

THE POTENTIAL OF DESIGN RESEARCH IN AN INDUSTRIAL CONTEXT

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To discuss the relation between design and product development and the potential of, for instance industrial design, it is necessary to – if not define – so at least describe what I mean with design and products.

To start with products – when I say products in the following, I mean physical products as well as virtual products and services. A car or a mobile phone are obviously examples of physical products. The software that control the computers in the car or the mobile phone is example of non physical products. The activities of a company that repairs the car or the company that facilitates to send SMS in the mobile phone are examples of another type of non physical product – a service.

So when I in the following mention “product” I often mean all three notations of product – physical, non physical and service.

Furthermore, a product is something that have been produced, not by hand but in a structured production process. A product is manufactured, often in large numbers of identical items and often but not always for commercial reasons.

Similarly it is necessary to mention something about design. The designer do not, as generally assumed, directly by her own hands give form to an object. If a person shape an object I would rather call that activity handicraft or art. Design is a *description* of how an object shall look, how it should feel to handle, how it should work, etc. The description can consist of text, sketches, technical drawings, physical models, digital models, animations, etc.

Design is also typically related to manufacturing of large series of products that will be used by a great number of people. If that is true it is possible to draw at least two conclusions.

The first conclusion is that the designer has to use a number of methods to find out how the product should be designed to match all needs and expectations that different categories of presumptive customers and end-users might have. Design is thus to plan the production of products aimed for persons that the designer know as categories but certainly not as individuals.

The second conclusion is that it is obvious that the designer can't be personally involved in the manufacturing of the product.

The industrial product development process is organised with the aim to, as effectively as possibly, develop products within a defined time and cost framework. An important actor in this process is the engineer designer.

The engineer designer is expert on product development based on technical knowledge. She or he has no or very little knowledge about methods of getting relevant information from prospective end-users or customers of the product that is under development. Typical for the engineering designer seems often to be to breaking down problems into sub problems and looking for solutions for the respective sub problems one after another in a linear process. The final solution sometimes is the sum of the different sub solutions. In this way the engineering designer often works “from inside out” and the organisation of components and sub solutions will finally form a

wholeness. But this wholeness is not a result of a vision or a result of a planned or controlled action. It might be a result where one or two sub solutions could have got a dominant influence on the wholeness which might result in a product that never will be optimised or perfectly adopted to human needs.

The industrial designer, on the other hand, is expert on product development based on knowledge of the end-user's relation to products. The industrial designer has access to and experience of a number of methods of retrieving information of the user's / customer's opinions and feelings of products, even of products not yet launched on the market.

The industrial designer works the other way round than the engineering designer. She or he is starting with the wholeness. The designer is studying different possibilities to create a wholeness with certain features and characteristics. The designer is working "from outside in". The designer wants to go into the technical construction of the product, into the organisation and packaging of components, in order to obtain the decided goal of the wholeness.

If the engineering designer is working in a linear process with a number of small decisions, the industrial designer usually wants to avoid just that as much as possible. The designer wants to take as many decisions as possible as late as possible in the process. The reason for this is that every taken decision eventually will lock the possibilities of creating new, creative combinations. The designer is working in an iterative process where the different phases are worked through time after time in the search for new combinations. The designer is at the same time altering between the wholeness and details.

The industrial designer has three main specialist competence areas. The first one is the ability to create an interesting and challenging form. The second one is the ability to understand the end-users and extract information based on the user's experience, her feelings and ideas. The industrial designer is trained to carry through a number of user studies to find this information. The third one is the ability to visualise. The industrial design process is a unique combination of an exploring and a creating process when searching for ideas that improves the product's usability and attraction. By visualisation, the industrial designer is striving to expose both the *factual* and the *possible*. The factual is the result of studies of factual use situation in the context in which a product will be used. The possible is the description of the possible design alternatives of the product itself and the possible features of the product.

Research about design is very important. We need to know more about design – design as a phenomenon in society, design and its importance for the industry, design as a professional activity, etc. Professional industrial design is a very young profession. Research about design generally and industrial design in special is still very sparse and immature.

Design research is very often equal to the study of design as a phenomenon. Researchers with a study background in economy, engineering design, history of art, psychology or cognitive science are looking at design from an outside perspective. They give valuable contribution seen from for instance an economical point of view or from a psychological or sociological perspective. This is a sort of research *about* design.

Very little design research covers the different activities that are connected to the design process itself and the design activities related to it. Researchers with a study background in one of the design areas (graphic design, fashion design, interior design, industrial design, etc) can be

studying proceedings, methods, tools or attitudes that are related to the design process and the design process' relation to the general product development process. This represent research *in* design.

The problem is that this kind of studies so far are very few. The reason is the immaturity of the area. There are still not so many students with a study background in for instance industrial design who want to go into the research business. This will of course be changed in the future.

At Umeå Institute of Design we have for a number of years carried through plenty of research projects that cover a certain aspect of this kind of research in design. This research scope, which I would like to discuss today, is about deeper studies of design activities related to user studies. This is a kind of participatory studies where researchers with a study background in industrial design are studying some aspects of proceedings and methods of user studies while they are performing a design project. At the same time as they are performing design work, they are studying themselves, the users and different actors in industry. By observing the efficiency of different methods, the reactions of the users, the communication with representatives of industry it is possible to draw conclusions that can be used to improve the proceedings and methods. This kind of reflection, analysing and trial of altered or improved methods is representing a kind of action research that is not so common in design research.

Professional industrial designers, employed at in-house design departments or at consultancies, often are working in a very tight time schedule. In most cases the designer therefore has to mainly concentrate on the most obvious core issues of industrial design – creation of visual form. The industrial designer is given little or no time to conduct serious investigations of user aspects of a future product, which is an important part of the industrial design competence profile.

Graduated industrial designers, with additional training in research methodology, can work with applied design research under different conditions than those being typical for the industrial designer in the industrial product development process.

I use the term *applied research* for the systematic and methodical search for new knowledge with a certain application in mind. Applied research is many time very close to *development work* which can be described as inventive and systematic use of scientific and other knowledge with the intention to create new (commercial) products, processes, systems or essential improvements of these.

Applied design research activities are typically released from the participation of a tightly scheduled product development process. They are carried trough before the actual development process starts. The goals of applied design research projects is much wider than of industrial design projects and the possibilities of free search for new and inexperienced solutions are greater. Last, but not least, the tolerance for a failure is much higher.

A researcher working with applied design research plays an important role by offering results of in depth studies of the presumptive end-user's opinions and thoughts. The design researcher sometimes fill a gap between the professional industrial designer and the engineering designer.

By studying how a product, that will be launched on the market in a near future, will be used and perceived, a very important contribution to the product development process can be given.

Methods like experience prototyping and similar, gives important high quality information on user's preferences, feelings and thoughts.

The kind of studies our applied researchers have been working with is mainly to perform different kind of user studies in different contexts. To be able to extend the knowledge of different user issues have been shown to be of a great importance for the industries we have been working with. This knowledge have been used in the product development and have led to improved products. In next step the design departments at the companies have used the research result in their regular design process.

A somewhat surprising observation is that from the industry's point of view, the ability to visualise is one of the most appreciated parts of the design researcher's competence. Visualising both result of the explorative process and the creative process makes problems and possibilities tangible for both users and the development team.

Another observation is that it is only after a long time of collaboration that this kind of research result can be of strategic use for the industry. A single research project can of course give valuable result in an isolated product development project. But the research result tends to stay within the small group of people that is working in that specific project.

As one of very few design educations in the world, the Umeå Institute of Design has an in-house research department with 10 researchers employed. A long term research collaboration, organised as a research program, with the Volvo Group started 1997. Up to today more than 30 design research projects have been carried through, which is described in an other paper by Thomas Degn in this conference. Similar research programs has been established with ABB and Umeå town. Beside that we have been collaborating with a great number of national and international companies.

The research activities are carried through by employed industrial designers with some research training and PhD students. We have been able to establish a good collaboration between research and education. The researchers frequently teach the Master's students. The industrial design students at Master's level at Umeå Institute of Design participate in the research projects during some term projects. Some of them also do their degree projects as part of a research project related to a company.

Also Master's students from other departments at Umeå University, who are carrying through their degree projects at the Institute of Design, give a very valuable contribution to the research. These students can come from departments like Informatics, Computer science, Applied physics and electronics, Psychology, Cognitive science, etc and bring new knowledge to the Institute and the research group. This is at the same time beneficial for our students since the general base of knowledge is increasing.

It is difficult to spread the result. Only after a long time of collaboration the collective result of a number of projects can be of use in a broader way in a big organisation. When a the research group at Umeå Institute of Design has been working with a company for a number of years it is possible to obtain a high level of penetration of research result in a big organisation. But it is very difficult. After years collaboration it is possible to have the research result spread to a bigger part of the product development department instead of limited to a small project group. In our collaboration with The Volvo Group and with ABB we twice a year give a major presentation of

research result at the company. We also document all result in reports. In the Volvo case we have produced some 30 CDs with result from research projects. They are all available for all product developers, directly from the CDs but also from an internal web site containing all the research material.

In this way both parties can benefit from the research result. The company gets research result that significantly raise their knowledge about the users of their products. This knowledge is spread to a great part of the developers at the company. By the long term collaboration with the company the research group can successively penetrate research issues that are more and more strategically interesting for the company. At the same time it is important that the research issues are of interest from a research point of view.

By the long term collaboration it has been possible to build up a confidence from the industry regarding the research group. This means that the researchers achieve a higher and higher degree of freedom in the sense of the possibility of proposing research scopes that are of interest both from the companies point of view and from a research point of view. Some results will remain confidential but most of the result can after some time be published.

Of course this kind of applied research is a balancing between applied research and development. Where is the borderline between research and pure product development? Is this kind of applied research in reality only a camouflage for product development? These questions are important to bear in mind when setting up applied research projects and research programmes.

The companies get detailed information about how existing and future products are used and will be used. They get information on the users opinion, their feelings, their expectations and they get valuable information on the context in which the products are used.

The researchers use a number of methods and can be observing how different methods works in different situations. They can also draw conclusion from the reactions from the developers at the companies. Which part of the research result and what methods are arousing most interest from the developers?

To be able to from a more general point of view study the potential of the design process in relation to the technical product development process, Umeå Institute of Design is currently planning for the establishment of a national center for design research – the Umeå Design Research Center. The Center will constitute a broad academic design research competence. Partners will be a number of major Swedish and Finnish manufacturers, public units and consultancies. Examples are Autoliv, ABB, Komatsu Forest, Nokia, Volvo Trucks, Volvo Cars, IKEA, Hennes and Mauritz.

The research activities will be performed in collaboration with the Business School at Umeå University and the Department of Economy at Stockholm University and will be carried through by employed researchers, PhD students, Master students as well as with researchers and designers at the respective companies or organisations.