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Moving Target: Designing for Evolving Practice

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Abstract

The paper discusses the limitations of current HCI design methods to effectively support the design of new artifacts which radically change the ecology of practice. The notions of *catachresis* and *utilization schemes* are used to describe the changing ecology of practice. The hierarchical model of *shearing layers* is proposed as a useful tool to support the required designer's consideration of evolving practice.

1 Introduction

There is a flurry of research in the field of wireless technologies, which is stemming both from the technological and the human-centred disciplines. Part of this excitement is due to the belief in the power of these technologies to radically alter the way we live and work. The predicted break from the traditional user-PC or users-groupware ecology in conjunction with the move from shared physical spaces to shared information spaces as the work habitat, calls for new ways of designing systems.

2 Traditional Design Methods and the Reality of Design

Despite this ongoing revolution, most current human-centred research programmes in the area of wireless computing continue to follow traditional HCI methodologies. The traditional HCI research methodologies and subsequent design methods originate from a positivist/conservative (Coyne, 1995) view according to which the design of systems/artefacts is a rational problem solving process. The desired object can be reached by following a strict analysis-synthesis-evaluation procedure (Jones, 1963). The positivist approach to design presupposes the users' ability to clearly state their needs in a way usable by the designer. The role of the designer is to follow the methodologies proposed by research and implement context-free guidelines, the application of which is viewed as unproblematic. On the other hand, the designer is supposedly able to strictly prescribe the future work practice in his design.

However, the realities of practice have shown that design practice is a "messy" affair filled with ad hoc solutions and analysis is interwoven with synthesis (Schon, 1983, Darke, 1979). According to Mead (cited by Coyne, 1995), designer of the VLSI (Very Large-Scale Integration chip), "design is a messy, ad hoc, atheoritical activity. The 'analytic constructions' come into play later in the process and are constructed in hindsight. Innovations come out of this 'tussle with reality'" Design activity is characterized by "throwness" (Dreyfus, 1991, Winograd et al 1987), where the designer

cannot avoid acting, doesn't have the ability to instantiate himself from the activity and reflect on his actions.

The designer cannot begin with complete "doubt" (analysis without synthesis): he is already in a world of artefacts and practices from which he cannot escape (Peirce, 1935). Most importantly the interaction of people with technologies goes both ways and the adaptation is mutual: practice is not the result of design, but rather a response to it (Wenger, 1999). Like Latour's citation games (Latour, 1987), the designer cannot prescribe how his device will be used and in what context as his design can be subject to *catachresis* (Beguin et al, 2000).

3 Catachresis & Utilization Schemes

The term "catachresis" comes from the domain of linguistics and rhetoric and refers to the use of a word in way different from the normal meaning. In the realm of human activity this notion describes how people use artefacts in ways not anticipated by their designers. This notion is very useful for describing how people interact with omnipresent technological artefacts like wireless devices.

Examples of such "deviant" uses are seen everywhere: from an ethnographic work on how people use cell phones we found out that people tend to use basic features of the cell phone even if the task at hand is supported by specialized features. For example, even though newer phones have a note-taking feature, people still use familiar functions like the Phone Book to store information like Social security number, ATM codes etc. or use unsent SMS-messages to take notes.

Another example of catachresis is provided be some expert users employing folders on the Windows Desktop to store phone numbers. At first glance such behaviour seems bizarre, but careful observation showed that experts use this to quickly store a phone number while in front of the PC as this is indeed the fastest way to do it by using basic resources, and not resort to using an address book (Figure 1).

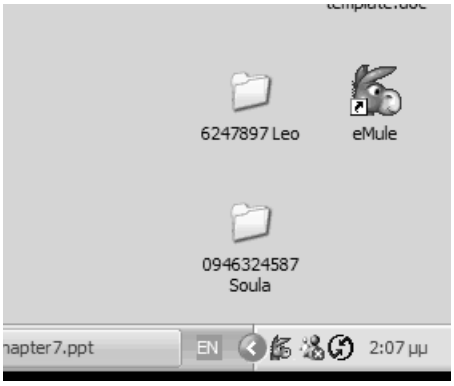

Figure 1: Desktop Folder used to store Phone Number

Adopting a snapshot view, such phenomena can be attributed to opportunistic behaviour on behalf of the user which leads to suboptimal results. On the other hand, if one adopts a developmental view the same phenomena reflect a process of co-adaptation between the user and the artefact. When the user names a folder 0946324587 he employs *utilization schemes* developed from the

interaction with other artefacts like Post-its (write it down quickly), instead of using MS Outlook™ or any other contact management application.

Utilization scheme (Rabardel, 1995) "is an active structure into which past experiences are incorporated and organized, in such a way that it becomes a reference for interpreting new data". Utilisation scheme has a dynamic and historical character. As such it makes a tool that can be incorporated in a design view which focuses on the evolution of the designed artefact through time.

The above examples are catachreses taking place in a short timeframe, so the artefact is usually left intact. In a longer timeframe, we observe both the development of new utilization schemes and adaptation of the artefact to the now legitimate way of performing the task. This leads to *instrumental genesis* (Beguin et al, 2000). The concept of instrument comes as a refinement/explanation of the abstract artefact in the classic Activity Theory triangle (Figure 2). According to this view, the instrument is a composite entity comprised of both the artefact and the psychological structures that organize the activity.

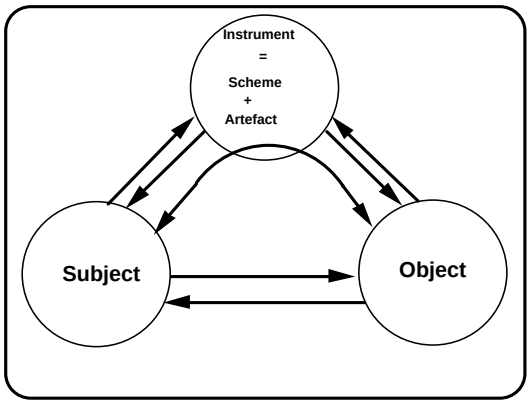

Figure 2 The mediating instrument, a composite entity. (Beguin et al, 2000)

4 Scheme Based Design?

As shown above the notions of catachresis and utilization schemes are powerful notions, but the question remains: how can they inform design? Beguin et al. (2000) believe that design should be based around the current work practices. They introduce a prototype of the design in the work system and observe the forming of a new ecology. While testing with a prototype provides useful insights by revealing hidden aspects of the existing work practices and/or the artefact (Coyne, 2000), it is doubtful whether the new work ecology has time to settle in such a short timeframe. As a result, the insights gained through this approach will tend to support existing practices (formal and informal), but are unlikely to transform them; it is what Vicente (1999) called "descriptive design".

5 Designing for Evolving Practice

We advocate the use of a pragmatic approach where the design activity is distributed between designer and user, not in the manner of participatory design, but distributed in time: after its introduction the artefact is underspecified and open to modification by the user/designer. In order

to incorporate the temporal element as a major constituent of design, we need an explicit representation of how the design evolves with time along with the infrastructure that supports/gives meaning to it.

In the domain of architectural design, Stewart Brand (1994) used the notion of *shearing layers*, where each layer operates at a different timescale, to describe the process of co-adaptation of buildings-inhabitants through time. The layers are: Site (eternal), Structure (30-300 yrs), Skin (15-20 yrs), Services (7-15 yrs), Space Planning (2-3 years) and Stuff (continually). This approach owes much to the work of Alexander (1979) as well as ecologists like O'Neill (O'Neil et al, 1986).

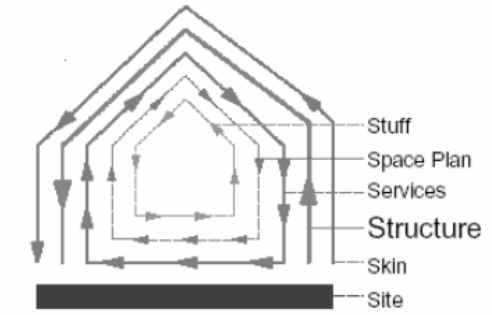

Figure 3: The Shearing Layers model (Brand, 1994)

According to this hierarchical approach, there is little/no exchange of mass/energy/information between the layers, so they can be considered as evolving autonomously from the other layers (Lemke 2000). This permits the system to be alive, so the 'fast' layers explore new possibilities, while the 'slow' ones provide continuity. The slow layers serve as infrastructure for the fast layers by providing opportunities and at the same time give them meaning (Chan & Gorayska, 2001). The lesson for the designer/architect is that there must be slippage between layers: the slow layers should not block fast layers and fast layers should not be able to radically deform the slow ones; office buildings built in the 60's had to be demolished in order to install network infrastructure, while older buildings adapted better (Brand, 1994). Another case in the realm of software are applications in which data and parameters are meshed in the program code and not independent of it (proprietary banking systems developed in COBOL come in mind).

Whereas modernist architecture focused on the middle layers and especially the Skin, the designers/HCI specialists of the artefact are usually concerned with how the interface will support the task at hand and disregard other layers. On the contrary, we advocate that when designing new artefacts we must strive to build a concrete *infrastructure* and "underbuild" the surface features to leave room for adaptation. This goes against the notion of Information Appliances (Norman, 1998), which are devices specialized for each task and as a result not likely to adapt. Examples of artefacts embodying the proposed view are the Palm PDA (began by giving robust core features and lots of room for modification), Spreadsheets (the grid is an open space which can be transformed in a phone book, a database, or used to make a diet plan).

6 Epilogue

Such an understanding is even more important for wireless computing, because mobile devices are characterized by their materiality (Dourish, 2001), their wirelessness and their distributedness

(Peer-to-Peer). Wireless as well as Peer-to-Peer architecture is more of a service/infrastructure than a product. So building stuff on proprietary infrastructure is walking on a tight rope: the design may be useless (end up unusable) as the slower layer maybe different than expected.

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