

# Human Computer Interaction – An Overview in Other Disciplines

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## ABSTRACT

In this paper, an overview of different kinds of approaches in phenomenology, philosophy and many more concerning Human Computer Interaction (HCI) are shortly introduced.

The outreach as well as complexity of computer technology has grown during the last decades, so that many people working with computers are not necessarily in this same profession. Therefore it has gotten more important to consider the aspect of human perception and comprehension of environment into HCI.

Many people have done research in this area, but most without connecting their research to the use in HCI. This paper will introduce some general ideas of these people and give a few examples for what it may be useful for in HCI. It provides a basis and insight to awaken interest for approaches which may be integrated into research or development of design processes in HCI.

## Keywords

Human Computer Interaction (HCI), enactive skills, intentionality, operational closure

## 1. INTRODUCTION

The use of computer technology and its software has spread among many different people, whose profession lies elsewhere than in the computer area. Software used varies from profession, company and workplace or even at home. So that people today often need to learn many different kinds of programs either widely used, e.g. Microsoft Office or Open Office or maybe even specifically used for certain task, e.g. control interfaces for machinery robots.

This makes it necessary to create software, which is easy to learn, use and explore for more detailed tasks. Therefore it is important to understand how humans perceive their environment and how learning processes work. In the following different people and their research useful for HCI will shortly be introduced as well as examples as in where the research could be helpful in HCI.

## 2. BASICS

### 2.1 Roots in the Past

The roots of the idea how humans think of their environment lay back in ancient times, about 370 BC, back to Plato and Socrates. When analogies were used to give a picture of assumptions. Best known is the Cave Analogy. This is a bit far in time, but may be helpful for some [3].

Quite a bit later René Descartes (1596-1650) was occupied with the dualism of mind and body [1]. His main question was about how subjective consciousness could know about external reality. With this came the Cartesian Program which engaged itself to this and many similar questions.

### 2.2 Intentionality and “Lebenswelt”

The phenomenologist and philosopher *Franz Brentano* (1838-1917) was engaged to intentionality. He was of the opinion that one had an inner mental intention to the world [1]. *Edmund Husserl* (1859-1938) was Brentano's student and later worked on his studies. He introduced a separation of the objects themselves, noema, and the mental experience of them, noesis. Then it was possible to examine the objects on the one hand and the experience of them on the other. The background understandings and experiences of the world were introduced by Husserl as the “Lebenswelt” [1].

Concerning HCI this is research which can be applied to the design of software. The intentionality can be integrated so that the designer should assume that the user has an intention of fulfilling a task in a certain way. The software should be able to satisfy or even help develop this intention. In addition, the background understandings of the interfaces should match that of the user, e.g. copying in the software should lead to duplicating a document as the inner mental intention of the user and his/her background understandings are.

### 2.3 Perception, Physical and Social Environment

*Martin Heidegger* (1889-1976) was a student of Husserl, but didn't necessarily agree with his thesis. Heidegger was of the opinion that objects and the experiences of them were inseparable. He called it the “dasein” – being in the world. Practical experience influenced the way people categorize objects or events. It was not separable like Husserl said into objects, noema, and inner mental intention of them, noesis. In addition, Heidegger made a distinction of “zuhanden”, ready-to-hand, objects and “vorhanden”, present-at-hand, objects. Ready-to-hand is for instance a mouse, when one uses it for interacting with the software and present-to-hand is when it may be broken and needs the attention on itself [1].

*Maurice Merleau-Ponty* (1908-1961) was more occupied with the objects themselves. He explained that each object did not have a meaning for itself, but also meaning of other objects. Objects meaning always stood in a context. An example, a table not only holds a meaning as a table, but also as an instrument to lay things

on or a chair needed to sit at the table. Here it was more the perception of objects which build up an understanding for all [1].

The experience as a social interaction was researched by *Alfred Schütz* (1899-1959). He worked on Husserl's "Lebenswelt" and incorporates social understanding. The social interaction a person experiences belongs to the experience or mental intention of an object [1].

This can all be applied in different ways to HCI. For instance Heidegger's research hints to software, which has an interface that allows situations to be practical without need of an internal/mental state. For example, I should not just be able to cut out a document and then paste it in a trash can to delete it, but also just drag it into the trash can. An interaction with objects in software could be used in a context to explain other objects, e.g. when a picture is cut it may need to be pasted somewhere, so that paste and cut also are in context with each other. In addition, it may be needed to adjust software to social circumstances, e.g. different social groups may use different chatting interfaces so that a button on a web browser should be different in different social fields.

### 3. DIFFERENT APPROACHES

#### 3.1 Social Environment

*Ludwig Wittgenstein* (1889-1951) combined many of the theories introduced before just in the context of language. He was of the opinion that a word has the meaning for which it is used within a language. It cannot be removed from a context and is dependent on the environment in which it is used. The idea can also be transferred to objects. This would result into a similar opinion as Merleau-Ponty. Wittgenstein also uses the social surroundings. The language receives its meaning by the way it is used in a social environment [1].

*Harold Garfinkel* (1917-present) was inspired by Wittgenstein and Alfred Schütz so that he worked on the topic and came to the conclusion that means, such as events or objects are to be considered in a social environment. Ethnomethodological studies of his were for instance sequential analysis of conversations, social categorization practices and workplaces settings and activities [1].

Lucy Suchman worked and studied on interactive technology. She was more of the opinion that these technologies should rather follow an approach of improvisation rather than the often used formulaic approach [1].

HCI can apply Wittgenstein's and Garfinkel's theory to give the whole software a context meaning as well as choose the language to fit the social environment the software is being used in. Suchman has also used her studies for her work on interactive technologies [5].

#### 3.2 Embodiment, Perception and Enactive Skills

Visual perception was thoroughly researched by *James Jerome Gibson* (1904-1979). He saw a deep connection between seeing and acting. This means that seeing is not independent, but is dependent on what is wanted to be achieved with seeing. It also meant that one acted upon what one could see, for example

humans react to 3D, because they can see it. People mostly do not react to infrared, because it is not for them to see. With this way of thinking he belonged to the ecological psychologists, who were of the opinion that an environment and organism were not to be seen separately, but as a whole [1].

*Francisco Varela* (1946-2001), *Evan Thompson* and *Eleanor Rosch* (1938-present) all worked on similar topics. They concentrated on interaction between the body and the physical world. They came to the conclusion that when someone interacts with the world it does not only have an effect on the object moved, but also for the context around it and on the person who moved it as well. This they call operational closure [3][7].

*Michael Polanyi* (1891-1976) came to the term of tacit knowledge, for instance used when riding a bike. One learns how to ride a bike when have experienced riding a bike and not by learning the balancing techniques by book. He separated the knowledge of "how" to do something, tacit knowledge, from the knowledge of "what" has to be done, description of activity. In addition, he has a distinction between proximal and distal phenomena. Proximal phenomena is experienced directly, e.g. a stick felt in the hand and distal is for instance when the stick is used to get something from under the bed. It is similar to Heidegger's present-at-hand and ready-to-hand. Just that here it is more focused senses as in feeling or sight [1].

*Jerome Bruner* (1915-present) categorized the following skills. One category was the enactive skills. These were the manipulation of objects, e.g. riding a bike or juggling, similar to the tacit knowledge of Polanyi. Then followed the iconic skills, these were the visual recognition of objects and well as their comparison and contrasting. The last group of skills was the symbolic skills. These skills helped to find an abstract reasoning of objects and events. These skills help people categorize their surroundings and give new meanings or expand meanings in their environment [3][6].

Visual perception in the way Gibson has introduced it, makes aware that HCI should catch visual attention so that the user will actually see what he/she are doing and that it may be needed to achieve attention to certain visual fields. The operational closure of Varela, Thompson and Rosch is good for use in interactive technology. The action should have a feedback and change the world of the software. Polanyi's distal and proximal phenomena may be important for input tools that be used easily as tools to guide the user through the program. Bruner's categorization in different skills can be used the right skill for certain actions.

#### 3.3 Child Development – Learning Process

*Jean Piaget* (1896-1980) was very engaged to learning processes, especially those of children. He divided the development into four stages. The first was the sensorimotor stage. Children from the age of zero to two years of age experience through movement and senses. The following stage is the preoperational one. It takes place between the second and seventh year and allows the acquisition of motor skills. Concrete operational stage is when the child from the age of seven to eleven begins to think logical about concrete events. After eleven the children reach a formal operational stage in which they start abstract reasoning.

*Seymour Papert* (1928-present) was influenced by Piaget and started programming Logo Turtle [4] trying to integrate the idea into a program which follow the development stages to help learn

by using. There is an emphasis on enactive skills and even Piaget himself said that no one had understood what he meant as well as Papert.

These methods can be used to create software which is also easy for adults to learn. The stages can be used to introduce new software.

#### 4. CONCLUSION

Giving an overview (Figure 1) of different approaches shows that using interdisciplinary knowledge may be useful even for modern technology. It may be hard to always find the right sources for one's challenges, but many people today have tried to find the essences of certain theories for uses in other professions, e.g. Paul Dourish[2]. In the future it will also be more important to combine this interdisciplinary knowledge to achieve a maximum in performance. The integration will hopefully shorten the progress of the software becoming a tool, ready-at-hand, from being a subject of understanding, present-at-hand.

#### 5. REFERENCES

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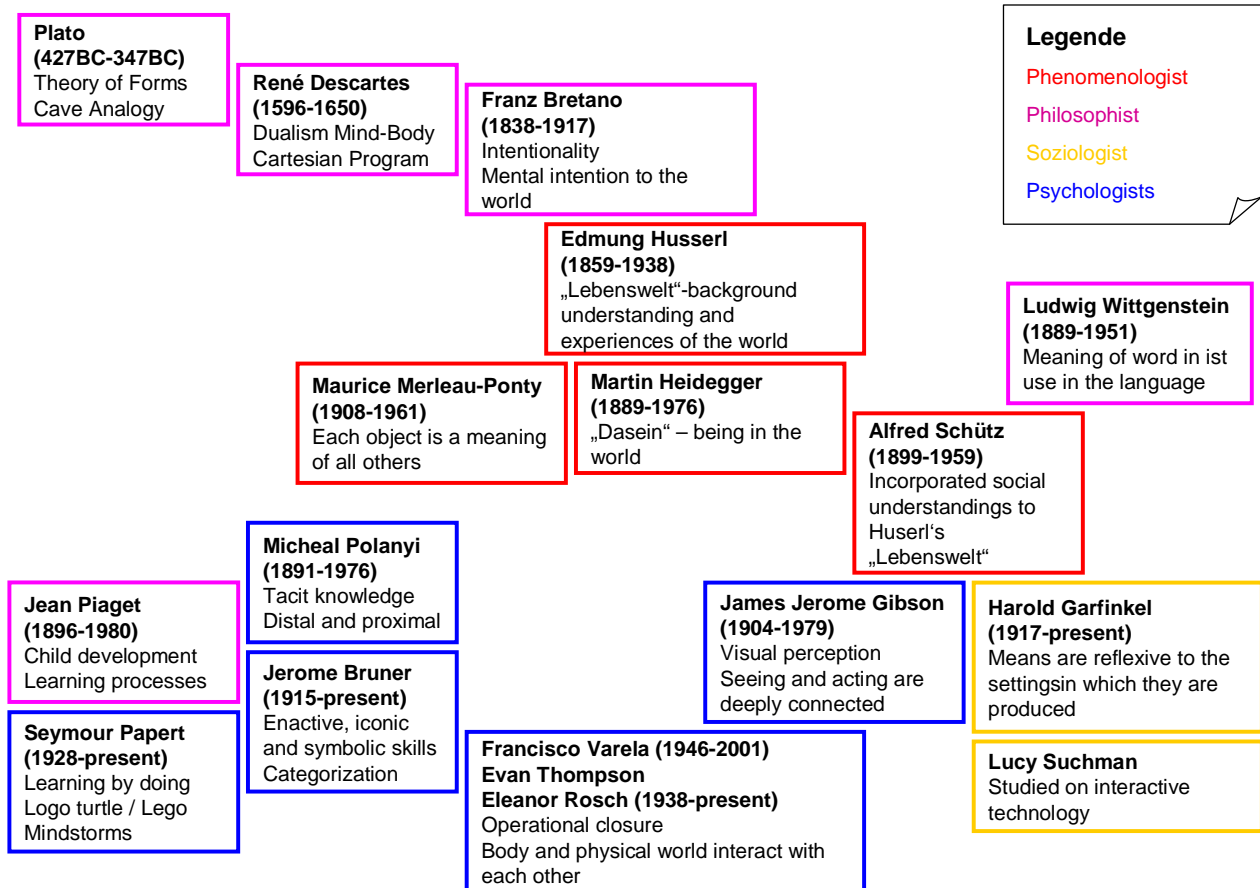


Figure 1. : An overview of all introduced people.