A Study of Familiarity

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Abstract: HCI has long sought to account for peopleÕs experiences with technology and to ground good design practice in this knowledge. In an effort to understand human action and cognition, HCI has drawn on a wide variety of disciplines. While the social sciences are regular ports of call, philosophy *per se* is rarely consulted. This paper is an exception: we present an empirical investigation of computer use by fifty individuals, the results of which have been interpreted using HeideggerÕs philosophical writings on familiarity.

Keywords: HCI, Heidegger, Familiarity.

1 Introduction

We introduce, discuss and report an empirical investigation into an important though under-researched aspect of human-computer interaction (HCI), namely, familiarity. An overview of the literature on older people and usability indicates that although issues surrounding familiarity have been found very important for HCI, they have also been neglected. It also illustrates the paucity of the theoretical background in this area. To help bridge this gap, we propose using HeideggerÕs treatment of familiarity. To date a number of researchers show a strong interest in HeideggerÕs philosophy, which is associated to the phenomenological school of thought (e.g. Winograd & Flores, 1986; Clarke, 1997; Coyne, 1999). Still, hitherto, HeideggerÕs philosophy has not been adopted widely as a conceptual basis for empirical investigations. The study reported here presents only the first stage of such an investigation, which has two main objectives. The first is to determine whether and how some of the core ideas that structure HeideggerÕs interpretation of familiarity can be reached through using protocols that are amenable to HCI research. The second, which is concomitant, is to establish the relevance of HeideggerÕs interpretation of familiarity in this context.

As our study involves older people, we begin with a brief overview of how HCI research has treated older people and usability before introducing HeideggerÕs treatment of familiarity. From there we examine the connections between HeideggerÕs philosophy and HCI research and reflect on which methodologies have the potential to both accommodate HCI protocols and provide access to some of HeideggerÕs core ideas related to familiarity. We then introduce our analysis of fifty peopleÕs experience of using computers and conclude with indications of further work.

2 Familiarity: A Topic in Search of a Theory

Usability issues involved in older peopleÕs relation to computers have been frequently analysed and evaluated in terms of performance. Most studies have found that older adults achieve lower levels of performance when compared to younger people (e.g. Westerman and Davies, 2000). Differences in performance have been identified in both the learning and the executing processes, which has been attributed to older peopleÕs greater difficulties in learning how to use and in using computers. In short, it has been found that older adults require more time in learning and executing tasks as well as more assistance, make more errors, are less accurate, and have difficulty learning and retaining information in a number of situations.

There are very few authors who attribute a role to attitudes in regard to usability issues and levels of performance in the context of computer use by older people (Ogozalek, 1994 is an exception). The consensus among most researchers is on correlating at least part of older people poorer performances with results obtained in the domains of human factors and psychology of ageing and skill acquisition (e.g. Czaja, 1997). According to them, these results would mostly indicate an age-related

decline of physical and mental faculties, particularly in vision, hearing, perceptual, motor and memory capabilities (especially spatial and working memory). They consider that this hypothesis should account for at least part of older people lower performances with computers, explaining especially older adults' difficulties in learning how to use computers.

Beyond this, researchers have considered whether experience plays any role in older people's difficulties to use computers. Czaja and Sharit (1993), as well as Ellis and Kurniawan (2000) found that not only previous computer experience is strongly linked to performance but also that older people have less experience with computers. Morris (1994) considers that learning how to use computers is more of a burden for older people because they could not experience computer technology during their developmental years. Morrell and Echt (1997) found that older adults are less likely to use computers than younger adults and that older users report less computer experience than the younger ones. For many authors then, previous experience and familiarity with computers constitute an important predictor of older users' performance. From a broader perspective, familiarity with the technology has been found to be something important – if not crucial – in the general relationship that people have with it, conditioning both their abilities to use it and their attitudes towards it. Yet, as Czaja and Sharit (1993) have explained, the role of experience is not well understood. "What is unknown, they say, is the degree to which experience mediates or moderates age differences in performance and the nature of the experience effect." Moreover, according to Czaja (1997), researchers are still unable to figure out the relative importance of experiential and biological factors. The situation has not significantly improved since these comments have been made.

This stands in sharp contrast with the treatment of familiarity by philosophers – Heidegger in particular. Indeed, much of Heidegger's work is grounded in an interpretation of familiarity. By calling on Heidegger we necessarily expand the discussion to include those other issues which are associated with familiarity. Heidegger has proposed not merely a theory of familiarity but a theory of the human being where familiarity is fundamental. His argument is that familiarity defines much of what it is to be a human being. This wider issue aside, Heidegger does also point the way to understanding the more tractable issue of familiarity *per se*.

3 Heidegger's Analysis of Familiarity

Taken in its commonsense meaning, the concept of familiarity appears quite trivial. Nothing in our everyday dealings with it seems to suggest that it might be a very important concept. Yet, Heidegger claims that this concept, in its triviality, holds something extra-ordinary. The reason of this is that the concept of familiarity says something essential about human nature, if we follow Heidegger. More, it contains what defines human nature as such. In his main text – *Being and Time* – Heidegger explains that what defines most essentially the human way of being is its familiarity with a "world" (a world, for Heidegger, is made of a system of practices, equipment, and skills shared by a specific community).

Adopting Heidegger's approach, familiarity subsumes a number of ideas. Firstly, it includes the idea of involvement, which Heidegger translates by the expression "being-in-the-world". The human being is involved in its world on the mode of dwelling, inhabiting, which is accompanied by a feeling of being-at-home. Secondly, familiarity also includes the idea of understanding. For Heidegger, it is on the basis of understanding that the human being relates to his/her world. Heidegger defines this understanding by saying that it is not cognitive, i.e. that it is not related to knowledge but that it is embedded in our activities and shows up with them. His contention is that we manifest our understanding by our taking part into activities. The reason for that is that understanding is essentially a skill, a capacity to do something. Although non-cognitive, it constitutes "the condition of possibility for all kinds of comportment, not only practical but also cognitive" (*The Basic Problems of Phenomenology*: 276), and this includes complex problem solving. Importantly, this understanding does not involve consciousness. Corresponding to what Heidegger calls "circumspection", human understanding is an "unobtrusive and unthought … sight" (id. 163). Heidegger explains that "unthought" means that "it is not thematically apprehended for deliberate thinking about things" (ib.). Finally, familiarity includes the idea of unity of self and world. Heidegger holds that self and world are not two distinct entities but only one, the undifferentiation resulting from the involvement in a world on the basis of understanding. This aspect may be one of the most difficult to grasp in Heidegger's thinking, as it stresses the unusual character of this thinking in our cultural context.

In summary, the human being familiar with his/her

world demonstrates, through her activities – both practical and intellectual –, an understanding of herself that unfolds most of the time spontaneously and without interruption, and, importantly, with the person acting absorbed in what she does, i.e. without thinking deliberately about what she does.

Heidegger was well aware of the originality of his position and made explicit his intention of contrasting it with the more traditional ones, which constitute the body of our philosophical and cultural background. Heidegger opposed the view explicitly or implicitly held by many Western scientists and philosophers according to whom the human being is essentially divided between a mind and a body. He also opposed the related idea according to which the relation between human being and the world can be authentically described as a relation between a subject and an object, i.e. a confrontation between two entities. In doing so, he disputed that human activity is dominated by knowledge and consciousness based on the making of representations.

It should be noted, however, that Heidegger does not reject completely the idea of mental content and with it the concept of representation. Instead, he considers that together with intentional actions and thoughts, goal setting and deliberate attempt(s), and the correlated relation subject-object, mental content emerges only in specific situations, which are either unusual, important, or difficult. Still, mental content is never uniquely based on perceptual cognition and independent from the background familiarity. On contrary, it is grounded in this background as its condition of possibility, the background making also focus and decision possible.

4   Heidegger and HCI Research

4.1   The Place of Philosophical Thinking in HCI

At the outset of their book *Understanding Computers and Cognition* (1986), Winograd and Flores took care alerting their readers who have a background in science and technology that philosophy has practical relevance for their domain. We would like to echo this concern for the HCI community. In HCI, philosophical thinking has a number of potential roles: firstly, philosophers primarily work on and with concepts, particularly in order to clarify them. These concepts are drawn variously from philosophy *per se*, from science, or simply belong to the everyday world of that rarest of commodities - commonsense. This work involves the careful examination of the use of language and of its meaning, including the important tasks of

uncovering connections and making conceptual depth explicit. In much the same way design theorists and practitioners also make use of such concepts, as these are essential tools to describe, understand, communicate, and often guide action, which they contribute structuring. Concerned by the accuracy or appropriateness of some of their most important tools, design theorists and practitioners may be interested in the work of clarification to which the philosopher proceeds.

Secondly, philosophers build conceptual frameworks, some of which have immediate implications for design theory and practice. As Winograd and Flores state: "Theories about the nature of biological existence, about language, and about the nature of human action have a profound influence on the shape of what we build and how we see it" [xii].

A third reason why philosophical thinking has a place in HCI is that design theory and practice are underpinned by philosophical positions. Here again, Winograd *et al*. help by explaining that many of our "ways of thinking", whether we are philosophers or not, "embody" philosophical traditions (at least one). Without us being necessarily aware of it, we use words and ideas that are more or less directly connected to what philosophers such as Descartes, Locke, or even Plato have thought and transmitted, and which are now part of our background or culture, of what we share and goes without saying.

All these aspects through which philosophy and design theory and practice connect are important and relevant for us. Heidegger belongs to the category of these philosophers who have played a crucial role in the areas of clarifying concepts, building an original conceptual framework, and making explicit some of the philosophical presuppositions that underpin the commonsense shared in our societies. What Heidegger says concerning the concept of familiarity is a clear illustration of this.

4.2   Heidegger's Influence in HCI

Heidegger has been influential not only in philosophy and in the social sciences but also in HCI. Also, the idea of using Heidegger in areas concerned with the relationship human-computers is far from being a new one. A number of influential works and methods have been produced which are more or less directly based on Heidegger's philosophy. For example, he has contributed to inspiring the ethnomethodological approach promoted by Garfinkel (1967), which is now popular in Computer Supported Cooperative Work. He has also contributed to inspiring the important works of Winograd and Flores (1986) and Suchman (1987),

who have grounded their analysis of human relation with computers in a Heideggerian or phenomenological point of view. Winograd, Flores, and Suchman have been attracted to Heidegger's existential phenomenology based on a critical appraisal of Western ways of thinking about the human being and its way of being, i.e. its relationships with itself and the world. Referring to Heidegger's philosophy, they have proposed to understand human action and cognition without using the concept of representation, and so have placed their reflection regarding the human being outside the traditional philosophical debate that has opposed the tenants of the internality of the mind to the tenants of its externality (which, historically, has taken the form of: most analytical philosophers vs. Wittgenstein).

4.3 Other Connections between Heidegger and HCI

Connections between Heidegger's philosophy and HCI research go beyond its direct influence on it. They can also be found among some of the fundamental concerns in HCI, including those related to the concept of representation, to the consideration of context in understanding users and user involvement in the design process.

Heidegger has contrasted his analysis of the human condition with a point of view grounded in the concept of representation, which he considered to be inappropriate to account for skilful activity/ being. Yet, many HCI researchers have expressed their concern about the difficulty to understand the user and ground design practice on this understanding in the context of theories that do not make a circumspect and limited use of the concept of representation. Among these researchers, we naturally find those who have adopted phenomenologically oriented approaches (cf. above). Yet, we also find activity theorists (Nardi, 1996; Kaptelinin, 1996) and distributed cognition theorists (Hutchins, 1995), who consider that mental representations should not be the main locus of study. Focusing on what is external to the individual's head, they propose to see mental representations as encompassed in a greater picture that includes at least artefacts and social relations. This bigger picture ressembles much of what Heidegger has to say.

Heidegger defines the human being by his/her involvement in his/her world. Yet, from the 1980s, the idea has grown in HCI that in order to understand the user one should go beyond the cognitive aspects as to consider work, i.e. what the user is essentially involved in – some work or activity – while relating to a computer. Similarly, the idea has also emerged that work had to be understood in practice, i.e. in context, in situation. There is now a whole literature concerned with understanding context of use (e.g. Anderson & Alty, 1995). The research focus has clearly been widened in order to include the consideration of real world practice in addition to laboratory studies. New methods, such as ethnography, have been adopted in order to gather contextual information. Tools and techniques, such as rich pictures or scenarios, have also been developed to include contextual information into the design process. In parallel, there has also been a move towards involving more the user in the design process, using techniques such as participatory design or contextual design, which are based on the idea that the user holds a great deal of useful information relative to his/her activities that needs to be fed in the design process. By focusing more on work, context and involvement, HCI is not far from acknowledging a theory of a user defined by her worldliness, i.e. from recognising the inseparability between the human being and his/her world, as Heidegger did.

4.4 Introducing Heidegger's Ideas about Familiarity in HCI

As illustrated above, Heidegger's philosophy connects with HCI research in a number of different ways. Importantly, Heidegger's interpretation of familiarity has the potential to contribute to both bridging the gap in HCI research regarding issues that surround familiarity and to underpin and link together the important topics we have pointed to. Yet, Heidegger presented himself as a phenomenologist and, as he explained, the term 'phenomenology' does not designate a doctrine or a set of ideas but a method, the method that he considers to be appropriate for a "science of philosophy" (cf. The Basic Problems of Phenomenology). Phenomenology as a method of investigation through which an interpretation of the human being emerges differs dramatically from the research protocols used in HCI. Yet, through taking advantage of some aspects of both phenomenology and familiarity, it is possible to envisage using protocols that are amenable to HCI research to try to gain access to some of the core ideas that structure Heidegger's interpretation of familiarity.

Importantly, "Heidegger, unlike contemporary analytic philosophers who attempt to give a logical analysis of concepts, always attempts to anchor his discussion in the phenomena" (Dreyfus, 1991). Heidegger's submission to the concrete first shows in his interest in the everyday life of human beings

and in his descriptive approach to it. It also shows in his use of the commonsense to draw conclusions regarding the human way of being. Heidegger's critical attitude toward commonsense concepts must be put in perspective with his equally strong reaction against any rigid separation between common thinking and knowledge. In Heidegger's approach, the commonsense is built from different sources. Partly made of concepts that originate from philosophical and scientific traditions, it is also made of conceptions that are rooted in the experience of being-in-the-world, i.e. of conceptions that structure and/or reflect this experience and which, consequently, contribute to describe it. Because he is convinced that there is a correspondence between some commonsense concepts and what people experience, Heidegger uses them to ground his description of the human way of being in the world. He makes it very explicit for the concept of understanding, which he says to be using in its commonsense meaning. Yet, we hold that the same applies to the concept of familiarity – which is immediately related to the former –, as its roots in the German language show (*vertrautheit*). While Heidegger examines the philosophical value and meaning of the concept of 'familiarity', what he does consists in revealing the meaning and importance of this concept as it is used by the commonsense. Heidegger's most crucial operation consists in uncovering the fact that the concept of familiarity, without us being aware of it, expresses something essential about our being-in-the-world every time we use it.

An important characteristic of familiarity is that it is mostly subjective, involving people's understanding of themselves in their being-in-the-world. What is observable are the outcomes: easiness, confidence, success, performance, which are all manifestations or signs of familiarity. As familiarity is subjective, it is mostly through witnessing one's own experience or having somebody witnessing it for us that one can obtain a description of it, the description being always provided by the witness him/herself.

Heidegger's attention on the concrete and for the commonsense coupled with the subjective dimension of familiarity allows envisaging a study of familiarity based on the use of research protocols that are more amenable to HCI research than Heidegger's phenomenological approach, namely interviewing as data gathering method and content analysis as data analysis method. Interviewing allows participants' views to be documented and explored, minimising researcher's interventions in the production of data and maximising the role of the people studied in this task (Blomberg, Giacomi,

Mosher, and Swenton-Wall, 1993). As for content analysis, it allows a direct account of people's conceptions.

Hereafter, we present our first step into the empirical work. From a philosophical perspective and using the protocols described above, we have investigated the possibility to have access to aspects of Heidegger's positions that bear on the concept of familiarity in commonsense descriptions related to the relation human-computer.

5 A Study of Familiarity and 'Commonsense'

5.1 Objectives
This work was conducted between 2001 and 2002 in Edinburgh, and sought to gather peoples' spontaneous descriptions of their experience with computer-based technology.

Our analysis of the data has focused on identifying potential connections between what people said and Heidegger's conceptions of familiarity. The underlying question was: do people understand their relationship with computers in term of familiarity and, if yes, what meaning and importance do they attribute to it? We were also interested in people's comments regarding age-related differences in the relationship with computers, as prior research has identified older people as a category of the population that is generally less familiar with computer-related technologies.

5.2 Participants
In all, 50 people took part in the study drawn from a wide variety of different backgrounds (e.g. degree of computer experience – spanning from novice to expert –, educational and professional backgrounds, nationality, age, and sex). While some of our participants volunteered (8) most were recruited (42). The sample was a non-purposive, convenience sample, which we approached as a philosopher looking for a useful dialogue with diverse computer users.

5.3 Data Gathering Method
As we were interested in gathering details of peoples' experiences, we simply used unstructured interviewing. This also served to minimise our interventions in the production of data. The participants were only given a general indication of what we wanted them to talk about, asking them to describe freely their experience with computers and technology. Interviews took an average of 1.75-2 hours, although some lasted for four hours.

5.4 Data Analysis Method

The interview data were subjected to an informal content analysis (Giles, 2002), as (i) we are working with language and meaning, i.e. on textual data ('text' is understood broadly as anything that contains concepts). The 'text', in our study, is made of the transcript of our interviews. And (ii) we wished to undertake a comparative analysis of the texts, i.e. a comparison of commonsense terminology and meanings versus Heidegger's phenomenological interpretation of familiarity.

Content analysis often stops with conceptual analysis, which involves checking the occurrence of concepts against a pre-defined list, in order to establish their existence and frequency. Relational analysis does that and also investigates the relationships between these concepts. It is based on the premise that concepts are always interrelated, i.e. that they do not exist or mean independently.

6 Results

6.1 "Familiarity Is the Key"

The word *familiarity* or its variants (familiar, etc.) was used frequently (we identified 45 occurrences). It is clearly an important word. Further, this importance manifested in a number of different ways. One of the participants [Brenda] opened the interview by saying, "I just need to familiarise myself". And again [Mickey] declared that "familiarity is the key" and [Natalie] reported: "I learned through try and error. What was essential was to become familiar." [Paul] too was very explicit:

> "well, I have not used Apple Mac that much. I felt frustrated when I used it because I am familiar with Windows. I expect to be able to do things the way I am used to. That's the main thing, really."

[Graeme] noted:

> "Familiarity makes more comfortable, so it is a good thing. It is learned behaviour. We want familiarity and comfort the more quickly possible. It has to do with easiness."

According to [Michael,] "Human memory is familiarity with the tool", [Chris] reports that "you need to be familiar with the basic language and symbols to feel confident". As for [Rosemary]: "I suppose the problem is simply that I am not familiar with it (talking about the computer)".

6.2 Familiarity is Related to Understanding

Reading through the interview data it emerged that familiarity appeared to be a kind of understanding.

[Mickey], just after he had heavily insisted on the importance of familiarity and anchored his discourse in this topic, turned his thoughts on understanding. He explained that he does not want to know but to understand, and exposed what according to him understanding means and involves:

> "I am not interested in how but want to do things, like watching movies. I do not want to know a list of facts but understand. … When you understand something, you join a community of people doing something in a certain way. I only feel comfortable at the level where understanding appears. There are certain things that never go into my head when I do not understand. I can forget things very quickly. … If I can understand something related to new technology, then I am interested by the developments. I follow a progression when I feel familiar."

[Chris] made the link between familiarity and understanding quite explicit: "*Desktop* is a term I found difficult to understand. It is OK once you are familiar." If familiarity and understanding go together for [Chris], lack of familiarity and lack of understanding go together for [Rory]:

> "I was first scared because computers presented an unfamiliar environment. I could only do what I was shown and nothing else. I did not understand the basis of what computers do, all the different things you can do."

For [Robbie], "understanding builds up on top of memory", which makes sense when one thinks of memory as familiarity, as [Michael] made it explicit.

6.3 Doing without Thinking

Interviewees also expressed the idea that familiarity involves doing things without thinking about them, i.e. doing them rather unconsciously:

> "Human memory is familiarity with the tool. You must do things naturally, I mean unconsciously and with no effort" [Michael].

Linked with the idea of unconsciousness, or of doing things without thinking about them, we find the ideas of intuitiveness and easiness:

> "Word is incredibly easy to use. You can guess. You usually can figure out how to use it, using common sense and intuition. The feeling of easiness is due to the design and the familiarity using computers" [John].

[Michael] also reported:

> "Easiness implies that you do not have to remember how to do things, how to do what you want to do. The commands must be found intuitively."

[Massimo] said about intuition: "I find Windows more intuitive than Mac. I reckon that I used my knowledge of DOS to feel familiar with Windows."

6.4 It's about "Getting Involved"

Although the data on this point is rather limited, the relationship with computers has been exclusively described in terms of "involvement". The concept of involvement was made explicit especially by [Chris]:

> "I had to get involved because it became embarrassing that one by one my colleagues were getting involved and not me. … The first of my colleagues to get involved in computers were the young, the youngest were already familiar with computers when they came to work."

An older member [name not recorded] of the group also noted that: "We have to get involved", and [Janine] reckoned: "I know many older people who get involved without any problem."

6.5 Older People are Globally less Familiar with Computers

Another interesting finding is the identification of a specific category of the computer user population as being placed at a potential disadvantage from the point of view of familiarity with computer-based technology. Interviewees highlighted the problem that 'the older you are the less likely you are to be familiar with new technology'. A large proportion of the older (50+) interviewees (~85%) insisted on the fact that computers open up a whole new thing for them. The reason given for that is that most often for older adults, computers were not part of their studies and/or of their job and are absent from their home or came in it only recently. Moreover, many of them have neither knowledge nor experience that could be related to computers or other devices that use microprocessors, screen interface, and/or keyboard or console.

7 Discussion

The results of our study show a strong correlation between people's spontaneous descriptions of their experience with computers and Heidegger's analysis of human being as defined by its familiarity with the world it lives in. The relationship to computers seems to be fundamentally understood in term of "involvement". Moreover, we have been able to show that the concept of *familiarity* is an important one. Familiarity is the term people use every time they express the conditions of satisfaction and also, crucially, of possibility, that apply to computer use. Importantly, the consistency between interviewees'

discourses on familiarity is striking. There is a very clear consensus and pattern of usage of the term. This consistency can be found at the level of the terminology as well as at the level of the relations between concepts. The patterns that are shared show a constellation of interrelated concepts, i.e. a configuration of concepts, which includes the concepts of familiarity, understanding, unconsciousness, "unthinking", involvement, easiness, comfort, and friendliness.

This first step into an empirical investigation of familiarity is a clear sign that interviewing computer users gives us access to some of the ideas that Heidegger has focused on. We foresee that HCI could benefit from pursuing further this sort of investigation without the need to adopt the very unfamiliar and demanding phenomenological approach. Our next steps are outlined in the next section.

8 Further work

We are currently pursuing the empirical work on familiarity, using a scheme based on the consideration of Heidegger's strong connections with Asian philosophies (May, 1996). The choice of the context for this empirical study has been determined by what has been previously said about familiarity in HCI. As explained above, older people constitute one of the categories of users that have been found to include the most significant proportion of users who lack familiarity with the technology. Moreover, studies about older people and issues surrounding familiarity are rare. For these reasons, the new empirical study we are currently leading takes place in a retirement home located in Edinburgh, and involves a number of its residents. It involves introducing a fully equipped PC, including a Web cam, and observing how the older residents who are unfamiliar with computer-related technology relate to it and learn to use it. Two other Web cams will be distributed to residents who already possess a PC in order to start a network inside Homeross House. We will also have one in order to communicate with the residents. The methodology, as before, is based on interviewing and observation, and the data collected will be subject to content analysis.

References

Anderson, A. and Alty, J.L. (1995), *Everyday theories, cognitive anthropology and user-centered system design*. People and Computers X: Proceedings of HCI '95, Huddersfield, pp.

120-135.

Blomberg, J., Giacomi, J., Mosher, A. and Swenton-Wall, P. (1993), Ethnographic fields methods and their relation to design. *Participatory Design*. D. Schuler and A. Namioka. Mahwah, NJ, Lawrence Erlbaum, pp. 123-157.

Clarke, A. (1997), *Being There – Putting Brain, Body and Word Together Again*. Cambridge, MIT Press.

Coyne, R. (1999), *Technoromanticism – digital narrative, holism, and the romance of the real*. Cambridge, MIT Press.

Czaja, S.J. and Sharit, J. (1993), "Age differences in the performance of computer-based work." *Psychology and Aging* 8: 59-67.

Czaja, S.J. (1997), Computer Technology and the Older Adult. *Handbook of Human Computer Interaction*. H. M. Amsterdam, Elsevier Science, pp. 797-812.

Dreyfus, H.L. (1991), *Being-in-the-World: A Commentary on Heidegger's Being and Time, Division I*. Cambridge, Mass., MIT Press.

Ellis, R.D. and Kurniawan, S.H. (2000), "Increasing the usability of online information for older users: A case study in participatory design." *International Journal of Human-Computer Interaction* 12(2): 263-276.

Garfinkel, H. (1967), *Studies in Ethnomethodology*. New York, Prentice Hall.

Giles, D. (2002), *Advanced Research Methods in Psychology*. Hove, Routledge.

Heidegger, M. (1962), *Being and Time*. New York, Harper & Row.

Heidegger, M. (1982), *The Basic Problems of Phenomenology*. Bloomington, Indiana University Press.

Hutchins, E. (1995), *Cognition in the Wild*. Cambridge, MA., MIT Press.

Kaptelinin, V. (1996), Activity Theory: Implications for Human Computer Interaction. *Context and Consciousness: Activity Theory and Human-Computer Interaction*. B. Nardi. Cambridge, MIT Press, pp. 103-116.

May, R. (1996), *Heidegger's Hidden Sources. East Asian Influences on His Work*. London and New York, Routledge.

Morell, R.W. and Echt, K.V. (1997), Instructional design for older computer users. *Aging and Skill Performance: Advances in Theory and Applications*. W.A. Rodgers, D. Fisk and N. Walker. Mahwah, NJ, Erlbaum, pp. 241-265.

Morris, J.M. (1994), "User interface design for older adults." *Interacting with Computers* 6(4): 373-393.

Nardi, B.A. (1996), Studying context: A comparison of activity theory, situated action models and distributed cognition. *Context and Consciousness: Activity Theory and Human-Computer Interaction*. B.A. Nardi. Cambridge, MA, The MIT Press, pp. 7-16.

Ogozalek, V.Z. (1994), *A Comparison of the use of text and multimedia to provide information to the elderly*. Human Factors in Computing Systems, Proc. CHI'94, pp. 65-71.

Suchman, L.A. (1987), *Plans and Situated Actions: The Problem of Human-Machine Communication*. Cambridge, Cambridge University Press.

Westerman, S.J. and Davies, D.R. (2000), "Acquisition and application of new technology skills: the influence of age." *Occupational Medicine-Oxford* 50(7): 478-482.

Winograd, T. and Flores, F. (1986), *Understanding Computers and Cognition: A New Foundation for Design*. Norwood NJ, Ablex.