# WHAT DESIGN STUDENTS THINK ARE HOT TOPICS; AN ANALYSIS OF 20+ YEARS OF INDUSTRIAL DESIGN MASTER PROJECTS

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**ABSTRACT**
This paper analyses the topic choice of all 286 final year master projects done at the Department of Product Design at NTNU. Master theses were categorized using five categories: primary focus (interaction design, product design, strategic design and service design), application topic, form of cooperation, primary user focus, and gender of the student. For most of the a priori formulated hypotheses we could find support: Interaction design, service design and design for health care and welfare have become much more popular in recent years, and it is often female students that choose a focus on health and welfare, and children or elderly. Also, projects done in cooperation with public services become increasingly popular. The developments in students' preferences are well in line with NTNU's and the department's research strategy, and reflect the broadness and relevance of design throughout society.

*Keywords: Industrial design, final project, Master thesis, curriculum development.*

## 1 INTRODUCTION

The role of industrial design in companies has broadened drastically in the last decades as companies sought new ways of profiting from the skill set of designers [1,2]. One of the roles designers have is to follow societal and technological trends, to understand and prioritize what is important for customers, and to translate these into concrete ideas for products and services for the company in line with its strategy using a range of different ideation and visualization techniques [3]. The role of industrial designers is acknowledged in an increasing number of industries, and they interact with an increasing number of different stakeholders, and are often instrumental in facilitating communication between them about product ideas, product portfolios, and building customer relations. Industrial designers no longer only design products, but also conceptualise services, product service systems, and systems. Based on earlier surveys, the role of the designers has developed from an aesthetics focus to holistic thinking, from one material to many materials, from one product to complex systems, from functionality to identity, from concrete to virtual, and from individual work to team work [4].

These developments have had their impact on the development of industrial design curricula in the past decade. Design students are trained to holistically approach the user, exploring users in the context of everyday life; they are trained to visualize the intangible, and to find integral solutions addressing all stakeholders that interact with the solutions over its life time [5]. Industrial Design education requires that students become trained in both rationality and free creativity [6], problem finding has become equally important as problem solving and solution detailing. Thus, design students need to be trained in designerly ways of thinking in order to address product design problems [7].

Many industrial design curricula are built up in a way where in the bachelor phase the majority of course modules address design challenges where students are handed over a design topic or even specific design brief preselected by faculty members. In the master phase, students gradually get more freedom, or are even completely free to select a design related theme they want to take on. In the industrial design curriculum at the Norwegian University of Science and Technology (NTNU) this is in particular the case for both the 30 ECTS final project during the last semester and the 22,5 ECTS specialization projects in the preceding semester [8]. It is to be expected that project topic choice in this phase of the curriculum would reflect the broadening of industrial design as briefly sketched above. Among teachers, often heard discussions address how interests of students seem to have shifted

over the years, for example from product design to service design, and to interaction design or interface design. To the knowledge of the authors, literature does not provide quantitative or qualitative analysis of topic choices by industrial design students.

This paper aims to collect and analyse empirical data of how student topic preferences have shifted over time. We feel this may serve three goals:

- It will provide empirical evidence for the broadening of industrial design, both as teaching subject and as profession;
- It will provide us with the possibility to test a number of hypotheses based on common expressions of opinion of how students' interests have developed over time;
- It will provide us with information that will be fruitful for the continuous improvement of our Industrial Design curriculum.

## 2   METHOD

The basis for our empirical material is the 5th year master graduation project course at the Norwegian University of Science and Technology's master program in Industrial Design, which graduates about 25 students a year. Empirical data was collected from all 286 final projects delivered since the industrial design curriculum was established at NTNU in 1993, with the first students graduating in 1997. This was possible as all projects have been archived as both hard and soft copies. Consequently, the data spans 18 years (master projects from 1997 to 2014), allowing for a comparison over time.

### 2.1  Categorisation

Each final project was categorized using 5 parameters, primary focus, application topic, target user, cooperation partner, and gender of the student. Each parameter is discussed in some detail below.

1.   Primary focus

All final projects were divided as belonging to either product design, service design, interaction design or strategic design. Though this may be perceived as an arbitrary division, in practice it reflects very well an almost mutually exclusive way to categorise master projects.

|  | Result | Methods relatively specific to the focus |
|---|---|---|
| Product design | Physical product, often with focus on form, colour, function, manufacturability | Sketching, Computer aided design, digital visualization and rendering, physical prototyping, physical user testing |
| Service design | Immaterial service, often with focus on user experience | Service blueprinting, customer journey analysis, stakeholder mapping, paper prototyping, |
| Interaction design | Interface design, often related to screens (touchpoints, mobile devices, webdesign) | Wire framing, information visualization, GUI methods |
| Strategic design | Design strategies, processes, product portfolio, branding/marketing strategy | In-company interviews, competitor benchmarking |

A secondary focus was initially considered and used for a further granulation of the projects' topics. This parameter was meant to help distinguish between focus on sustainability, usability, aesthetics, tactility, materiality, and so on. However, in practice it turned out to be challenging to choose one secondary focus, as many projects addressed multiple topics to some degree, and assessing to which degree would have been a too arbitrary and time-consuming process to complete.

2.   Application topic

All projects were categorized according to topic of application they were aimed at. Following an organic process where a large number of application topics were initially distinguished as the categorization process went on, the topics were condensed into Healthcare and Welfare, Communication, Furniture, Logistics, Offshore, Sports equipment, (Other) Professional Equipment, Food and Packaging, Life style and household products, Tourism, Building and Architecture, Professional and leisure clothing, Education, Humanitarian Aid and Public Spaces.

3.   Target user

A third category was used to distinguish between the target user for the final proposed product, service, system or strategy. A distinction was made between Average professional users, Average private users, Elderly, and Children. With 'average' it is indicated that no other demographic characteristics than professional or private use was relevant for these categories. This fourth category was included to test the hypothesis that over time, students have focused more on addressing users that

may not be researched using conventional user research methods based on interviews, surveys, or other forms of active participation by the user.

4.    Cooperation

A fourth category addresses whether the final project was done in cooperation with industry, a research organization (such as NTNU or SINTEF, a main Norwegian research organisation) or public services, or was done as a personal project without direct cooperation with a third party of interest. Cooperation with design agencies was categorized as industry cooperation, though such agencies may have had public services as clients, which may also be true for projects in cooperation with SINTEF.

5.    Gender

Finally, the gender of the student was noted to verify to what extent this may have influence choice of final project topic over time.

## 2.2  Categorisation process

The categorization of every master project was done by a single staff member, who has had the role of study program leader (whose role, among other things, includes responsibility for coordination of the final projects) for many years, and has been employed at the department since 2001. This staff member remembered most final projects which facilitated categorization. Another advantage of a single staff member doing the categorization was to avoid differences in interpretation of the categories. The data was stored in MS Excel and analysed using a variety of its mathematical functions.

## 2.3  Hypotheses

Before the analysis was done, and to make the exercise even more interesting, all scientific staff members connected to the department were approached to informally share their biased opinions about how they think final project topics may have developed over time. Some of the hypotheses that were created by combining these opinions are:

1.    "Interaction design has gradually become more popular in the past 10 years or so";
2.    "Service design has suddenly become more popular in the past 5 years or so";
3.    "Design for health and welfare has suddenly become more popular in the past 3-4 years or so";
4.    "It's often female students that choose for design for health and welfare and service design";
5.     "It has become more common to cooperate with actors from the public domain";
6.    "Female students choose interaction design, male students choose product design".
7.    "Perhaps are furniture projects done by students as personal projects when they cannot find a company or public service to cooperate with?"

## 3    RESULTS AND ANALYSIS

This page limit for this paper does not allow for presenting the complete set of results. Therefore a selection is made, focusing on the most interesting results from a departmental perspective, with particular attention for verification of the hypotheses.

### 3.1 Parameter 1: Primary focus

*Table 1.Cumulative results for choice of primary focus*



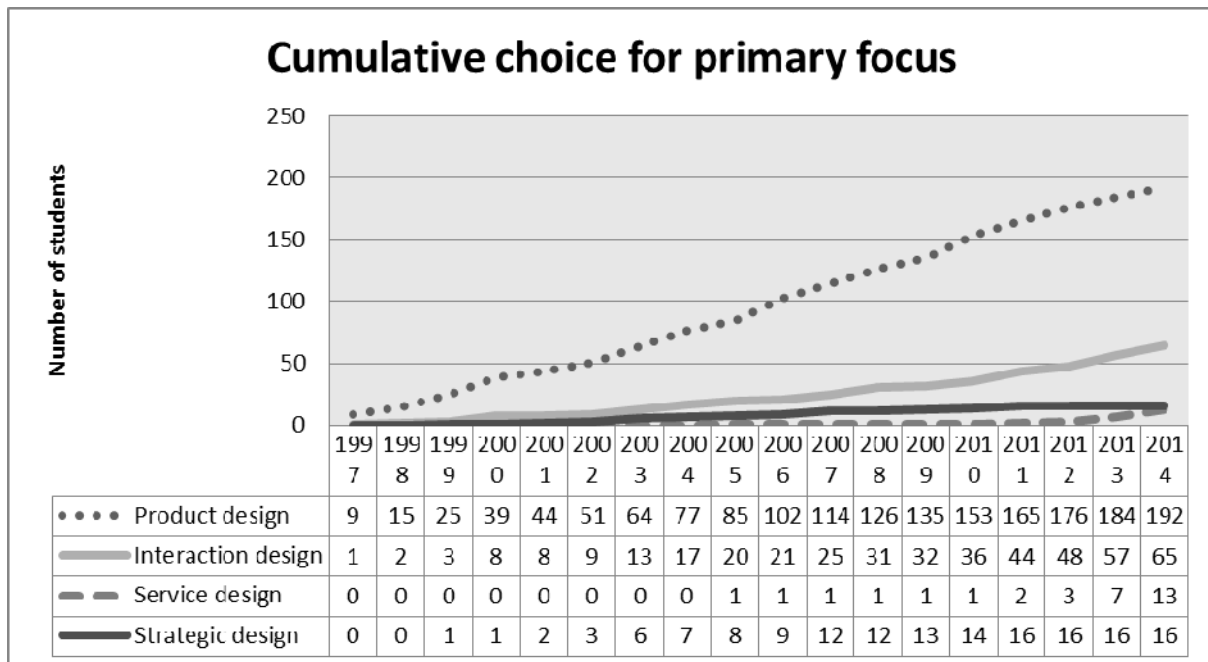| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product design | 9 | 15 | 25 | 39 | 44 | 51 | 64 | 77 | 85 | 102 | 114 | 126 | 135 | 153 | 165 | 176 | 184 | 192 |
| Interaction design | 1 | 2 | 3 | 8 | 8 | 9 | 13 | 17 | 20 | 21 | 25 | 31 | 32 | 36 | 44 | 48 | 57 | 65 |
| Service design | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 7 | 13 |
| Strategic design | 0 | 0 | 1 | 1 | 2 | 3 | 6 | 7 | 8 | 9 | 12 | 12 | 13 | 14 | 16 | 16 | 16 | 16 |

Table 1 presents cumulative numbers for the choice for the final projects' primary focus. The most interesting observations here are that product design has, until 2012, always been more popular than the other areas, but that interaction design has been equally or more popular in the last few years, confirming the first hypothesis, though the increase in popularity is more recent than assumed. Service design has only really emerged as topic since 2013, which is also more recent than thought with hypothesis 2 in mind. Interestingly, no students have chosen strategic design since 2012.

### 3.2 Parameter 2: Application topic

Table 2 lists for 1997-2014 the number of projects that focused on the various industry branches, with a further breakdown per primary focus. The application topics show a good spread across a large number of industries, where in particular the healthcare and welfare services, and the communication industry are well represented. Of all healthcare oriented projects, about 50% has been done in the last four years, confirming the impression that led to hypothesis, although health care and welfare design has from the start been present among the students' topic choice. Topics related to health and welfare design have often a more than average component of mapping user needs, and often address the challenge of mapping needs and wishes for users that may be not be reached through conventional user centred design methods, because of age or illness. Projects range from developing specific products such development of medical equipment, to interfaces for home medication or navigation, to hospital or medical group practice services. In recent years, health care and welfare design is an explicit element of the department's research strategy, as design research is seen as having an important contribution to developing more efficient and user friendly solutions in this field [9,10]. Within the healthcare and welfare domain, the vast majority of the products are done with in cooperation with a partner from the public services.

For all topics except tourism and education, product design dominates over interaction, strategic and service design. Unsurprisingly, the percentage of projects within the communication industry has a relatively high share of interaction design oriented projects, whereas furniture projects, with one exception, are all product design oriented projects. The fact that communication, furniture, offshore and sports equipment all score relatively high in popularity can be partly explained by the fact that these industries are relatively well represented in Norway and as such offer student interesting opportunities for cooperation. In light of hypothesis 7 it found that students choosing for furniture related project almost exclusively work with industry projects, with only a few exceptions choosing this as personal project.

*Table 2. Application topics: totals and breakdown per primary focus*

| Application topic/ Industry branch | # projects 1997-2014 | % of total | product design | interaction design | strategic design | service design |
|---|---|---|---|---|---|---|
| Healthcare and Welfare | 44 | 15,4 % | 29 | 11 | 0 | 4 |
| Communication | 40 | 14,0 % | 22 | 14 | 1 | 3 |
| Furniture | 32 | 11,2 % | 31 | 0 | 1 | 0 |
| Logistics | 31 | 10,8 % | 23 | 6 | 2 | 0 |
| Offshore | 27 | 9,4 % | 13 | 12 | 2 | 0 |
| Sports equipment | 22 | 7,7 % | 18 | 3 | 1 | 0 |
| (Other) Professional Equipment | 15 | 5,2 % | 8 | 1 | 5 | 1 |
| Food/Packaging | 14 | 4,9 % | 10 | 1 | 2 | 1 |
| Life style/household products | 14 | 4,9 % | 10 | 1 | 2 | 1 |
| Tourism | 12 | 4,2 % | 3 | 7 | 0 | 2 |
| Building and Architecture | 11 | 3,8 % | 7 | 3 | 0 | 1 |
| Professional/leisure clothing | 11 | 3,8 % | 11 | 0 | 0 | 0 |
| Education | 7 | 2,4 % | 2 | 5 | 0 | 0 |
| Humanitarian Aid | 3 | 1,0 % | 3 | 0 | 0 | 0 |
| Public Spaces | 3 | 1,0 % | 2 | 1 | 0 | 0 |
| Total | **286** | **100 %** | **192** | **65** | **16** | **13** |

## 3.3 Parameter 3: Target user

Over the full 18 year period, about 51% of all projects were done with mainstream individuals in mind as end-users, 34% for professionals, 10% for children, and 5% for elderly and handicapped persons. No clear trend can be determined regarding the division between professionals and children, though projects aimed at children and elderly have become more popular in recent years; in 2012 44% of all projects, and in 2014 32% of all products were done with these user groups in mind.

## 3.4 Parameter 4: Cooperation

It turns out that about 80% of all projects over the years were carried out in cooperation with an industry partner, 10% with public services, 5% with a research organization (NTNU or SINTEF), and 5% as an independent project. Projects with public services have become increasingly popular since 2012, as 20 out of 29 projects in cooperation with public services were done in the last three years; in 2014 these even made up almost half of all projects. This supports hypothesis 5.

## 3.5 Parameter 5: Gender

Strikingly, we found out that the 286 delivered master projects were divided exactly equally between female and male students. This image of emancipation is visible throughout the existence of the study program, with maximum majorities of 72% (for male students in 2008, for female students in 2014).

It was analysed how gender affects choice of focus and topic. There is no pattern that suggests that female students prefer interaction design over product design, falsifying hypothesis 6. But what is striking is that all 13 students that have chosen service design over the years were female. Another interesting result is that since 2010, when the end user focus on children and elderly started to gain interest, 77% of all projects focused in these areas have been done by female students, often in cooperation with a partner from the public services such as hospitals or other health services; in cases where an industry partner participates, is this usually a design agency, with a public service as client. This clearly suggests support for hypothesis 4.

## 4 DISCUSSION AND CONCLUSIONS

The analysis of the results has provided insight about to what extent the teachers' 'gut feelings' about how students' preferences about topics to take on in their master projects have developed over time. In most cases, these gut feelings have been confirmed. The preferences have indeed changed over time,

and interaction, health care and welfare design, service design, cooperation with public services, as well as a focus on children and elderly can indeed be observed, though changes are mostly from a more recent date than expected. The changes in focus are well in line with the department's research strategy which is made up of interaction design, health and welfare technology (which is also one of NTNU's research focus areas), and social and innovation design.

In the development of the department's new study program which was initiated in 2012 and is currently in its 3rd year of offering the new study program which, in addition to a new number of new courses, offers the two study specialisations product design and interaction design. In the fourth year, from summer 2015, a new course will be offered called Design for Society, which will, more than before, create space for addressing societal challenges (in particular health care) and introducing service design methods as part of the designer's tool box. The increased attention for service design topics may to some extent influence the requirements for deliverables in final master projects, where the final result is usually not a concrete product or interface, as it has been traditionally. Implementing and testing services is often experienced as more time consuming, and final results are sometimes regarded by external assessors as a proposal for a concept rather than a proven one.

On a last note, developments in students' preferences reflect the broadness and relevance of design throughout society; this was already visible close to twenty years ago, but holds even more truth today. Although not researched in detail, we see that students, more than before, find jobs in all industries, be it as designer, product manager or consultant. Designers with educational experience in interaction design and service design seem today especially in demand, based on feedback and inquiries directed to the department, and based on feedback from students that embark on the job market.

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