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From the Editor in Chief

INTUITIONS IN HUMAN–TECHNOLOGY INTERACTION DESIGN

Pertti Saariluoma
Cognitive Science, Department of Computer Science and Information Systems
University of Jyväskylä, Finland

While science is interested in how things are, design concerns more how things should be in the world. While both focus on the common the pursuit of improving the quality of human life, they are different in many respects. One of the differences is the way intuition is applied.

Here, the word *intuition* has a specific meaning: It refers to subconscious foundations of thinking and thoughts. In science, grounds and arguments are key. Empirical observations are made in a controlled and methodical manner to give as much certainty as possible to the facts. Nevertheless, full certainty can never be reached (Nagel, 1961; Saariluoma, 1997). Moreover, it is easy take something as it is without even paying attention to it (Saariluoma, 1997; Wittgenstein 1969). These tacit and barely explicated foundations of scientific thinking are called intuitions.

Intuition is not only about empirical work, but also is involved in mathematical thinking. Euclid, for example, assumed that one line, at most, can be drawn through any point not on a given line parallel to the given line in a plane. However, by giving up this assumption, mathematicians are able to create nonEuclidian geometries. This means that Euclid's idea, apparently very true under given assumptions, was just an intuition. In other situations, another intuition could be used. Similarly, hundreds of years later, behaviorists used to think that mental concepts were not relevant in psychology (Watson, 1919), but this proved to be too strong an assumption during the rise of cognitive psychology.

Logically, scientific truths make assumptions concerning reality, and therefore they rely on intuitions. We can look for grounds but, because we cannot have endless chains of arguments, at some stage we have to establish our knowledge on intuitions. This rather abstract truth has practical consequences. For example, human attention used to be described in terms of capacity, but this no longer is believed to be the only way (Broadbent, 1958; Covan, 2000). Clinical attention research leads scholars to suggest that certain mental contents may affect attentional information processing so that, for instance, agoraphobics process threatening words differently than neutral words (McNally & Foa, 1987). It was just an intuitive assumption that capacity is the only important perspective to attention.

Intuitions are problematic in science. It is not that they necessarily would be incorrect; no doubt some intuitions are correct. The problem is that, in the absence of argumentative backing, one cannot be sure whether or not they are true (Saariluoma, 1997). It may be that they are valid in some contexts but invalid in others. The scientific community just cannot know

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what these tacit assumptions mean to the validity of scientific ideas. Returning to the example of the behaviorists, they did not make false observations but, from a contemporary point of view, their thinking was limited.

What is interesting, then, considering the scientific challenge of intuitions, is that they nevertheless advance science. The cognitive revolution replaced behaviorist intuitions with different intuitions, and immediately psychology progressed into new areas. Galileo and Kepler found anthropocentric and geocentric intuitions unfounded, and Einstein reworked the assumptions about the nature of universe. In all these cases, science significantly advanced. This means that explicating and reforming unfounded intuitions is an essential mechanism for the advancement of science.

Intuition in the field of design, however, plays a very different role: Design thinking is intuitive in concerns about the future states of affairs. Good intuitions are the very soul of good design. The creation of Facebook needed no scientific theories; the creators simply had a great vision. The innovators of the wildly popular *Angry Birds* game claim they have no idea why it has become a worldwide sensation. Indeed, intuitions are very relevant in attempts to understand design thinking.

In design, good reasons are not always apparent for every solution. Sometimes designers just have to trust their intuitions, even if they do not know whether these intuitions are true or false. However, as long as the success stories remain at the forefront of minds and literature, it is easy to miss the downside of design intuitions. In reality, intuitions may very much be incorrect, and much work can be invested needlessly in chasing phantoms.

In other words, by focusing on the success of *Angry Birds*, it is easy to overlook the scores of other games created that same year that never gained an audience. Perhaps they were based on incorrect intuitions. The story of WAP has been repeated many times, but serves as a good example (Saariluoma, 2011). It illustrates how companies may base their design processes on ideas that will not work. In the case of WAP, the developers incorrectly assumed that people could and would learn about and enjoy using it. Incorrect intuitions are actually very common in design.

When applying intuitions, several outcomes are possible. The design intuitions may be correct and successful, as in the case of the Ford Mustang. Or, it could be assumed that people like a product based on intuition, but they do not, as in the case of the Ford Edsel, resulting in loss of time and money. Or, it may be that the design idea is correct, but the designers' intuition on the idea is mistaken; a good idea is abandoned until someone else comes along and turns it into a success, as in the case of the touch screen. Thus intuitions take place not only in design thinking, but also, and especially critically, in management decision making.

So how do designers, and individuals and communities, address the challenges of intuition in design thinking? The only solution is to explicate the assumptions. This means that intuitions must be critically scrutinized. Before an idea gets too old, the designers need to formulate the underlying assumptions and become socially aware of them. This process can then decrease the number of design errors caused by false intuitive assumptions.

For example, usability testing on the WAP technology showed as early as 2000 that it was not likely to work as envisioned (Ramsay & Nielsen, 2000). Nevertheless, the work continued under the intuitive assumptions that the technology would become a household concept. On the other hand, a paper machine corporation assessed an extended nip concept as too complex and rejected it. However, as a consequence of a factory purchase, they had to return to the idea and reinvestigate that technical solution. Consequently, they became a world technology leader in paper machines (Saariluoma, Nevala, & Karvinen, 2006).

Usability studies are not the only method of explicating intuitions. Another important method is requirements engineering, because requirements are explicated intuitions. They give form to the goal of product design and design rationales in human–technology interaction. Explicit requirements allow for discussing whether or not intuitions make sense.

In summary, intuition plays a role both in scientific and design thinking. Moreover, intuitions particularly are relevant when considering the generation of new ideas and the advancement of technologies. It is fortuitous, then, that *Human Technology* has been able to publish this second set of papers in the two-part special issue on creativity and rationale that investigates the relations of design rationale and the advancement of design thinking.

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Author’s Note

All correspondence should be addressed to:
Pertti Saariluoma
University of Jyväskylä
Cognitive Science, Department of Computer Science and Information Systems
P.O. Box 35
FIN-40014 University of Jyväskylä, FINLAND
pertti.saariluoma@jyu.fi

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