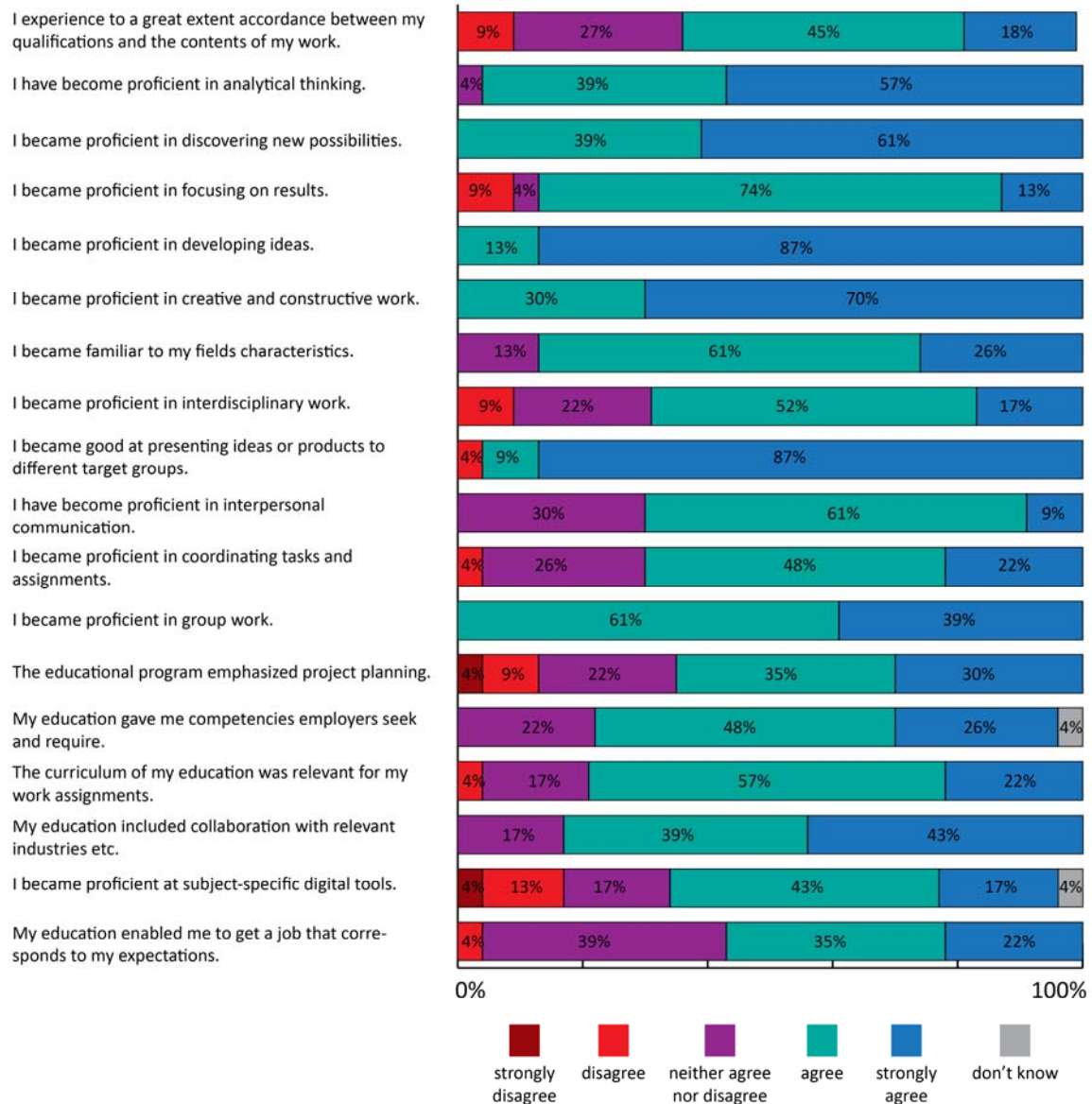


Figure 2. IPD students' answers in IVT kandidatundersøkelsen 2013

3.2 Interviews with Practising Industrial Designers

All designers from the five in-depth interviews were graduates from IPD at NTNU and employed at the time of the interviews. Their working fields included interaction design, IUX and service design, graphic design and product design. The following questions were asked:

- What do you think about your role as a designer (interaction designer, product designer, etc.).
- What do you assess as important qualifications and knowledge for a designer (interaction designer, product designer, etc.).
- What knowledge, skills and experiences acquired during your education has been useful in you work?

- Critique of the course/study (recommendations for improving industrial design education, what should have more/less focus, what could/should be done different, is something lacking or missing, etc.).

The small set of interviews might usually be considered a limitation. In the present study, however, information was derived from in-depth and detailed descriptions rather than from a large number of interviews [16] and the authors concluded that the interviewee selection was suitable for a description that allowed to show a pattern of common factors. When defining the role of industrial designers regardless of which field of design they work in, although this may not be generalized, one can say that the “superior role” of an industrial designer is to be a person who has an overall understanding of a project and one who keeps an overview. This validates for both the project itself and everything regarding the project. If one attempts to link this up to the core of the industrial design profession to create functionally and aesthetically valuable products and services [4], one can say that both understanding and keeping an overview may be key components in successful execution of the design process. The skills, knowledge and qualifications common for all the designers included understanding, communicational skills, negotiating skills, to be able to systemize and organize, to be able to sell ideas or concepts, and to be able to have an overview over work, projects and information. Important skills knowledge and experiences acquired from education common to the designers were; having learnt design process and design methodology, to have entered the “design mind set”, having learnt to manage and complete a project, present and sell an idea or a concept, and collaborate. Almost all the qualifications and skills mentioned above can be found in the five dimensions of characterization of a professional behaviour from section 2 of this article. Suggestions for improving industrial design education by the interviewees included improving the involvement and collaboration with businesses and to use working/practicing designers as mentors and supervisors for projects etc. Further, the building of a proper “toolbox” during the first three years of the study, ample learning of design methodology and practicing the design process and to a greater extent combining of theory and practice was considered relevant. Some of these points of improvement coincide with some of the issues with most dissatisfaction from the surveys in section 3.1.1 and 3.1.2.

4 EVALUATION AND FURTHER DEVELOPMENT

Teaching industrial design students one should provide a set of fundamentals that are helping them to integrate knowledge across disciplines, equipping them with learning skills. Thereby a focus on the “designerly” ways of knowing, thinking and acting, independent from a given application, is what might be most beneficial in terms of improving design education [12-14].

Following findings from the surveys and the in depth interviews together with the interviewees’ view, an industrial designer needs competencies and qualifications that relate to both one’s professional field and behaviour as well as to the working environment. Competencies and qualifications would include:

- Overall understanding of projects
- to have entered the “design mind set”
- mastering the design process
- knowing design methodology
- to be able to systemize and organize
- to be able to sell ideas or concepts
- to be able to have an overview over work, projects and information
- to be able to manage and complete a project
- to be able to collaborate
- to be able to communicate and negotiate

Recommendations for a better design education include better involvement and collaboration with businesses and industry, and using working/practicing designers as mentors and supervisors for projects to make students accustomed to key aspects of working life. Furthermore, the building of a proper “toolbox” during the first three years of the study to make students become proficient in skills like sketching, 3d-modeling, model making etc. is important. The learning of design methodology and practice to enter the “design mind set” has to be emphasized as well. Finally, it is important to make the goals of the course curriculum more explicit, and the students aware of these goals.

In the future, design schools should add more emphasis on these issues and adjust education towards them. Further research and evaluation for the matters reviewed and discussed in this article is neces-

sary, starting with mapping what can improve the quality in content as well as outcome of industrial design education and comparing studies of design educations across countries. To paraphrase Norman: "Craft skills and carefully honed intuition may have sufficed in the past, when designers primarily contributed form to industrial products, but it no longer suffices with today's complex systems of people, machines, and services. A more systematic approach is required. If designers do not provide the appropriate knowledge, others will do it for them, and it is not apt to be to their liking." [17]

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