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From the Editor in Chief

SCIENTIFIC AND DESIGN STANCES

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Human technology interaction is a strange field of expertise, because both academics and industry are interested in it. And yet, every now and then, it becomes apparent that academics and industry do not always see eye to eye (Carroll, 1997). They seem to think in different manner. While scientists look for how things are, industry mostly seeks out how things should be. Indeed, sometimes two very different stances behind the basic thinking of the two important human–technology interaction (HTI) communities surface.

Scientists primarily are interested in general laws and principles, even eternal truths with no exceptions. They want to identify general laws and use them to explain individual phenomena. As an analogy, they are not satisfied with the simple assessment that a car is not working, but would prefer rather to say that the carburetor of a car broke because freezing water expands as it changes its state (Hempel, 1965). Scientists equally are concerned about finding deterministic or stochastic laws, which are valid in all circumstances (Bunge, 1967) Thus, much of scientific thinking is built upon the idea that the function of science is to produce generalizations. This way of thinking can be termed in this editorial as *scientific stance*.

In solving HTI problems, general principles regarding the human mind are very valuable. Consider the notion of limited capacity (Broadbent, 1958; Miller, 1956). When interaction problems are to be solved, the ergonomic and human factor dimensions are evident. Every cognitive ergonomist knows that it is essential to decrease mental workload and organize matters so that people can use chunking, for example.

Programming paradigms provide a good example. We have no other reason for constructing computer languages and paradigms such as structures programming or object oriented programming except to decrease mental workload by chunking. The problem is not the machine but the mind. A somewhat polemical person may point out that the complexity of the code for a machine is precisely the number of the symbols in a program; any other measure is always constructed from human perspective. The number of functions, or meaningful reserved words, for example, makes sense only to people. They have no meanings to the machines because machines do not have any meanings. Nevertheless, the importance of functions and meanings can be explained on the grounds of human’s limited working memory capacity and its laws (Miller, 1956).

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One may ask here, where is the problem if we have general psychological laws such as picture superiority effect, which, for example, explains why graphic user interfaces make sense. The problem is that the study general psychological laws do not directly lead to useful technologies: The laws do not tell us what kind of technologies should be developed for people. This means that there must be something else hidden HTI-thinking than scientific stance.

As stated above, the difference between scientists and industry people can be seen in where they put their emphasis, and industry people place their primary attention on making something that works. Edison designed the electric lamp that worked, but also thought through all of the related infrastructure needed for the technology (Millard, 1990). He understood that many things were needed to advance the technology, while an academic of Edison's time commented that he expected the world would never hear about the device again once the electric lamp exhibit closed at the Paris World Exhibition (Cerf & Navatsky, 1984). Presumably, this person looked the electric lamp without the infrastructure that Edison was able to envision. The difference between how Edison and his academic critic thought was that Edison innovated by thinking constructively. He did not pay attention to the obstacles and difficulties, but how to remove them. This constructive attitude and way of thinking is typical of the *design stance.*

The main criterion for design thinking is not necessarily what is universally true, but what works in practice. A good example was given to me by an experienced industrial designer. He told me about a huge computer program that suddenly achieved everything they hoped it would do. His team did not fully comprehend why it worked, but the case was closed nonetheless. They decided that no one should touch the code, and they just went on. Surely this is not the only case of this kind in the world, but rather the way industry has to work. Nevertheless, it shows how proving truth and constructing technology have different criteria for success. To get something to work is the very core of the design stance.

However, design thinking cannot neglect the laws of nature nor say that the principles are meaningless. In fact, if a product or process contradicts some of law of nature, it will not work. So while a technology could be ignorant of natural laws or the laws of the human mind, it cannot break them. This is why the principles created by scientists are valuable for the designers, even if they possess different approaches to and position on the principles.

Design thinking seldom relies on a single law. Any construction can be viewed as an enormous set of solved problems but the problems can be subsumed under several types of law. This means that while scientists analytically strive to generate one law or principle at a time, designers strive to combine them under one single working idea. A design stance leads us to a specific way of constructive thinking that is typical in industry. It is also something that may be difficult to understand from academic point of view.

The goal of design is innovation. All small problem-solving processes characteristic to design industry should be combined under a single coherent frame, for example, a machine or a Web service, which then can be used by people to improve the quality of their life. In this work, some general principles of how the human mind works are more rational than others in finding solutions to perplexing problems or obvious needs. This means that general principles also can explain why one potential solution for a design problem will work better than another, which is the main characteristic of *explanatory design thinking* (Saariluoma & Oulasvirta, 2010).

Interestingly, very little explanatory thinking is applied in human technology interaction design! When we look at the field of engineering, for instance, it is very common in mechanical and software engineering for designs to be founded on the laws of nature or principles of mathematics. However, in user interface or general interaction design, solutions are generally intuitive and corrected through testing. Nevertheless, explanatory thinking would aid in bridging the gulf between scientific and design stances.

In this issue, we have a number of design-oriented publications. To very strict adherers of the scientific stance some aspects of the papers in this issue may look somewhat loose, but we still think that it is important to foster discussion and publish these papers with many very original ideas. Indeed, if we do not present design-oriented thinking, we can hardly think and rethink the issues: We simply do not see the issues. Let's think, for example, of Nielsen's (2000) famous principle of five subjects, which states that only five subjects are sufficient to test industrial usability. This principle has received much attention and criticism (Bevan et al., 2003). However, if Nielsen had not called our attention to the issue, we would have today a much poorer understanding of how to construct usability experiments. Indeed, we can see here that design problems can pave the way to scientific problems, analyses, discussion, and theories. The interaction between design and science is not a one-way street.

We begin our issue with a paper by **Aguierre-Urreta and Marakas**, who investigate the role of gender in technology adoption. In particular, they look at the psychological mechanisms that impact technology acceptance and do so through the novel use of a choice between viable technologies. Next, **Solves Pujol and Umemuro** present a new stream of research focused on affective technology, that is, technologies that support and encourage emotional interaction via technology. Their focus is on love, specifically productive love, embodied in eight principles that can guide technology development. They provide a pretest of one such technology as an illustration of how theoretically and empirically derived principles can support technology development aimed at promoting productive love. **Bergvall-Kåreborn and Ståhlbröst** demonstrate how user expressions regarding a service can be translated through qualitative research into requirements for a particular technology. Drawing on focus group data, these authors found that user requirements differed, depending upon the users' need *of* the service as compared to needs *in* the service.

Our fourth paper in this issue addresses the topic of tagging video or photographic materials online, specifically how to motivate and facilitate the consumers of these media in contributing tags that, among other things, assist in the indexing of digital materials. **Melenhorst and van Velsen** tested four tagging input mechanisms to see which process resulted in more individuals tagging consumed videos. They found that none of the three new mechanisms faired better overall than the standard input box, included as a comparison mechanism. They recommend further study of alternatives way of motivating users—either through education or technologies that are more engaging. The final original paper demonstrates a method for capturing user experiences. The repertory grid technique, a mixture of qualitative and quantitative methods, allows researchers to holistically gather cognitive and emotional aspects of the consumer experience of a technology. **Fallman and Waterworth** take the reader step-by-step through the use of the repertory grid technique, with recommendations on how designers and technology researchers can employ this method at various stages of the design process.

We also include in this issue a book review: **Ignacio Del Arco Herrer**a assesses Antti Hautamäki's *Sustainable Innovation: A New Age of Innovation and Finland's Innovation Policy*. In short, Del Arco Herrera acknowledges Hautamäki's contribution toward the current transformation in perspectives on innovation policy. Whereas innovation policies traditionally have focused strictly on economic outcomes as measures of success, contemporary thinkers on innovation are advocating more holistic and sustainable outcomes, that is, in Hautamäki's view, policies that acknowledge and support equally the values of the environment and natural resources, the human resources (through, e.g., quality of life and education), and the economic outcomes.

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