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From the Editor in Chief

THE CONCEPTUAL LEVELS AND THEORY LANGUAGES OF INTERACTION DESIGN

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In a way, concepts are like friends. Tell me what your concepts are and I can tell what you are. Modifying freely the way Wittgenstein (1921) expressed this important Kantian (1781) point on the limiting power of concepts on one's thinking, the concepts that human–technology interaction designers of different scientific backgrounds use differ from each other and, consequently, they are apt to solve the same tasks in different ways.

Theoretical concepts constrain the kinds of questions specialists can ask and what kinds of things they are interested in. Thus programmers have a different view of users than do psychologists or sociologists. Just as a lay person can understand little about ventricular tachycardia and cannot ask meaningful questions concerning this phenomenon, so an interaction designer with little psychological knowledge cannot know deeply the relevance of the Big 5 personality traits in interaction design. This way in which concepts function in critical thinking has been known for a very long time, and remains important in interaction design since the problems and innovations of this field can be approached by people who have very different disciplinary and conceptual backgrounds.

While the power of concepts in shaping human thoughts has been known for centuries, I have seldom seen its practical consequences considered in interaction design. In this multidisciplinary field, the differences between the various special design languages have not often been addressed, even though concepts form the foundations for the various design languages. All hypotheses and solutions are drawn from concepts either explicitly or implicitly; thus, the contents of concepts define the contents of one's speaking and thinking. Of course, concepts are not cut in stone but, rather, they are dynamic and versatile. While concepts can be formed on the spot, they grow from or respond to some other system of concepts, that is, perspectives needed to be able to formulate propositions or thoughts (Wittgenstein, 1958).

The point of this editorial, however, is to acknowledge that many problems in design and human–technology interaction arise when designers and programmers, among others, attempt to solve specific problems using concepts inadequate for solving those particular problems. One cannot program with only philosophical concepts just as one cannot conduct a user psychological investigation using only concepts from the information systems sciences.

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Therefore, one must critically look at which theory languages are appropriate in solving the defined problems. All too often, however, one can observe designers moving outside the limits of their specialization and using what they consider to be common sense in solving problems, solutions that would have been easily achieved with adequate background knowledge in, perhaps, a different conceptual system or discipline. For example, a designer with an engineering background thinking about the emotional and artistic aspects of a design will most probably miss many points that would be obvious to a person with an in-depth understanding of emotions and emotional design.

The field of human–technology interaction includes many different interaction design languages, each with its respective conceptual systems and its own scope and limitations. For example, languages that address the physical or chemical aspects of design provide us tools to address one type of problem. What would be the best way of creating a touch screen which can withstand 300 degrees? Which level of electricity should be used to make text on a computer monitor visible in full sunlight? Without a doubt, this kind of discourse is vital in developing interaction technologies in regard to specific goals, but it is not the only one.

Somewhat different design languages are provided by mathematical machine concepts. For example, Turing's language describes the commands and the symbols manipulated by the commands in computational devices. The language also may describe the controls and related operations in traditional machines. This language, then, defines what a machine as a system can do.

A different language, however, is applied when we describe the people who interact with computational machines, that is, the users, who have to be able to tell the machine in its unique language what the machine should do. Users decide which instructions are important in one situation and which in another. This means that designers have to define what is relevant from a human point of view. The users' concern is to understand which button to use, when and how, to get the machine to behave as they want. Therefore, we need a different theory language, one that could be called the *language of use or usability*. This distinct language is as relevant a language as any more technical design languages. For those who doubt this assertion, they should think how considerably more difficult it would be to communicate with a machine in the machine language.

Art design is today recognized as a central element in technology design. Art designers consider the diverse range of the users' experiences, and thus their work intends to facilitate users liking what they do with the devices and programs they use. Of course, they normally have to solve many issues in collaboration with usability specialists. Nevertheless, the language of art design, as do most other "technology languages," involves a great deal of tacit rather than explicit knowledge, and opens its own discourse in interaction design.

However, the language of usability or the language of art design is not the same as the language of human–technology interaction. In the usability language, for example, users hold goals for their interactions with machines. They reach those goals by pushing buttons that send signals to sensors, using a microphone, touching a screen, or twisting a control knob—physical actions that result in a reaction by the machine. The basic point is that these operative actions "tell" the machines what the human expects as the outcome of his/her action. The machine cannot "know" what is important to the user: Machines are inanimate and thus without independent goals and intentions. Therefore, designers need a language of human intentions and actions in order to direct machines to act and react in line with human expectations.

Furthermore, the analysis of actions and goals opens immediately a need for another language. On a general level, this language could be perceived as the language of life: Human–technology interaction design is simply addressing what people can and want to do with technology, but also includes the "why" behind the use of a particular technology. Designers have to seek out and consider the motivations for a human being to push a button, to learn how to do it, and to like doing it. They have to ponder the place and role of a technology in a human's life. These are essential bits of knowledge because technology receives its justification for existence from human life. The effort people invest in technology is motivated by the expectation that it will make life easier.

For this reason, the field of human–technology design needs new theory languages that will help designers and researchers to position technology within the diverse tapestry of human life. These languages would provide the capability to analyze human life and to position technologies in a way that advances life. They would facilitate designers in determining the worth of a technology for people or its ethical value (Cockton, 2008). They also would provide the possibility for designing technologically supported action before the technology exists to realize the goal (Leikas, 2009).

The last condition might seem a bit impractical to some people: How is it possible to design technologies before they have been engineered? Yet Jules Verne and Leonardo da Vinci did precisely that long before it was possible to physically create their technologies. Verne set the concept of a submarine within its place in life decades before anyone could construct such technology. In the 21st century, a good theory-language could make similar design concepts, but based on more solid scientific grounds than those artists from centuries past.

Concepts are ubiquitous. A person can remove him/herself from friends for a time, when needed, but concepts accompany us everywhere. Thus, it is essential to consider seriously their role in one's life and worthwhile to investigate the limits these conceptual systems bring to one's perspectives on and decisions in living and interacting. The goal, of course, is to extend them, to find new ways of seeing people, places, and things, and new ways of experiencing one's own actions. It is worthwhile assessing critically the limits one's conceptual systems places on the ability to create new concepts and theory languages (Saariluoma, 1997) and innovative solutions to contemporary technical challenges.

Concepts and their respective theory-languages are like tools, as Wittgenstein (1958) so clearly understood. We use saw to cut a tree but need a hammer to hit nails into the tree's wood. With appropriate and diverse tools, it is possible to work in a very holistic manner in solving the challenges of interaction design. However, designers today, for lack of suitable languages, have to hammer nails with a saw. Such a case is even more likely when programmers are more or less forced think and produce based solely on their own intuitions, when in fact their products should be placed in life amid complex issues such as individual preferences and capabilities, and cultural differences.

It is easy to forget that in solving design problems, the designer must explicitly or implicitly resolve all the task-necessary problems, whether or not the designer is a specialist in all aspects of the design challenge or possesses .the required theory-language. Ever since the Stone Age, problems in the levels of interaction design languages have existed. A hand stone used to carve animal woodwork was designed to make the task easier. The stone tool had its ergonomic aspect, its place in life, its material, and its forms. Sometimes it even had its artistic design. Nevertheless, the caveman faced the basic challenges of tool design that arose from amid the nature of human life and action. That reality remains these millennia later, and, like our ancestors, we have to solve design problems on each conceptual level. To do this, we either draw on our everyday intuitions or we develop our conceptual systems. These are the options available to us in addressing as the basic problems of interaction design that will always be around.

When a designer realizes that design presupposes the use of various conceptual systems, with their associated languages, and that a good design practice unifies these into a whole that eventually solves the challenge at hand, he or she will then logically ask, “How do I unify the different conceptual levels?” This simple question serves as the first step toward the realization that people with different theoretical backgrounds speak differently but equally about unavoidable things.

In the field of human-technology interaction, the human end of the spectrum has been central. The papers published so far have very clearly shown the complexity of the systems of theory-languages people use in investigating ICTs today. The same is true for the papers included in this issue of *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*. These papers have been written from different specializations. In our first paper, **Lamminen, Leppänen, Heikkinen, Kämäräinen, and Jokisuu** bring in the information systems scientists’ point of view to the analysis of usability. They introduce a new semiautomated quantitative evaluation method for locating Website usability problems through the criteria of search time and search success. **Oinas-Kukkonen and Kurki** explore the perceptions, practices, and experiences of children’s use of the Internet, a different sociological perspective and language than compared with the questions approached from an adult user’s conceptions. The authors find that nine of ten children are regular users of the Internet, but Internet use differs by gender, with girls using the Internet for social interaction and boys for game playing.

Short and McMurray address to the important problem of harassment by way of the mobile phone texting, involving a psychological and sociological viewpoint. In a study that presented vignettes to students taking on, separately, the role of sender and receiver, these researchers find that harassment, as defined in terms of frequency and time, is more prevalent via texting than by other technologies or off-line behaviors, but appears also to be more accepted, despite reports of its distressing nature. Next, **Olatokun and Adeboyejo** explored technology use by reproductive health workers (RHWs) at a university hospital in Nigeria, drawing on concepts of medical care and information systems sciences, usability, and sociology. They find that while progress has been made over the last decade in some areas regarding the implementation of various ICTs in the work, research, teaching and professional development of RHWs, much still needs to be done to increase access to and application of ICTs in the daily responsibilities of the RHWs and to eliminate the digital divide among developed and developing countries. Finally, **Dolezal** considers the function of phenomenological theory-languages in interaction analysis and design from a philosophical perspective. She explores the concept of the body as it relates to telepresence and re-embodiment, particularly in the growing practice of telesurgery, in which the patient and the surgeon are geographically separated. Each of the papers illustrates how different specialists can shed light onto very different aspects of the modern problems in the field of interaction between people and technology.

REFERENCES

Cockton, G. (2008). Designing worth: Connecting preferred means to desired ends. *Interactions*, 15(4), 54–57.

Kant, I. (1781). *Kritik der Reinen Vernunft* [The Critique of Pure Reason]. Stuttgart, Germany: Philip Reclam.

Leikas, J. (2009). Life-based design: Form of life as a foundations for ICT design for older adults. (Doctoral dissertation; Jyväskylä Studies in Computing, No.105). Jyväskylä, Finland: University of Jyväskylä Press.

Saariluoma, P. (1997). *Foundational analysis*. London: Routledge.

Wittgenstein, L. (1921/1961). *Tractatus logico-philosophicus*. London: Routledge and Kegan Paul.

Wittgenstein, L. (1958). *Philosophical investigations*. Oxford, UK: Basil Blackwell.

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