

1 - 6: Core Competency Areas

The core competency areas are typical for the field of Industrial Design, they distinguish our programme from the other ones at the TU/e. When observing an industrial designer at work, you would certainly see these competencies being put into effect. The first ones that spring to mind are: being creative and making a lot of

drawings. Of course there is more to it. As a designer you must have a solid view on the end user of your product and you have to know about the latest technological developments. Finally, you should be aware what influence your design might have in society and how you can position it in the market.



A B C D: Meta competency Areas

These are named 'meta' because they involve you at a higher abstraction level. At the TU/e other programmes also require most of these competencies because they are closely linked to being an academically educated engineer. For instance the ability to work in multidisciplinary teams, mastering the processes of design and

research and abstract thinking. Last but not least, there is one metacompetency typically linked to the educational model of the faculty Industrial Design: the ability to reflect on your own learning process and to direct it actively into the right direction.

A Multidisciplinary Teamwork & Communication	B Design & Research Processes	C Self-directed & Continuous Learning	D Analysing Complexity
A.1 Multidisciplinary Teamwork A.2 Verbal Communication A.3 Presentation A.4 Written Communication A.5 Professional Conduct	B.1 Design Process B.2 Research Process B.3 Scientific Research Process B.4 Reasoning	C.1 Learning Ability C.2 Self-Regulation C.3 Reflection	D.1 Generic Modelling D.2 Mathematical Modelling D.3 Data Modelling D.4 Logic & Language

Competency Framework Department Industrial Design

Idea Generation

I.1 Practice, select and apply idea generation processes and skills

I.2 Idea Selection & Communication

Select and communicate design concepts successfully through several different creative media

Concept Development I.3

Develop ideas through cycles of research and concept progression, in ways that support the philosophy and principles of the original idea, through several stages of design development and form building.

Ideas & Concepts

Develop visions and innovative concepts through creativity techniques, through experimentations and through the translation of research

Concept Appraisal

I.4 Develop the design concept with thorough integration of all relevant issues appropriate for the specific design project.

Ideas and concepts are initiated through different ways of thinking according to your attitude, influences and experiences such as: empathic thinking (concerned with feeling and sensing your way), associative thinking (compares and makes connections with different objects, places and experiences), different analysis and selection processes to select and match the best design, observing the flow of experience and actions, and physical modelling, as a part of the concept forming process. The process of generating ideas to develop into select-

ed concepts is a major step. It is worthwhile to practice your ability to generate and select ideas, as the key to producing effective design concepts. Ideas are born from your observations and experiences. Both non-explicit and purposeful observations provide natural conclusions about the immediate human/space/object relationships – basically ‘the world around us’. As an industrial designer you need to have a variety of activities and tools for the process of ideas generation and concept development.

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Sensors & Actuators

2.1 Design the (instrumental) interfaces between an (intelligent) product, systems or services and its environment.

Design and implement the internals of a product, system or service resulting in autonomous and intelligent behaviour.

2.2 Transformations & Intelligent Control

2 Integrating Technology

Select and integrate concepts and technologies from different fields into the whole design process

2.3 Physics for ID

Understand the mechanisms and principles of the physical world and use these to solve design problems

Material Properties

Take both & material aspects and manufacturing technology into account in the design process

2.4 Manufacturing Technology

Technology Integration & System Level Engineering

Design the architecture of an (intelligent) product, system or service in terms of internal components and their interfaces

Issues of a technological nature are very common for designers. Your design will need to meet all kinds of functional requirements, or demands related to prototyping and volume production. For industrial designers in the field of intelligent products, systems and services, 'design with intelligent technologies' is considered an essential topic. Intelligent products, systems and services integrate specific technologies to become more adaptive to the environment and to enable improved human experience.

Integrating Technology is a competency area that needs to be considered during the whole design process. Sometimes the focus lies at the end of the design process, sometimes technology can also be an inspirational part of the design process.

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3.1 Investigate the user in context through the use of methods and tools that support the gathering of valuable information. Users should be seen broadly: their capabilities, limitations and drives as they conduct daily activities.

Understanding the User

3 User Focus & Perspective

Observe and empathize with potential end users and analyse and interpret their needs.

3.2 User-Centred Design

Apply methods and tools for gathering information about users and integrate it in a structured design process with a focus on the end user.

Interaction Design

3.3 Create optimal behaviours for products, systems or services within the context of their use. Design the tangible and intangible elements that create an experience (response / action / challenge) for the user of a product, system or service.

With observation and insight of how people interact with products and the environment, designers can create products, systems and services that improve the quality of life. Design can also recognize key attributes that focus on the needs of each individual user or user group. With thorough user research and testing, products, systems and services can be optimally tuned to match these user needs.

The designer needs to take into consideration the cognitive limitations and capabilities of users, according to what they can learn, remember and how they think, etcetera. Human emotions and attitudes will also influence the appearance of objects and the user-interaction with product systems. People have different personalities, age groups, cultural groups, social groups, all of which influence their requirements and needs and the way they form communities and social relationships.

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Design & Art 4.1 History

Put his/her work in a perspective of design and art history, and take a well-founded and critical standpoint with regard to his/her and other's work.

4.2 Socio-cultural Trends

Observe and analyse social behaviours and their cultural context in developing design applications for specific communities.

4 Socio-cultural Awareness

Drive the design process from an awareness of developments in society, put the development of products in a broader perspective, and take position in and evaluate the possible impact of a product, system or service on society.

Design for Sustainability

4.3
Is aware of the roles he/she can take as an industrial designer with regard to design for sustainability, knows how to assess the environmental impact of a new product, system or service, and is able to drive the design-process from a sustainable perspective.

Industrial Design is inevitably part of the larger human society and culture. Global society develops at a breathtaking pace. Mega trends like ageing, globalisation, new technology and issues like scarcity of resources, political power, economic and demographic development, play an important role in what the world will be like in

the future and inevitably influence each undertaking in life. A designer needs to develop a keen bird's eye perspective on this continually changing cultural landscape turning observations and knowledge into products, systems or services which match the needs of societies and cultural communities.

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This competence covers the topics that relate to bringing new products to users in a global market using a dynamic international industrial context. It focuses on (structures of-) industrial business processes that are currently used to bring high-tech products to the market under the influence of a continuous influx of new

technology with a high degree of uncertainty of future user profiles. In this context it has a strong relation with competences that deal with product design; often this competence deals with activities that are also addressed in Product Design but now focusing especially on the industrial context.

Competency Framework Department Industrial Design



The human senses form the basis for the way we understand the world around us. Vision, hearing, touch, taste and smell all affect our reactions to objects, spaces and the physical world we inhabit. Form is the arrangement of a set of elements – these can be visual elements

comprising the shape, size, or colour of an object, it can be a set of sounds arranged in time, or it might be a series of smells selected to create a specific effect. Form is what the designer creates; senses are the human tools for perception.

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Multidisciplinary Teamwork

Adjust his/her role in the dynamics of an (international) multidisciplinary team to the demands of the different phases of the design process

A.1

Verbal Communication

Formulates opinion and information clearly, using language, gestures and body language; appropriate to listener(s), purpose, and context (in Dutch and English)

A.2

A.3 Presentation

Present an opinion, design idea, concept or other information clearly and convincingly to a group, using language, gestures, body language, and supporting materials where applicable (Dutch and English).

A Multidisciplinary Teamwork & Communication

Work together towards a common goal using all strengths within a team and communicate opinions, ideas, information and results clearly and convincingly.

Written Communication

Present opinion, information and design results clearly in writing with the correct structure, grammar, language and terminology, appropriate for the reader (in Dutch and English)

A.4

Act as a professional within the field of Industrial Design

A.5 Professional Conduct

Design projects by nature involve many different stakeholders and experts, where designers can play a leading role in the assimilation and integration of many different parts of the project. Inevitably this requires special skills and experiences to work in multidisciplinary teams, which are often internationally based.

Teamwork is about working together, where the whole is of more value than each person working alone. Teamwork is about understanding the differences between people, how to work together towards a positive goal and most of all, teamwork is about good communication and project management.

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An Industrial Designer should be able to run the design processes efficiently and effectively, to reflect on different kinds and different ways of designing and be able to choose an appropriate design strategy for their design challenges. Therefore you need to understand what kind of activity designing is, how it differs from other human activities, and which abilities you should develop to become a designer.

A successful design is highly dependant on a thorough research process as a 'knowledge builder' and 'information gatherer' about the subject domain. Specific research and design processes are planned and organised according to the nature of the design subject and context, these can be quite different and need to be considered carefully according to the required project deliverables.

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Developments in society are characterized by an enormous growth in available knowledge and information, which makes it impossible for graduates to have a complete command of their academic discipline. There is just too much to know and to learn, and what you know today may well be out of date in a number of years.

In your professional life as an Industrial Design engineer you will be challenged to create an environment that adapts to and supports the lives of individual peo-

ple. This will often ask for solutions on the cutting edge of technology. Becoming an ID engineer enables you to accumulate new knowledge and skills and gives you the ability to continue this learning development during future professional experience (well after your graduation). This requires an open attitude in your professional work and towards our society, including your own performance and learning needs in professional situations. You graduate once but you will never stop learning.

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Design problems generally are complex and ill defined. Analysis and formal modelling can be powerful tools to unravel principle patterns and mechanisms in the complex reality, and to explore the potential impact of design decisions.