Designing for Proficient Users: Drawing from the Realities of Practice

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Abstract

The phenomenological perspective is discussed as a means to obtain a better understanding of how experienced computer users shape and are being shaped by the artefacts they use. The concept of embodiment is introduced to describe the combined mind-body skill of situational discrimination and seamless immediate action in the world. The importance of this concept is demonstrated through examples from real world practice. We stress that bringing forth embodiment is a necessary step in understanding proficient interaction, thus essential in design situations of new versions of professional software, new modules for existing applications or genuinely new applications that are developed for specific worlds of practice.

1 Introduction

New challenges for the field of Human-Computer Interaction arise as more and more contemporary applications come as replacements or enhancements to older ones. As a consequence, when designing new applications, designers need to respect existing practices as their future users have already embodied them as a kind of language or sign system that is applied across various applications. Moreover, when designing a computer application for a particular work setting, it is vital to consider how the applications previously used, have profoundly shaped the way the community of practice think - act upon the object of their work (Nardi, 1996). Also, the study of how these applications are actually being used (or shaped) as tools by their users should provide valuable insights on the real requirements for a new application. People get shaped by the technology they use as much as they shape this technology (Coyne, 1995, 1999).

Traditional HCI research and the derived design methods and guidelines have evolved under the reductionist paradigm, which is based on the dual split between body and mind and between an individual and the external environment. For example, human behaviour is analysed rationally, by identification of "the underlying cognitive schemes" it is based upon. This representationalist - symbolic view has given good service in providing structured and coherent models of human behaviour. However, most successful applications of this view, involve novel activities, rationally structured domains and/or "generic human subjects", where reflective reasoning dominates and meaning/ontology generation can be sufficiently restrained by the analyst. But although these models offer predictive power in controlled environments, their general and detached character, make them inappropriate for coping with the richness and immediacy of the real world. This is most evident if one considers the frequency of encounter of the term *"contextual factors"* to accommodate for all the shortcomings of applying such models in real world settings.

In the present paper, we discuss the relevance of the phenomenological perspective through the notion of embodiment as a means to obtain a better understanding of how experienced users interact with software artefacts. As people appropriate a software environment they tent to use it with remarkable creativity, some times in ways that were not anticipated by their designers (catachresis). We advocate that the acknowledgment of this appropriation process and the identification of the deviant creative uses are becoming essential for successful software design.

2 Body-mind-world as a whole

2.1 Perceiving –acting

The habituated scanning of my eyes and the movement of my hand when trying to accomplish an action in a specific computer application are important. Peripheral sight and hand trajectory over the mouse in order to print a file are important. It forms an integral part of *knowing* how to print a file. Hearing of the floppy disk noise is important because it always happens when saving a file. Response lags on a specific PC or while at a specific Internet site are important. Actually I usually neither measure them nor think about them, I just coordinate my hand and eyes movement with these lags to perform my actions with the least tension. All the above bodily patterns are an integral part of coping with the world that the body "learns".

2.2 Acting-thinking

Even when confronted with a new software tool, and under the condition of an existing motivation to do something more or less specific through it, I have expectations. These expectations are, to a large extent, the result of previous experience with all kinds of software (and other artefacts) I have used before. Expectations are manifested through the pre-reflective *"I know I should be able to do this"* which many times (if a breakdown occurs) may be reflectively transformed to *"I know it should be somewhere"* referring to some familiar type of software routine or command.

This pre-reflective knowledge, the *"I know I should be able to do this"* is rooted in everyday experience, it is primarily a feeling. When people are forced to explain why they think it can be done, i.e., to reflect upon their feeling, they may reason using some folk knowledge of software engineering or point to an analogous (for them) routine or behaviour of another software tool.
As Mingers (2001) suggests, much of what we "know", in the sense that we are able to undertake particular actions and activities, is essentially tacit, habitual, and only partially open to our consciousness. Such knowledge is always learnt through practice and habituation. Pre-reflective knowledge such as the example above may end up right or wrong in a particular situation, but the important thing is the claim that it is useful for the purposes of design, to consider it as such.

This stand, towards the analysis of human behaviour as a whole composed of the body, world and cognition, is gaining acceptance over the last decade. It is more or less evident in cognitive psychology work on Distributed Cognition (Hutchins, 1995), Situated Cognition (Suchman), Activity Theory (Nardi 1996) and on Artificial Intelligence through the work of Winograd & Flores (1987) and others.

2.3 Embodiment

The notion of embodiment can be defined as the mind-body skill of situational discrimination and seamless immediate action. It draws from the phenomenological tradition of European philosophy and particularly from the work of M. Heidegger with his contemplations on the nature of concern-full every-day activity, and in a more radical way from the work of Merleau-Ponty (Dreyfus 1991,

1996). According to Merleau-Ponty, in everyday, absorbed, skilful coping, acting is experienced as a steady flow of skilful activity in response to one's sense of the situation. Accordingly, human behaviour can neither be explained in a behaviourist way in terms of external causes, nor internally in terms of conscious intentionality. Rather, it has to be explained structurally in terms of the physical structures of the body and nervous system as they develop in a circular interplay *within the world*. The world does not determine our perception, nor does our perception constitute the world. As Merleau-Ponty (sited by Dreyfus, 1996) puts it *"The relations between the organism and his milieu are not relations of linear causality but of circular causality"*.

The above suggests that the representationalist consideration of *context* as a noise factor that disturbs some default rational ontologies of the human mind is misleading; context is instrumental in building interpretations of ones actions. The proficient user of a computer application is, to a large extent, immersed in the world of his skilful activity, and just sees what needs to be done based on mature and practiced situational discrimination. Also as expertise builds up, the body "knows" how to achieve the goal (Dreyfus 1996). Embodiment develops through engaged action regardless of any explicit effort to support it.

2.4 Embodiment in HCI

In HCI the notion of embodiment is present in a number of current HCI theoretical and hands-on research efforts (Dourish, 2001). In most of them embodiment is often reduced to efforts to enhance the interaction through more "natural" manipulation. That is, an effort to try to mimic a target physical analogy. See for example the Bishop marble answering machine (Dourish 2001) or tilting and squeezing a palmtop (Fishkin et all 2000). Thus, the so entitled "embodied interfaces" are tangible interfaces, built with an explicit aim to support *readiness-to-hand*.

Tangible interfaces offer increased interaction means and materiality of IT technology. But although multimodality and materiality of the interface seem to support the development of transparent action, this lies more on the concrete history of skilful/concerned activity of the individual than on any surface feature. Take as an example the skill of writing text on the cell phone. Although the cell phone's interface was not designed for writing text and is generally regarded as bad design for this task, certain individuals communicate through SMS messages with an impressive speed and ease, and without even rupturing their involvement in another social activity. Embodiment develops primarily through engaged action, regardless of any explicit effort to support it.

The same can be observed with expert computer users working on command line interfaces. From a phenomenological perspective such individuals neither type commands nor read outputs from the computer screen. The object of their concern lays elsewhere; it is mirrored in spontaneous verbalisations such as *"I am trying to locate this file"* or *"there is some dll conflict"*. The speed and seamlessness of interaction with the operating system, in conjunction with simultaneous statements such as the above is an indication that the interface has been embodied to a large extent.

Embodiment as pre-reflective flawless action extends well beyond the physically observable. It tends to dissolve from reflective thinking even abstract concepts and metaphors. An expert AutoCAD draftsman, when designing, views the world in layers. While immersed in that world, he doesn't *reason in terms of*, but *acts upon* layers with his eyes and hands (Goel 1995).

2.5 Embodiment goes beyond familiarization

It is a trivial observation that many work domains that were early adopters of information technology (i.e. accounting, banking) still work on outdated often command based environments. The persistence of such software should not be solely understood in terms of an acquired familiarity with a particular interface. People nourished in such domains inevitably "see and act upon their work" through their embodied understanding of such artefacts undivided from the "semantics of their work". "Ctrl - F5" has particular meaning for a bank teller community, it is integral to their praxis.

Consider a particular case from banking. A small regional bank, in order to start a dedicated loans collection unit, employed a loans overdue collection expert that previously worked in a big multinational bank. Although the person had more than 10 years experience in loans overdue collection, she had tremendous difficulty in transferring this expertise to the new setting. While she was working with a management consultancy in order to set up standard procedures for the new unit, she kept giving what seemed "irrational explanations" for many parts of the process. It was latter realised that she was almost unable to differentiate between the "loans overdue collection task" *per se* and the use of the information system that she had been using as a medium for this work in her previous position in the multinational bank. Her meaning making had evolved inseparably from the particular information system. The above may be an extreme case, but this type of phenomena exists almost in every engaged activity.

The above examples point to the need to acknowledge that people progressively create meaning through engaged action in the world. Nowadays, more and more people have already established authentic ecologies containing particular software tools. They should not be viewed as mere humans but as experienced workers with an embodied understanding of their activities. In such cases, new designs should explicitly consider and support this embodiment. A good example illustrating acknowledgement of embodiment is MS Excel™ which, for many successive versions, provided an alternative Lotus 123™ interface (the first widely adopted electronic spreadsheet) or the preservation of the old shortcut keys in new graphical interfaces for bank tellers.

Through appropriation of particular software environments, people progressively pass to a stage where they perceive and exploit opportunities. They tend to use software features with remarkable creativity in ways for which they are not overtly designed. *Readiness-to-hand* opens a whole new *worldview*. In this sense, a search engine may become an ecological phrase checker, just by looking at the number of occurrences in the WWW, or a folder name on the desktop, may become a phone number memo, just by right click and type (Papantoniou, Nathanael & Marmaras, 2002). These deviant uses of software that are to a large extent are grounded to embodiment may be seen as *catachreses* (Béguin & Rabardel, 2000). Catachreses do not necessarily imply a misinterpretation by the designer of users needs. As we have pointed above, people are highly creative and the contexts they may find themselves in are infinite. Catachreses may well point to the inescapable co-evolution of people and artefacts. Identifying and explicitly considering them in may well provide fresh opportunities for improved design.

3 Epilogue

In this paper we advocate that successful design for proficient users should acknowledge embodiment and deviant creative uses of IT artefacts. The discussion and the examples provided suggest that universal-principle-based HCI design, detached from the historically evolved human practice, is insufficient for the support of every day skilful activity.

For the analyst, trying to bring forth embodied interaction requires involvement since it is experiential to a large extent. We are not yet in a position to communicate in a systematic way how one recognizes embodied features of specific worldviews or practices. Spontaneous verbalisations, catachreses, software logs seemingly irrational habits etc., provide valuable hinds. Further work needs to be done towards this direction.

In is important to not that, as the realities of software design demonstrate, embodiment is actually respected to a large extent. It is more so for widely used historically evolved applications and on the WWW as manifested in by the trend towards uniformity of Interaction platforms and the implicit or explicit "mimic" practice inside the design community.

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