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HOW CAN A DESIGN PROCESS AND A SCIENTIFIC PROCESS IN INFORMATION DESIGN COLLABORATE?

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Abstract: *This paper presents how a design process and a scientific process can collaborate and act together when we are working with design of information. The paper is based on interviews with information designers, an analysis of two relevant scientific publications, and a study among members in the research team in Information Design, at the Department of Innovation, Design and Product Development, at Mälardalen University in Eskilstuna, Sweden. Praxis and theories ought to enrich one another in Information Design research. An information designer has to be conscious about her/his design activities and the knowledge that can be used with a specific intention. How a design process and a scientific process will collaborate depend on definitions of science, scientific ideals and theories we use as well as our basic view of how to construct knowledge.*

1. INTRODUCTION

One of the primary areas of interest for the business community is information design for product development. In Sweden, the subject Information Design developed from engineering. In 1999 Information Design was declared an academic subject at Mälardalen University in Eskilstuna [1]. Information Design is the art and science of how to design messages that are understandable to the intended audience. It may be text and images in a manual, artefacts and shapes in an exhibition, or light and audio messages in a car. In the world of business, information design has a clear task, because "if we do not understand information, we cannot act upon it." [9].

A graduated student in Information Design will master how to analyse, plan, prepare, shape and evaluate an information set [1], [2], [3], [4]. Therefore an information designer needs practical as well as theoretical knowledge, and experience of scientific methods. Is there a paradox here?

Articles on design research include statements that no designer is working with only one method, and that design is nothing in itself and only a part of other sciences. Other statements suggest that design is a practice or that it is impossible to create fundamental laws within design because design is about creativity [5], [6], [7], [8].

Knowledge about how to deal with science within Information Design is a necessity. Today target-group analysis, usability tests and evaluations are done to study if the designed information fulfil its purpose. These are scientific methods used at the beginning and at the end of a design process. But how can we deal with science in "the middle" of a design process? What can be suitable scientific methods and scientific attitudes in Information Design research?

Snodgrass and Coyne claim that: "*Designers are truly designing when they are so absorbed in the task that they are not aware that they are designing.*" [5]. If an information designer is totally absorbed by her/his creativity and not aware of scientific methods during the design activities, then it might be impossible to educate students to become skilled craftsmen with a conscious scientific attitude. In this paper we discuss how a design process and a scientific process may collaborate and act together.

1.1. What is Information Design?

In this paper the term "Information Design" is defined as a multidisciplinary topic, which comprises a holistic view of techniques and processes adapted

when designing information sets, as well as studying the usage of them.

Information Design shares points of view with other areas of knowledge. The most important ones are language, art, aesthetics, communication, information, cognition, economy, law, and media technologies [1]. In this way Information Design can be a part of other disciplines, influencing for instance Product Development. Here information design can be significant for the technical communication between actors in a product development process [10].

1.2. Delimitations

In this paper we discuss science and design, with focus on Information Design. We do not discuss product development processes. The literature studies and the study are used to increase our understanding and to explain scientific methods and attitudes in Information Design.

2. DESIGN

The concept of design was expanded at the end of the 20th-century. Focus changed from traditional values of aesthetics and art to functional values in modern industrial mass production and concepts of usability. In modern industry the correlation between economy, environment, man, material, organisation and technnology are important factors. In this paper the concept design includes (1) processes used when designing products, environments and systems. The term design also includes (2) the result of (1). The form should support the usability, the shape should be aesthetic, and it should be adapted to economical, environmental, human, material, organisational and technical demands.

In this paper a designer is defined as a person who runs a project, visualising products, environments or systems, both in mind and in performance. A designer is confronted with some of the higher cognitive abilities as creativity and problem solving since design unites parts to a whole [6].

2.1. Creativity

Hagoort [11] refers to Wallas, who developed the PIIV-model. The model describes creativity as consisting of the following linear stages: Preparation, Incubation, Illumination, and Verification. Comparing creativity with a linear process can cause some confusion since creativity is not linear sequences of steps or phases. One example of a non-linear process is the pragmatic perspective. A person adjusts her/his creativity to a specific situation. An example is a female dancer who describes her creativity as:

A) The starting point can be a word, an image or a piece of music.
B) The brood deep thinking phase. Limitations of the area start to appear.
C) The concentration phase. The idea gets a concrete shape.
D) The risk phase. The performance/the piece is presented for an audience.
E) Finally it shows if it has, or if it transfer, the intended value or quality [11].

You may plan to be creative, but you cannot plan the creativity. To use ready-made methods when solving a problem is not creative. Neither is the usage of a tool, but the tool can be used to express creativity [12]. The creativity is within the designer's activity and knowledge of how to combine the tools. An information designer may use combinations of language, images and/or shapes in creative ways.

2.2. A Design Process

Design processes describe the planning and forming of a product. A design process is multi-faceted depending on discipline, the product, the target group etc. An information design process is comparable with a communications process. Steps that can be included are:

- Analysis of/defining problems.
- Analysing requirement.
- Planning the work/project.
- Synopsis.
- Development.
- Production.
- Evaluation.
- Making decisions.
- The finale product/commission.

The assigner can be a customer or a company, and the target group are the users. In a design process there are several phases when decisions has to be made, as well as a recurring of tests and reviews to avoid defects of the product. The goal is the final product and an evaluation is a way of examining the design [13], [8], [1].

Design activity and design processes are not the same [14]. The designer's activity is just one component in the design process, since a design process includes parts when the designer is no longer active e.g. preparing for press. To design can be described as the sum of the designer's activities. Those activities result in "*realizing the transformation of designing in the design process...*" [14].

2.3. A Scientific Process

Just as the concept "design process", a "scientific process" is multi-faceted [1]. Its expression depends on the research area. Is it research of predicting a phenomenon, prescription of a method or a development work? One way of describing a scientific process is:

- Problem/complex of problems.
- Questions/hypothesises.
- Literature study/facts, analyses.

- Theorizing/methods (induction and/or deduction).
- Testing, for instance hypotheses.
- Analysis, evaluation and discussion of the result.

Reflections are done between the diverse phases in a scientific process. Evaluation of the results leads to future research and the goal is to create new knowledge [15].

2.4. A Design Process and A Scientific Process

Nijhuis and Boersema [15] conclude that a graphic designer and a behaviour scientist can collaborate and produce a successful result. Sometimes conflicts rise because of professional differences in how to deal with time and money. However, many similarities can be found in the processes. *"Not only is it possible to construct congruent strategic models of the two disciplines, but it is also shown that the corresponding tactics are remarkably similar. Differences exist only at the operational level, where specific skills and methods are used to achieve intermediate results*." [15. p. 21-41].

3. DESIGN AND SCIENCE

Cross [6] describes three different ways of approaching design and science: scientific design, design science and science of design. *Scientific design* has its foundation in industrial design, and deals with methods, intuitive and non-intuitive, in modern design practice. *Science of design* is the scientific analysis of the design activities performed via scientific methods. *Design science* deal with the organisational, the rational and wholly systematic approach to design; to bring forward scientific knowledge of artefacts and design as a scientific activity in itself.

3.1. What is a Theory?

A theory is a number of assumptions or statements that conceptualises diverse phenomena, and systematises our knowledge about them [15]. According to Hooker [16] a theory is not only a conceptual framework, an enclosed area. A theory illustrates how something is and why. The system built for categorising species of plants of Carl von Linné is not a theory, subsequently it does not state anything. A theory is a tool for the human mind, just as equipment can be a tool for an action [17].

3.2. Design Theory

Design theory can be viewed in two perspectives, a "dogmatic design theory" and a "zetetic design theory". The dogmatic theory deals with how a model is transferred to a concrete object. A zetetic perspective relates to the understanding of the performance, in other words, how the model is created. The actions will be perceived as a way of communicating meaning [18].

Design theory may be defined differently depending on how we reflect upon design. If we focus on how design can be perceived, design theory will deal with socio-psychological phenomena. The interpretations of design are within the knowledge of the signs that are surrounding us. It may be a political and cultural context, which influence how humans understand and create meaning [19. p. 14 ff].

If we approach design as craftswork, design theory will deal with how to organise the knowledge of design as a practise [16]. If we reflect on design as Le Corbusier, a way of thinking [20], design theory could deal with the actual mental visualisation process model. There are however some doubts if a design process can be theorised. Hooker [16] claims that design is a part of different supporting sciences and therefore designing is explained by several theories. Hence "*...one cannot theoretically organize his knowledge of how to design."[16]*.

If theorising about design or a design process is possible depends on how humans view knowledge. Ramirez [18] claims that design theory represents a reversal theory of knowledge. If theory of knowledge is about how reality can be perceived and how our ideas meet the world, a design theory is about how reality is created and how our ideas and experiences can shape or change the world.

3.3. Design Science

Around 1920 the design association De Stijl argued that creating new products required methods or objective systems [6]. During this period of time architecture was systematised and organised by Le Corbusier. Today, in Sweden, design science is a subject matter at the university "Mitthögskolan" and the name of a department at the university "Lunds tekniska högskola".

Herbert Simon introduced design science as a concept in 1969, in the textbook *The design of artefacts*. The introduction of design science was a way of separating the research in academic design topics from the practical and artistic activity, used when developing utility goods [21. p. 235]. Design science was a movement of forming a doctrine about the design process [6], and a doctrine of "the logic of artefacts which is related to /…/ the logic of the natural world." [22].

Simon was active at the time when the concept of design increased from traditional aestetical values to functional values in modern industrial mass production and concepts of usability. Simon discussed principles and laws, similar to the concept of usability. Some of the principles and laws were: "*satisficing, heuristics, search and bounded rationality and satisfactory*" [22]. In design solutions there are grades of satisfaction, both economically and during

the actual usage "*Thus, designs, in general, constitute satisficing solutions to design problems*" [22].

Critics of design science claim, for instance, that design is nothing in itself, just a part of other sciences. Other comments are that there are no fundamental laws in design or that design is a practice [5], [6], [7], [8]. Some scientists connect design science to the positivistic formal logic, since design science is a way of establishing an underlying philosophy concerning the meaning of design [23].

4. SCIENCE AND ATTITUDES

Science is often directly related to scientific method. To explain reality and predict incidents are som of the main tasks (especially within natural science). Another main task of science is to understand actions and behaviour of humans (especially within humanities and social science) [15], [17].

Research is the work of developing theories, methods and concepts to broaden the existing body of knowledge and to give birth to new knowledge. There are many different views of knowledge and various kinds of knowledge, and many ways to develop experience, insight and knowledge. All these aspects are, however, not at all discussed in this paper. The Organisation for Economic Co-operation and Development (OECD) has accepted that research can be performed as:

- Fundamental research. (When seeking new knowledge and new ideas.)
- Applied research. (When aiming at that the application.)
- Developing work. (When systematically and methodically use scientific knowledge to create new/improve products/processes.) [15]

The goal in fundamental research is to create new knowledge, also in areas where nobody can see "a practical use" for it. Fundamental research does not require any direct use of already existing knowledge. However, results from fundamental research are often used in applied research and in developing work [36, p. 246].

The goal in applied research is to develop experiences and knowledge that are needed in order to find solutions to existing and concrete problems. New knowledge is applied where it is needed [36, p. 591].

Research activities in developing work deals with changing and improving processes and products [36, p. 635].

There are no clear borders between these three types of research. On the contrary the borders are rather indistinct.

A research project in Information Design can rankle in the group "developing work", and grow into the group "applied research", maybe also into the group fundamental research. For example, a radical innovation can lead to fundamental research. Research performance may depend on discipline and ideals.

4. A Positivistic Scientific Ideal

There are two main traditions within science – the positivistic tradition and the hermeneutic. These traditions represent different scientific attitudes and ideals.

Positivism is often ascribed to Comte, who claimed that we should not deal with the religious and metaphysical ways of explaining the world [15]. The positivists declare that human knowledge is limited to the experience of the senses, and to the general assumptions based on that experience [24]. Knowledge could also consider the relationships between ideas [15]. The positivistic main purpose is to universalise science and to contribute to human knowledge. It means to observe, measure, describe, systematise, correlate in a taxonomy/ontology and be able to predict and reproduce behaviour.
The positivistic ideal has influenced formal sciences as logic and mathematics. The ideal can be found among the British empirics and the logical positivists [15].

In the formal logic ideas during 1900 the logical analysis was considered the one and only philosophical method [24]. Actors of formal logic claimed that sensory impressions do not need to be interpreted, since the sensory impressions are neutral observations and these observations are used as foundations to all knowledge.

Positivism does not only concern logical science. It is a scientific attitude and an ideal. You can be a mathematician with a positivistic attitude as well as one with a hermeneutic attitude.

4.2. A Hermeneutic Scientific Ideal

There are several parallel concepts of the hermeneutic tradition. We present the progress of hermeneutic tradition from three perspectives.

According to Dithey it is not necessary to have an object or phenomenon physically present. Humans can also perceive an object/phenomenon mentally and spiritually, since a human being can develop concepts or symbols. This is called *"The dialectic hermeneutics"* [15], [24].

According to Apel we first have to understand a phenomenon in order to explain the cause of it. Traditions of the culture influence human interpretation, and consequently the understanding. A concept can be understood when humans can watch and listen to how it is used in action. This is called *"Transcendental-pragmatic hermeneutic"* [15], [24].

According to Von Wright all phenomena that constitute human culture are characterised by meaning and intention. The situation is crucial. The purpose of a specific action cannot be explained if we

do not understand the situation in which the action is taking place. Meaning can be obtained and learned by conscious actions. This is called *"Critical-analytic hermeneutics"*[15], [24].

4.3. Design and Hermeneutic

Niiniluoto [25] discusses design science with a hermeneutic attitude. Design science is not about describing how things are or to prevent incidents. It is about explaining how something should be to reach a certain purpose or goal. This gives birth to knowledge of how planned actions can reach to a certain purpose. This so-called "mean – ends relation" is based on the critical analytical hermeneutic [15], [24].

According to Von Wright [33] it is impossible to examine a person's intention without examining how those intentions transformed into an action. Von Wright's intention model deals with action and intention [33]:

1) The individual (I) have the intention to reach a goal (G).
2) According to I´s opinion it is necessary to make a specific action (A) in order to reach G.

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3) When the right situation is present then I start doing A.

A conversion of this model can be described as: "*If you (I) want G, and believe that you are in situation B, you ought to do X*." [25]. Where X is a recommended action to reach a certain goal. Niiniluoto argues that the describing sciences do not accept such conclusions, since it is an expression of how things should be, *"but it may be a part of what we may call design science*." [25 pp. 375].

It is probably impossible to be sure of what have to be done and how things ought to be. One may wonder who is deciding the criteria?

Snodgrass and Coyne [5] claims that designing is not based upon problem solving, but on interpretation and the comprehension of a situation. Design is adapted to a certain situation, where object and subject is inseparable, just as in the philosophy of human sciences. Design work is hermeneutic and follows the hermeneutic spiral, since design is based on the relation between the whole, the parts, and interpretation in every step in the process. Design is a symbiosis of questions and answers, a so-called *question-answer structure*, just as the concept hermeneutic spiral declares. Hence design can not be performed in a positivistic attitude and with a formal logical alignment.

Hermeneutics discuss that there are at least three ways of understanding a phenomenon: bodily, mentally and spiritually. Accepted data, within humanistic and social sciences, should not be compared with data in natural science. It is not enough with observation hence hermeneutics claim that a scientist has to understand the data. It can be compared to scientific research within the dicipline of Information Design, where information can not be achieved until a user has received, interpreted and understood the data.

5 INFORMATION DESIGN

How humans create meaning is the hart of the Information Design. It is not enough with data. We need information. In Information Design data can be defined as values, processes and facts. Information can be a process, knowledge or an artefact [26].

5.1. Data and Information

In Information Design we define data as values. The data "3" can for instance be a date, temperature, or the lenght in metres. We have to understand the data to be able to organise and embody it in an information set. The information set can be seen as a representation of the data. How the information set is interpreted and result in meaning is a process in the minds of humans. In the discipline Information Design, there is a semantic perspective of information as "*data + meaning*" [34], since information is the result of humans' interpretations and attempts to produce meanings.

5.2. Research in Information Design

To generate meaning requires knowledge of the codes that are shaping the world [19], [27], [28]. Information Design is a multidisciplinary field of research. Most of the research in Information Design is applied research and some research is developing work. Theories are based on practical performances and scientificly founded knowledge. Critically selected research results from other disciplines are used to develop laws, principles and guidelines for the designing of information sets that fulfil communication demands and economy. Evaluations give feedback when receivers tell us if the information set was successful or not [29].

Within natural sciences, laws can be categorised as fundamental, empirical and observable phenomenons. Some scientist's claim that it is impossible to create fundamental laws in design, since design is innovative and creative. This does not resist fundamental laws, principles and guidelines within Information Design. Here a fundamental law is that all documentation should be current, understandable, correct, and relevant for a target-group. A principle is the RLR-principle, an information set should be readable, legible and have reading value. An example of guidelines can be directions to suitable colours for overhead- and PowerPoint-presentations.

6. STUDY

To be able to understand and explain the use of scientific methods in the discipline Information Design we have studied purposes, scientific methods and presentations of data in 38 articles, presented in IVLA Selected Readings 2001 [30] and ID-Journal 2002 [31] – two publications in our field

Our study focused on the three concepts *design process*, *scientific process* and *scientific attitudes*. How concepts are described in theory and how they are used in practice can vary [24]. In order to understand and explain how the concepts are practised we have studied the tacit knowledge in Information Design at our department[1].

In order to understand and explain scientific attitude and the use of scientific methods, two professors and five PhD-students in Information Design (lated named "the research team") have answered questions via e-mail concerning methods, presentation of data, satisfaction of a result and how they consider good quality.

We conducted 1,5 hours long interviews with five teachers. The teachers are information designers – theoretically orientated competent craftsmen. The questions concerned descriptions of a design process and activities, in a specific mission. To understand a process, methods and attitudes we asked how the information designers gain knowledge when planning and shaping an information set. Do they use their own pre knowledge and their own opinions, or do they use research methods and external sources?

We want to understand if the information designers evaluate and judge the result methodically or by own opinion/feeling. Usability is a concept of quality. We want to understand how the information designers evaluate quality? Do they mainly want to perform "their own thing", or can other factors influence their satisfaction and evaluation of quality.

Finally we want to understand similarities and dissimilarities between the research team and the information designers.

6.1 IVLA Selected Readings and ID-journal

30 of the articles in **IVLA Selected readings 2001** present purposes that are descriptive (describes the reality via for instance observation), constructive (developing of products), normative and prescriptive but not predictable. The scientific methods are often qualitative as for instance experiments, case studies, studies of historical information, theory-building, mappings, usability testing, project descriptions, presentations of questionnaires, personality test in combination with observation. The articles consider how humans apprehend and behave.

The study of eight articles in **ID-Journal 2002** shows a multitude of research areas and methods. The purposes are normative and constructive. Some of the presented scientific methods are experiments and simulations, use of questionnaires, quantitative and qualitative analysis and philosophical concept inquiry. The methods are mostly quantitative.

In both publications a qualitative study seems common. The descriptions and the usage of methods differ between the articles. A specific concept can have different terms and a specific term may denote different concepts. The methods are not unison and not comparable. This multitude of methods and diverse terminology can depend on the fact that the articles are representing different research areas as engineering science, behavioural science and educational science. *The conclusion is that a multitude of methods representing diverse research areas can be used as scientific methods in Information Design. The descriptions of terms, concepts and usage of methods varies and it is not possible to compare the results.*

6.2. The Research Team

The questions to the research team were:

1. What kind of scientific methods do you use?
2. Why do you use this/these methods?
3. How do you collect and gather the data?
4. When are you satisfied with the research result?
5. What is good quality, for you?

The research team in Information Design uses methods like experiments, testing of prototypes, questionnaires, interviews, and observations. The methods are both quantitative and qualitative, with a qualitative majority. The usage, the descriptions of methods and terms differ. We know that members in the research team come from different scientific traditions. The similarity between the members in the research team is that all of them are working on how humans interpret messages and how they behave.

It was concluded that the research team in Information Design work with a multitude of methods from diverse scientific traditions. The descriptions terms and usage of methods varies.

The team members were satisfied when their research results are reviewed and paid tribute to by experts. One researcher said that he is never totally satisfied since every new result raise new questions. Another researcher pointed out that good quality is a durable development: "A research result always has to be developed. I am satisfied with the result when I can see that there is a connection to other research."

Concerning the question on how they estimate quality in their field of work one researcher described it as: "The easiest way to say, is that an article that has been published in a qualified scien-

[1] The department of Innovation, Design and Product Development at Mälardalen University in Sweden.

tific journal has good quality." Another researcher describes good quality as building knowledge and know-how within a certain area.

Members in the research team are satisfied with the research results if it has good quality. If the research result can verify or falsify a hypothesis then it is of good quality and can lead to new recognised knowledge.

6.3. The information designers

The questions to the information designers were:

1. Are you active in a mission or can you tell us about a mission you have performed?"
1. How did you start the project?" (step by step)
2. How did you obtain necessary knowledge?"
3. When are you satisfied with the result?"
4. What is good quality?"
5. Is there something unique with an information designer?"

The information designers have experiences in exhibitions, graphic design, illustrations, technical illustrations and online education. They described their activities, step by step, when performing a specific design job. The interviews revealed that the information designers have a strategy and they do not work haphazardly. The processes resemble in such way that the information designers desired to understand for instance the users and the customer's requirements. The designers deepen their knowledge about the problem and they start to generate ideas and solutions. The solutions are reconsidered and the mission becomes more concrete, as Information designer nr 3 describes that he contacts expertise, ask questions, writes new text, and alter old ones. The information designers tend to be most creative when they have deepend their understanding and gained knowledge about the case. And then they feel that they have good possibilities to use their creativity during the first sub-processes in the design of information material. Then a framework of limitations develops and the creativity decreases. Information designer nr 5 describes that he tends to work in a "fluffy cloud to become more square".

The information designers work after diverse methods when they deepen their knowledge. Examples are literature studies, observations and interviews with experts etc.

Information designers' satisfaction with a result and how they consider quality are related to time. Time is an important factor. What is lack of time in a project? Did the information designer do as much as he could with the available time? Did he meet the deadline? The time decides the form of the information material, for instance the style of illustrations.

The customer, the user and the information designer influence the satisfaction and sometimes the perception of quality. Did the customer receive what she/he wanted? Did the user understand the message? Did the designer perform what he wanted? As Information designer nr 3 remarks: "… as a designer, you often know the answers to how it could have been. You know it could have developed much more." Quality can be connected to the information designers' own succession.

There are occasions when the opinions from the customer decide how the information designers will judge the result. And contrary, as Information designer nr 1 explained, when he is satisfied the customers also seem to be satisfied. The information designer can also be satisfied with a result if he tried something new (e.g. a new style) or completing a project.

The information designers claim that the subject Information Design is unique but not its occurrence. There are for instance graphical designers that design information. Information designer nr 4 argues that information design is about common sense. Some of the designers tend to think that information design is praxis, a convention, which influences their work, without being really conscious about it. There can be a conflict between Information Design as an academic discipline (theory) and skills (praxis).

The information designers do not always connect their satisfaction of the result with acknowledgement of good quality. Sometimes compromises, caused by for instance lack of time influence their satisfaction since the result could have been more successful. Sometimes the information designers are satisfied with the result if they just succeeded to meet a deadline, manage the project or if the customer is satisfied.

7. DISCUSSION

***Scientific Methods*:** The study shows that there is a multitude of accepted scientific methods in Information Design. Since an omnipotent scientific method do not exist an Information Design researcher should be free to use a method/methods she/he finds suitable for e.g. verifying or falsifying a hypothesis.

Information design is a multi disciplinary subject, therefor researchers will use experiences from different traditions. This is a necessity if we should be able to understand a complex situation or problem. This gives cause for the importance of establishing a common terminology within Information Design.

Scientific Attitudes: The designers do not use the same method to gain knowledge. Some carry out observations, some conduct interviews and some perform literature studies. The use of diverse methods may be a result of different target groups and different purposes. The study points out that the information designers have a structured working

method when designing. The information designers have a similar attitude – a hermeneutic attitude. They work with the whole and the parts, they review, interpret, alter and change, they review, interpret – in a hermeneutic spiral.

The scientific methods used by the research team and used in the scientific publications are similar to the methods used by the information designers. The methods concern applied research, with a majority of qualitative studies; a hermeneutic attitude is often described, and a common purpose is to understand human interpretations and behaviours.

The subject Information Design is founded on theories (based on scientific knowledge) and craftsmenlike experience and praxis. When working scientifically in Information Design both constructions of the scientific knowledge and the craftsmanship should be examined. What are the similarities and what are the differences? As Snodgrass and Coyne [5] we conclude that information designers, who operate both practically and with a scientific approach, require a hermeneutic attitude.

Creativity: Creativity is a part of the design process and pops up repeatedly during the process. The information designers are not totally absorbed by their own design activities; instead they have a constant correlation with the external-, close- and internal contexts. The designers seem to be highly conscious of the framework and their design activities. Any obstructer lines of action do not exclude an analytic thinking. If anyone or anything should be considered creative the activity has to be based on a thought [12]. The thinking and acting are connected to each other. Creativity is also a part of a process.

Result and Quality*:* The information designers and the members in the research team have different attitudes toward the final result. In the research team it is common that the members are satisfied if the results have good quality, in other words, if they verify or falsify a hypothesis and contribute to new knowledge. To be accepted in a scientific journal and reviewed by experts is a mark of quality. A scientifically accepted research result and good quality is united.

The information designers distinguish between their satisfaction of the results and good quality of their work. They seem to have a mental picture of the results[2]. Influenced by compromises, the designer sometimes thinks that the result could have been better. They tend to find an intrinsic value in designing information, since they can be satisfied when they created an information set that had a so called "wow-effect", or if they just manage to complete a project.

It is probably not possible to compare the research team with the information designers, because they work under different conditions. The research team do not have a customer, and they have the possibility to be reviewed by experts within the same field. The designers have a customer. Independent experts reviewing the result are not common. In the academic subject Information Design it is of relevance to discuss the relation between the assignor and the information designer.

Time and Money: An information designer is not an isolated island. According to the interviews, the framework, the requirements of the target group and the desires of the customers affects the information designer. The information designers tend to relate their satisfaction of the result and their viewpoint of quality to time. For instance the time limit can decide the artistic style and influences the designers' evaluation of the result. Also research results are influenced by external factors, since there are other interests than only the scientific ones. A research result can be affected by the status of the scientist, political context etc. [32].

Applied research is the most common in Information Design and some researchs are developing work. They are both governed by needs and have to be useful. If research in Information Design will consider a design process as a scientific activity in itself, we may be snared to our own and others expectations of a result in a developing work. Nijhuis and Boersema [8] claims though that a design process and a scientific process can collaborate. The differences are in how to deal with time and money. *When working scientifically we need to consider how time and money, satisfaction of the result and quality may influence the design activities and the result. It is a question of consciousness and research ethics.*

Collaboration between processes*:* Some scientists within design science argue that a design process is a scientific activity in itself. In this paper we enlighten that a design process does not have to be a scientific activity. The information designers did not intend to discover and establish new knowledge. They found an intrinsic value in designing. Hubka and Eder [14. p 45] discusses that if a design process should function as a scientific activity within engineering science, there is a need of: "…self-motivation, openness to newer outlooks and insights, and sufficient and suitable prior knowledge." *If a design process and a scientific process in Information Design should be able to collaborate we have to raise the level of consciousness of a scientific attitude during the design activity.*

Some scientists claim that design science is based upon a positivistic attitude. It is about forming a universal design philosophy, and to establish a common base in a logical positivistic tradition. With a positivistic attitude the focus may be to use the same methods, since design processes do not reveal the same results [6]. It is not possible to design deci-

[2]Cross [35] presents a study where product designers tend to influenced the product by the first mental picture they recived, before analysing the problem or seeking for new knowledge.

sive models of how humans interpret and understand information.

Some scientists claim that design is hermeneutic. There are several perspectives in hermeneutic. One perspective focus on understanding by mentally visualising, another on understanding by watching, listening and observe a process. The third perspective aiming on understanding a specific situation and action. We believe that developing work in Information Design can be linked to the critical-analytic hermeneutics attitude, presented in the intention model by Von Wright. He demonstrates the relation between an intention, an action, a situation and a goal [33]. Niiniluoto [25] argues that this is an expression of how things should be.

In Information Design research there can be several different results. It is probably impossible to be sure of how things ought to be. One may wonder who is deciding the criteria?

If knowledge is as Plato defined, *justified true believe*, we believe that not one result but several results is also knowledge. We argue that in Information Design the users/receivers are deciding the criteria via their experiences of an information set (a product). Is the message correct? Is it readable? Does it give satisfaction? In Information Design research those experiences are collected into laws, principles and guidelines.

We believe that a design process can be a scientific activity if the information designer has a conscious scientific approach. What is our intention? What situation is present? And how will a conscious design activity have an effect on the goal? An information designer has to be conscious about the knowledge brought forth in a specific action if she/he wants to work scientifically.

Research in Information Design depends on our definition of science, the attitude we have, on what theories we base our knowledge, how we evaluate the results and our opinion of what knowledge is. The praxis and the theories ought to enrich each other when creating a foundation of knowledge.

While knowledge theory is a theory of how reality should be apprehended and how our ideas agree with the outer reality (environment); design theory is a theory of how reality can be created and how ideas and experiences can shape an outer reality (environment) [18].

8. REFERENCES

[1] R. Pettersson, *Information Design an Introduction*, Amsterdam, Philadelphia: John Benjamins Publishing Company, 2002

[2] Jacobson, R. (2000). *Information Design*. Cambridge. Massachusetts: MIT P

[3] R. E. Horn, *Information Design: Emergence of a New Profession*. In Jacobson, R. (Eds). (2000). *Information Design*. Cambridge. Massachusetts: MIT P, 2000

[4] International Institute for Information Design (IIID): www.iiid.net, 2004 February 13

[5] Snoddgras & Coyne, *Is Design Hermeneutical?* Architectural Theory Review, Journal of the Department of Architecture, The University of Sydney, Vol. 1, No. 1, 1997 pp 65-97.

[6] N. Cross, *Designerly Ways of Knowing: Design Discipline Versus Design Science*, Direct Science, Massachusetts Institute of Technology, *Design Issues*: Volume 17, Number 3, 2001

[7] R. Willem, *An exhibit of designing*, Design Studies 17, Elsevier Science Ltd, Great Britain, 1996, pp. 241-251

[8] W. Nijhuis & T. Boersema, *Cooperation between graphic designers and applied behavioural researchers*, In H. J. G. Zwaga, T. Boersema, & H. C. M. Hoonhout, (Eds.) 1999. *Visual information for everyday use. Design and research perspectives*, London: Taylor & Francis Ltd, Philadelphia: Taylor & Francis Inc, 1999

[9] *Information Design Makes For a Better World*, No. 1, Design at Work Learning Network, 2003

[10] C. Andersson & S. Elfving, *Shifting Communication Paradigm Changes Course of Product Development in Clusters*, In B. Griffin, (Eds), Selected Readings: IVLA-conferece 2003, Changing Tides, Newport, USA, 2003

[11] G. Hagoort, *Art Management. Entrepreneurial Style*, Delft: Eburon Publishers, 2000

[12] E. Raudsepp, *Kreativitetsboken*, Stockholm: Pocket express, 1993

[14] V. Hubka & E Eder, *Design Science*: *Introduction t the Needs, Scope and Organization of Engineering Design Knowledge*, New York: Springer-Verlag Berlin. Heidelberg, 1997

[15] Nationalencyklopedin (NE), http://www.ne.se/, 2004 Mars 19

[16] J. N. Hooker, *Is Design Theory Possible?*, Pittsburgh: Graduate School of Industrial Administrations, Carnegie Mellon Uiniversity, October 1991. Revised in November 1992.

[17] J. Lundequist, *Design Och Produktutveckling : Metoder Och Begrepp*, Sverige: Studentlitteratur AB, 1995

[18] J.L. Ramirez, *Designteori och teoridesign*, Stockholm: Nordplans Medd, 1995

[19] L. Rampell, *Designatlas: En Resa Genom Designteori 1845-2002*, Sverige: Gabor Palotai Publisher, 2003

[20] O. Nylander, *Bostaden Som Arkitektur*. Sverige: Svensk Byggtjänst, 1999

[21] V. Margolin, *The politics of the artificial – Essays on Design and Design Studies*, Chicago: The University of Chicago Press, 2002

[22] S. Dasgupta, *Multidisciplinary creativity: the case of Herbert A. Simon*, Lafayette, USA: Institute of Cognitive Science, University of Louisiana at Lafayette, 2003

[23] K. MCPee, *Design Theory and Software Design*. Technical Report TR 96-26. Alberta, Canada: Department of Computer Science, The University of Alberta Edmonton, 1996

[24] Johannessen, K. (1999). *Praxis och tyst kunnande*. Stockholm: Dialoger

[25] I. Niiniluoto, *Futures studies: science or art?*, Elsevier Science Ltd, 2001

[26] M. K. Buckland, *Information as a Thing*. Berkeley: University of Calefornia, CA 94720, School of Library and Information Studies, 1991

[27] D. Araï, *Introduktion Till Kognitiv Psykologi*, Sverige: Studentlitteratur, 2001

[28] E. B. Goldstein, *Sensation and Perception*, New York. USA: Wadsworth Publishing Company, 1998

[29] NF. Roozenburg & J. Eekels, *Product Design: Fundamentals & Methods*, John Wiley & Sons Incorporated, June 1995

[30] *Visual Literact in Message Design*, In R. E. Griffin, J. Lee, V. S. Williams (Eds), Selected Readings: IVLA-Conference 2001, Eskilstuna, Sweden, 2001

[31] *ID Journal 2002*, Volume: 11, Issue: 1, John Benjamins Publishing Company, 2002

[32] T. Pinch, *Golem, What You Should Know About Science*, Cornell University, New York: Cambridge University Press, 1998

[33] G. H. Von Wright, *Explanation and understanding*, 1971, Citation in K. S. Johannessen, *Tradisjoner og skoler i moderne vitenskapsfilosofi*, Bergen: Døves Trykkeri AS, 1997

[34] L. Floridi, *Blackwell Guide To The Philosophy Of Computing And Information.* Part I: *Four Concepts*, Oxford. UK: Blackwell Publishing, 2003

[35] N. Cross (Eds), *Analysing Design Activity* Christiaans, N (Eds), K. Dorst. (Eds), 1996

[36] R. Pettersson, *Ord, bild & form – termer och begrepp inom informationsdesign*, Lund: Studentlitteratur, 2003