Ambient technology: Reconsidering informed consent

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ABSTRACT

New forms of ambient technology are emerging. Human computer interaction continues, but with an at time invisible interface. Agents monitor seniors in their homes to ensure medical doses are taken in timely and correct fashion. Testing the usability of such technology raises numerous ethical concerns, particularly to do with enabling participants in such testing make informed decisions. Current principles of informed consent, as used in the human computer interaction profession, may be inadequate to the task ahead.

Keywords

Informed consent, transparency, seniors, medical technology.

INTRODUCTION

Human Computer Interaction (HCI) is facing new challenges. The context in which HCI work and research takes place today has to cater to ever increasing diversity of technology, especially in the area of medical technology. The challenges of ubiquity, pervasiveness and ambience all bring new challenges to the way in which research and practice involving human participants takes place. It can be envisaged that in a context of an ambient environment, where the technology disappears, carrying out informed consent procedures using traditional approaches, will no longer be appropriate. Yet this should not mean that one discards considerations of risks to the human participants in this work. These new technologies raise difficulties with 'informed consent', in terms of compliance and other issues. How will HCI address these issues?

Whilst not writing in an era of transparent and disappearing technology, Moor (1985) drew attention to the ethical aspects of computer technology given by its social impact, and characteristics of logical malleability and invisibility. The challenges posed by invisibility, for Moor, were the potential for invisible abuse, the invisible values that are embedded in programs, and the capacity for complex calculations that are beyond human understanding. To this list we can now add the invisible computer which removes another layer of observation.

The paper begins by placing ‘informed consent’ in its current context in HCI. A review of the literature shows there are 10 principles relating to informed consent, at least 8 of which are cited frequently enough to lead one to assume these are generally accepted in the HCI community. The paper continues by detailing two case studies that illustrate why informed consent issues are important in HCI. Next the challenges to HCI of disappearing technologies are discussed with, with reference to the same case studies, illustrating the possibilities for invisible abuse that can arise, without due consideration of informed consent issues. The paper concludes by recommending that participants deserve to be given a broad context of use and understanding, especially given the new contexts and appearance (or disappearance) of these technologies.

INFORMED CONSENT

Existing literature on 'informed consent' in HCI focuses on the traditional means of selecting representative samples from the potential user base to participate in assessments of product usability at a single, controllable location. Writing in the context of usability testing, Dumas and Redish (1999) said that the focus of usability testing on users extends to issues such as enabling users to be productive with software products, helping them accomplish tasks they need or want to engage in easily and quickly. In terms of engineering products that are usable, they argue that early and continuous focus on usability will lead to functionality that will be used, identifying needed changes before making such changes becomes too expensive, facilitation of the development of documentation and training, and reduction in the amount of product maintenance that will be required.

Dumas and Redish (1999) give multiple examples of the usability laboratories (labs) set up for traditional usability situations. In large organisations such labs can involve multiple testing suites, each equipped with an observation room and an executive viewing area. Each test room would typically have three or more cameras, with data-logging facilities in the observation room. Some labs are equipped with video conferencing facilities that connect to large rooms from which an entire development team, management and clients can observe the test.

Out of respect for participants and also to ensure unbiased results people participating in a usability test are informed about what will happen during the test, how they will be affected and what their rights are during and after the test. Informed consent policies exist to safeguard both the participant and the organisation conducting the test.

The Legal Argument For Informed Consent

Informed consent is part of the larger issue of ethical experimentation. In most western countries implementing policies regarding informed consent is a legal requirement. Dumas and Redish (1999, pp204-205) writing in the context of the American legal system, cite the Notice of Proposed Rulemaking in the Federal Register, 1988, Vol. 53, No. 218 pp 45661-45682, on the treatment of human participants, as the grounds for requiring a formal consent procedure prior to any usability test in that country (at least for all usability testing that is federally funded). Similarly the Australian 'National Statement on Ethical Conduct in Research Involving Humans' (Commonwealth of Australia, 1999), affirms the principle of respect for persons. This principle requires that participants be treated with respect as autonomous agents and that participants with diminished autonomy (such as the young and the physically and intellectually impaired) are entitled to special protection. In the UK vulnerable groups are described as: children and young people, those with a learning disability or cognitive impairment, or individuals in a dependent or unequal relationship (ESRC, 2007). The informed consent process ensures the risks and benefits of the test are disclosed to participants or their guardian before the investigation can proceed.

In addition to legal requirements by governments, there are also professional society stipulations that require respect for participants in testing software products (ACS, 2007; APA, 1997; BCS, 2007). Dumas and Redish (1999) argue that even if there is no threat of possible legal action against a company engaging in usability testing, formal procedures for informed consent should still be followed. They reason that this reduces an organization's vulnerability to appearing negligent in regards to proper treatment of human participants in those tests.

Miller (1998) writing in the context of software engineering states that informed consent is complete when the form has been signed. However, in usability testing informed consent is more than the legal requirement of a form that must be signed. As in medicine (Mackay, 1991), in usability engineering informed consent is an attitude that begins when the facilitator greets the participant and continues until the participant leaves. Medical practitioners are to inform patients to the extent of what patients might reasonably want to know about a therapy the practitioner is recommending. Mackay's (1991) review of this area showed that poor communication was frequently the cause of patients refusing treatment. In the context of informed consent in usability testing, this supports the view that by building rapport and supplying information to participants, one is more likely to get their cooperation to proceed with the test.

WHY IS INFORMED CONSENT IMPORTANT?

Policies regarding informed consent in HCI are developed by organisations on the basis of generally agreed principles concerning the treatment of human participants. Seven of the principles that follow are derived from the related discussion in Dumas and Redish (1999, pp205-208), though in their presentation they only view principles P2, P3 and P4 as principles of informed consent. They see their other principles as part of the wider issues involved in the legal requirements that need to be met prior to a usability test. One of the additional principles was suggested by Sanderson (2000) in a review of Dumas and Redish on usability testing. The last two principles were suggested by Burmeister (2001) for the context of remote usability testing.

P1 Minimal risk

Usability testing should not expose participants to more than minimal risk. Though it is unlikely that a usability test will expose participants to physical harm, psychological or sociological risks do arise. If it is not possible to abide by the principle of minimal risk, then the usability engineer should endeavour to eliminate the risk or consider not doing the test. If the test needs to go ahead despite the risk then there are well established policies put out by many of the psychological societies that can serve as a basis for ensuring the protection of the rights of participants (APA, 1997).

Dumas and Redish (1999) citing the Federal Register state that minimal risk means that "the probability and magnitude of harm or discomfort anticipated in the test are not greater, in and of themselves, than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests." (1999, p205) Similarly the Australian 'National Statement on Ethical Conduct in Research Involving Humans' (Commonwealth of Australia, 1999), has a principle of beneficence, which involves maximizing the possible benefits and good for the subject, while minimizing the amount of possible risks and harm, as does the Economic and Social Research Council's research ethics framework (UK) (ESRC, 2007).

P2 Information

Informed consent implies information is supplied to participants. Information to include suggested by Dumas and Redish (1999) can be summarized as: the procedures you will follow; the purpose of the test; any risks to the participant; the opportunity to ask questions; and, the opportunity to withdraw at any time. This principle of 'information' might be extended to what participants are told about the test when they are solicited to participate. They could for instance be sent a letter detailing in advance what will be recorded and what they will be doing.

P3 Comprehension

The facilitator needs to ensure that each participant understands what is involved in the test. This must be done in a manner that is clear. It must also be done so as to completely cover the information on the form. The procedure for obtaining consent should not be rushed, nor made to seem unimportant. The procedure is about the participant making an informed choice to proceed with the test and therefore they need to be allowed opportunity for questions. In a remote test this might be managed with a facilitator on site with the participant. Clearly one possible outcome of applying this principle is that the person involved may choose not to participate. However, not to permit such opportunities may adversely affect their ability to make an informed choice.

Mackay (1995) says that participants may be naïve when it comes to video taping. The facilitator needs to ensure they understand the implications of giving permission to be video taped and how these recordings will be used. She points out that in some tests the video camera is left on throughout the session recording everything that happens, whether directly associated with the test or not. She suggests a sign be used that lets participants know when the camera is on and when it is not. This reminds them about the use of the camera and also gives them an opportunity to step out of the view of the camera, such as in breaks in the test session.

P4 Voluntariness

Professional demeanor influences participant involvement. This has implications in remote testing in particular, where people not trained in usability may be called upon to perform various functions during the test, such as assume the role of facilitator. Participants should not be rushed, nor should facilitators fidget while the participant reads the form. Coercion and undue influence should be absent when the person is

asked to give their consent to participate in the test. Undue pressure might come in a number of subtle ways that one needs to be wary of. For instance, if you are in a position of authority over the participant such as employer to employee or teacher to student. Another subtle form of coercion is involved when participants receive payment for their participation. In the case of the latter it may be prudent to make the payment upfront, prior to the test. That way the participant will not feel pressured to have to stay to the end of the test (see P5 about the right to leave the test at any time).

A variation on this approach is that of Jarrett (2000). She says: “If the participant has been offered a financial incentive as part of the recruitment process, I hand it over immediately before explaining that they can stop the test at any time without giving any reason. I felt that the knowledge that they hadn't received their incentive might inhibit them from leaving the test. If the participant is not aware of the incentive, then I leave it to the end.”

P5 Participant’s rights

Countries vary as to their recognition of human rights. Even where there is general agreement, definitions of those rights and interpretations of how they apply vary. Participants should have the right to be informed as to what their rights are. Karat and Karat (1997) reviewed the codes of ethics of 30 national computer societies and found that they shared 5 major topic areas. The first on their list “Respect” addressed the need to respect the rights of people involved with the technology, if for no other reason than for the prestige of the profession.

Dumas and Redish (1999), revealing a western bias, suggest rights most relevant to usability testing include the right to leave the test without penalty, the right to have a break at any time, the right to privacy (such as not having their names used in reporting the results of the test), the right to be informed as to the purpose of the test and the right to know before the test what they will be doing.

P6 Nondisclosure

When the product is under development or in any way confidential, participants need to be informed that they cannot talk about the product or their opinions of it. Dumas and Redish (1999) suggest giving participants appropriate wording that they can use to account for the time they spent in the usability test. Participants need to be informed about what they are permitted to divulge.

P7 Confidentiality

Confidentiality is different from the participant’s right to privacy; it refers to how data about the participants will be stored. (Brankovic & Estivill-Castro (1999) define privacy as being to do with people and confidentiality being about data.) The ACS (2007) code stipulates that it is obligatory for members to preserve the confidentiality of others’ information. The British Computer Society Code of Conduct does not specifically mention confidentiality or privacy, but states that members “shall have regard to …” the legitimate rights of third parties, and have knowledge and understanding of relevant legislation, regulations and standards. Information in this case would be covered by the Data Protection Act (UK) and relevant regulations and standards, in the case of research, would be covered by the research funding councils in the UK. Amongst the principles for ethical research listed in the Economic and Social Research Council’s research ethics framework (ESRC, 2007) (applicable in the UK) confidentiality applies to ‘information supplied’ and privacy is covered by the respect for anonymity of the participant. Mackay (1995) extends confidentiality also to who has access to video footage.

P8 Waivers

Permission needs to be obtained from participants to use materials such as questionnaires, audio and video recordings (and their transcripts). In many countries they have the right to refuse to give waivers. Participants should be given the option of having the data used for the purposes of the test, or of also having it used in a wider context. If the latter, then the consent form should state in what further ways the data will be used, so that an informed decision can be taken by the participant. At a minimum permission should be sought to use the materials for purposes relating to the evaluation of the product being tested. The actual wording will depend on numerous circumstances, such as local legal requirements and company policies.

P9 Legalese

Miller (1998) says that in software engineering informed consent documents should include measures of software quality. Measures that should be documented include margins for error, significant digits and rounding protocols, and these should be presented in unambiguous language. This should also become a principle for usability testing. It is too tempting to have legal departments draft the consent form. Just as software engineering terminology and legal jargon can hinder the signing of forms, so in usability testing such language does not make for rapport building prior the start of a usability test. Sensitive use on non-legal jargon should be made so that comprehension (P3) on the part of the participant is possible.

P10 Expectations

Globalization and related issues to do with international differences in culture and ethnicity lead to the notion of expectations. Each social grouping has its own means of resolving issues of power and hierarchy, turn taking, how interactions between people proceed, who can interrupt and contradict. There are accepted behaviors. Cultures interact through expectations. The level of familiarity with users that is acceptable in one culture for eliciting useful information may be deemed inappropriate in certain other cultures. For instance, privacy expectations vary, which has am impact on the use of recoding media in a usability test.

Khaslavsky (1998) argues that misunderstanding in communication is common between people of the same culture (which is one reason for P9). She says such misunderstandings are magnified when dealing with people cross-culturally. Misunderstandings arise due to differences in work practices and social class systems. Yeo (1998) illustrates this with an example of a usability test conducted in Singapore, in which a participant broke down and cried. A post-test interview revealed that the participant's behaviour was attributable to the Eastern culture in which it is not acceptable to criticize the designer openly, because it may cause the designer to lose face. Yeo also cites examples of gender expectations that differ between cultures. In some cultures it is simply not appropriate to pair a man and a woman in a co-discovery design scenario. These are important considerations for product testing.

Conflict Resolution Among Principles

As is seen in the cases that follow, conflicts can arise between these principles. For example, case C2 shows conflict between the participant's rights to be informed about the purposes of the test and the company's rights concerning commercial in confidence matters.

The ACM/IEEE joint Code of Ethics (Gotterbarn, et al., 1999) states that in matters of ethical conflict 'public welfare' is the highest standard. A professional has a responsibility foremost to public welfare and professional judgment is needed to decide how this is best served in difficult moral decision making. The principle of minimal risk (P1) is the closest approximation of this for informed consent.

Given the heterogeneous nature of participants in usability testing, none of the other principles can be considered mandatory, they are instead discretionary, that is subject to contextual interpretation. Yet in most Western societies the first 4 principles fall into the "mandatory" category, because of legislative requirements and the codes of professional societies. However, even P1 has situation dependence. It is defined as minimal compared to 'normal' behaviour. But by this definition what is normal and hence of minimal risk to military personnel being tested on a new product may be considered very differently if one were testing primary school children of the same culture, even in the same city as the military personnel.

The Process Of Obtaining Informed Consent

Informed consent is both a process and a formal record of the process. That formal record is typically a form, but may also be another type of recording, such as video. Whatever the nature of the formal record entails, the consent given by the participant to proceed with the test must be recorded. Dumas and Redish (1999, p206) argue that: "If you are videotaping the test, have the camera(s) on while you are going over the form. The videotape shows that the participant was properly informed and voluntarily signed the form without pressure." However, whilst one sees the intent, this process is deficient. They are effectively recording the participant before the participant has given permission for this to happen. One imagines that if the participant chooses not to sign the form, that such a recording then becomes illegal in some countries; in such a situation the video footage of that participant should be destroyed.

The process of informed consent either begins on the arrival of the participant, by showing them the viewing room (if one exists) introducing observers, showing the equipment in the test room and generally building rapport. This also applies in remote testing situations that involve the use of distributed usability labs (Hammontree, etal., 1994). The process of informed consent can begin even earlier in the situation where participants are sent information (P2) about what will be expected of them ahead of their arrival. Neither the form nor the process ought to be vague about what the participant will experience (P2, P3). There should be a description given to the participant as to what the study is about, or if they are told then the facilitator should use a script so that each participant is informed about the same things in the same way. This is needed to be sure that the participant can make a voluntary (P4) informed decision (P2) about whether or not to participate.

The consent form should state whether the data will be confidential (P7) or anonymous. However, the use of video often compromises principles of confidentiality (P7) and the rights of participants (P5) (Mackay, 1991; Mackay, 1995). Some participants will want to have a copy of the consent form, so provision for this eventuality should also be made. It might for instance be seen as one of the rights of a participant (P5). Finally as stated previously, the process of informed consent describes an attitude that begins when the facilitator greets the participant and continues until the participant leaves. This requires a professional, relaxed approach that is apparent to the participant right from the start.

Renegotiating informed consent

Miller (1998) does not encourage renegotiation of informed consent at a later date, though he says that allowance for this could be made. Case C2 below is an instance of where a company might deliberately pre-plan to renegotiate the agreement after the test. The morality of such a practice needs to be examined. One instance where renegotiation might ensue is presented by Mackay (1995) when video tapes are to be used for purposes other than were originally agreed to with the participant. Bentley (2000) has argued that the type of practice shown in case C2 is not deceptive but rather an example of deliberate misdirection. Bentley describes the need for a double consent procedure (discussed in more detail in the context of that case).

Cases

Though the following hypothetical cases could be used to address many issues in usability testing, the focus of the discussion after each case is on informed consent. The cases are adapted from Burmeister (2001).

Internet banking (C1)

An international bank, based in the United Kingdom, was testing a new internet banking product. They had a fully equipped usability lab in one of their Australian offices. Participants came to this lab to be tested and were introduced by the facilitator to the lab facilities and to a second person who along with the facilitator would be observing them. What participants were not told was that the product being tested had been developed by a Finnish team of software developers. Members of that team were remotely observing the tests being conducted using video conferencing facilities. When the developers in Finland had a question they would use the video-conferencing facility to ask one of the two people in the Australian observation room to ask the participant the question. This way the participant would not become aware that others were also observing the test. Bank management reasoned that this ensured the development team was properly informed concerning usability issues with their product, because the video conferencing facilities permitted them to observe the tests in near real-time, rather than viewing the video footage after the test. One of the things the site asked for was the participant's birth date. The purpose of this question was to verify that the user was at least 18, but the site didn't explain this. Users commented that the question was odd, though no one refused to answer it. [Note, participants were being paid to test the site.]

Because participants were not fully informed (P2, P5), they could not understand (P3) how the information being recorded about them would be used. Therefore principle P8 on waivers comes into this case in the sense that participants not being informed about the video link to Australia did not give permission to use the video recording for any purpose. If this were discovered by the participants (though that is unlikely), then the bank could face litigation. Perhaps the bank asked for permission to use video in the lab recording, but it is doubtful that such a (necessarily) vague permission relating to the use of video would save them from litigation. The video conference link that participants were not told about is also a violation of P7; there was no commitment to keeping participant data confidential.

P10 also comes into this case in the birth date situation. One should not assume that because certain age requirements exist in one country, that they also exist the same way in another. It may be that participants were confused because the age limit Finnish developers implemented did not apply in Australia.

Another principle that needs to be considered is P4. By paying for participation, are the results trustworthy? None of these participants refused to answer the birth date question, though they thought it 'odd'. Perhaps this is because they felt coerced through the payment. Had they not been paid, they may have refused to answer.

Double consent: Agents and Cookies (C2)

What are the policy implications when the test is specifically aimed at hiding information from the participant? For the following case assume that the financial institution concerned has approached your usability lab and asked you to organize the test. From an informed consent view point only, what are the policy implications?

Participants, who have previously shopped online and made purchases, are recruited for a usability test that they are told is to assess the look and feel of a number of online shopping sites controlled by a particular multinational company. The shopping experiences range from retail outlets, to entertainment and grocery shopping. Participants are given credit card details they are to use to make their purchases. However, the real purpose of the test is twofold. One is an initiative by a financial institution to test intelligent agents that are designed to identify and report fraudulent credit card transactions. That is, certain credit card numbers that were given to participants should have been identified by these agents. Also the shopping scenarios were scripted such that the agents should report on certain of the activities, but not on others. However, the financial institution does not want the public to become aware of their use of intelligent agents and therefore participants are not informed about this at all. Secondly, the sites that participants visit use a new form of cookies, that ought to quickly identify certain user behaviour, whether purchases are made or not, and target advertising to those users with increasing accuracy. For the purpose of this test it was deemed inadvisable to inform participants of the cookies ahead of their test. Then there are two alternatives. Under option A, a post test questionnaire asks participants about the advertising, informing them then or in a separate debriefing session about the use of the cookies. Under option B, participants are not informed at all about the use of the cookies.

At first one might object to this sort of testing as being dishonest or immoral. The participants are deceived from the beginning. Given the ethical codes of conduct in various countries this type of behaviour is unprofessional. However, there are many legitimate situations in which informing participants about the purpose of a test contaminates their behaviour. Usability specialists would argue that this process involves a degree of misdirection. That is, "how informed" does the participant need to be in order to observe P2 and P3? One study reported by Bentley (2000) used a double consent procedure that could be applied in circumstances such as in this case. That is (following option A) participants are informed at the end of the test about the use of cookies and asked to sign a second consent form. The risk here is that a participant may refuse to sign the second form, in which case Bentley says the data concerning that participant ought to be destroyed. Following this line of reasoning, deception is not involved, but rather some of the details are hidden (at least temporarily). This is deemed to be misdirection rather than deception or dishonesty.

As to the use of intelligent agents, one view could be that principle P6 on nondisclosure protects the company and therefore participants should be informed (P2) about the true nature of the test. In this case the informed consent form will need to be carefully written so that the company is indeed protected and procedures need to be put in place to ensure that participants understand (P3) the implications of this for them. This process should be done in a way that principle P9 concerning the use of non-legal jargon be observed.

Alternatively the bank could test their own employees, who as employees are bound by employment contracts to keep commercial in confidence material private. Mackay (1995) addressing the context of US video taping of employees in a usability test says that permissions to reuse the videos in any work related context is not required legally, given they were employees. Australian law likewise does not require the employer to obtain informed consent from the employee. However, Mackay makes the point that whilst this is not a legal requirement, it is not ethical (at least in her view).

CHALLENGES THAT THE HCI COMMUNITY FACES IN FUTURE DEVELOPMENTS

As computer technologies are introduced into what might be called 'lifestyle' settings. For instance, research on ambient technologies could be conducted in a number of different situations and locations to fully appreciate the impact of environmental influence – studies on location such as in the home or in medical institutions. It should be recognized that different settings could have an impact on the principles of informed

consent – on the provision of information, on comprehension, voluntariness and expectations. It is important to consider whether participants are distracted by the setting they are in and whether they fully understand what is being asked of them. All the different locations mentioned above will have different characteristics in terms of distractions and power balances, and impacts could vary according to the participant groups. Distractions may influence comprehension, and cultural behaviours may have an increased influence in settings that are 'familiar territory' for participants and where behavioural patterns are likely to be at their strongest.

More than the location changes, however, are the challenges posed by the technology itself, as different technologies converge, become seamless, invisible and 'intelligent'. We stated at the beginning of this paper that aspects of invisibility in programming and performance can raise ethical issues in respect of intended and unintended consequences such as in the case of invisible abuse and invisible complex calculations. In both of these instances the risk to the participants are greater as the visibility of the system itself (that is the artifact that presents the interface to the user) diminishes. In the case given above on Internet Banking (C1) the video conferencing situation was used by the development company who were not visible to the participants, and who did not announce themselves. The availability of invisible monitoring technologies (for example in Virtual Learning Environment applications), invisible observation (from remote systems, or in online chat rooms) allows access to data that users may be unaware of. Move these contexts to the home – where a strong case for monitoring elders in respect of their safety and health is actively promoted on the research agenda – and we have to be very careful how ethical research practices are managed. The temptation to utilize opportunities for data collection is strong – to many it represents efficient and best use of the situation presented and is not necessarily seen as unethical practice.

In the research context just given two issues relevant to ethical research are raised. The first is that our participants could now be classed as a vulnerable group, requiring special care and consideration. The second, not unrelated to the first, is how 'informed' will informed consent be? What of the level of comprehension? Is it necessary for the participant to understand the principles behind the technology (monitoring, transmission, storage) to be fully informed? An elderly user may easily comprehend the idea of, say, monitoring pill box use (to guard against overdose through forgetfulness for example) – but what of pressure sensors on a chairs, and radio tags embedded in household items and clothing that communicate with tag readers in floor mats, shelves, and walls? (Research proposed by Intel and described by Blanchard (2004).)

Consider the following vision of ambient technology applications:

> "Humans are no longer the only intelligent decision makers on earth. Numerous decisions are being made by the visible and invisible microchips that are increasingly present everywhere in our working and living environment. Soon they will be hidden not only in our dishwasher and our mobile phone, but also in our furniture, clothing, shoes and walls. Ubiquitous computing is becoming a buzzword. All intelligent agents in our environment can make their own decisions. Continuously in communication with one another, they are guided by adaptive software to ensure that the result of their cooperation is a helpful, intelligent service to the user of the environment. These microchips are linked to a host of sensors, which minimizes the need for the users to interact with the computers. There is no need for keyboards or screens or menus. The intelligent environment has already heard what we said to the visitor, it has already noticed that we are leaving the building. The environment knows how it should behave, before we even think of giving an order. Such intervention greatly enhances our human comfort and our possibilities for managing the environment. Small tools can become active everywhere, even in our body. They can monitor, take over, correct or enhance our normal bodily functions. Numerous EU projects are developing the technology to realize this." (Van Steendam, et al., 2006)

So how will informed consent and usability testing look in this context of invisible computing? At one level probably not so different – informing the participant involves a description of the task to be accomplished in a given setting. The extent to which technical detail is conveyed may simply depend on its relevance to the task in hand, and to grounding user expectations. However, the detail of user interaction will undoubtedly change removing the user from the monitor/keyboard or mobile phone/PDA type of device. What is usability testing where there are no "keyboards or screens or menus"? How do we manage testing biometric interfaces? If our home, car, medical technologies rely on biometric input, for example to establish the personal profile of the user, will the user understand the implications? (In terms of security of data, or national data collection schemes.)

The case of double consent given in the previous section discussed the use of agents and cookies (C2). In the ambient context agents are envisaged as playing a significant role, and in many cases the context relies on a personal profile (as collected currently by cookies). A similar situation as C2 could arise where intelligent agents operate in the background collecting information concerning behaviour and/or attitudes, but the

researchers would not want to disclose this at the outset (to avoid influencing the research). A positive attitude may seem important to the researchers in gaining the co-operation of the participants, and encouraging an acceptance of the technology (which could have a positive impact on perceived usability). In many instances these home technologies are being designed for assisting the older population to maintain independence. They may wish to test participants' ability to cope with increased complexity, and only reveal the requirements of the task at a superficial level to begin with, increasing complexity as the study progresses. At what point is renewed consent required or desirable? And what is the 'required' or 'desirable' benchmark?

In many instances these home technologies are being designed for assisting the older population to maintain independence. The participants may have been informed of the beneficial effects of such a technology in their homes and be encouraged to test it with this in mind. These are not necessarily misdirected instructions, but without an understanding of the ways in which the technology is working, or any idea of what may be going on behind the scenes, informed consent in the test situation is based on a purely functional view of the technology rather than placing it in a wider context. When processes are out of sight we are likely to either ignore them, or be unaware of them. In both cases these are usually classed as the benefits, if not the purpose, of computers – that is, to take the cognitive load off the user. Designers can choose to enhance or reveal "invisibility" – dialogue boxes for example reveal occurrences in programs often warning that something is wrong. Dialogue boxes characteristically offer the user choices, but users often (a) do not understand the terminology or the context given and (b) are unaware of their choices (for instance, in rejecting "cookies"). Will researchers want to re-instate some cognitive burden in order to fully inform their users?

Providing the wider context would not only enhance the experience for the participant, but also educate them in the technologies that may be underpinning their lives. In other words, there is an opportunity to extend the test situation to 'value added' research.

CONCLUSION

Informed consent procedures raise the level of public trust in the process of the whole usability test. It is part of a quality process that is required to successfully bring a product to market. For HCI researchers to get honest and reliable feedback from participants, those participants need to be able to trust the company or research organisation, and the people administering the test. Informed consent procedures go a significant way towards ensuring that trust is established and maintained.

We have noted some of the challenges for the HCI community in the future, both in terms of their practice with regard to meeting their obligations to the research participants and the changing context and interface presentations and modalities. As the technology becomes less obvious, so the temptation to provide only the necessary information increases. Indeed, a purely innocent lack of awareness regarding the implications of the data collected can have consequences for the participant and decisions may need to be made post test whether to revisit the participant for further consent or elaboration. The professional engaged in this type of research has responsibilities that extend beyond simply meeting requirements, either of ethics committees or the law. Introducing new technologies into a population who are ill-informed will not only have an adverse effect on feedback, but is opening the door to a level of distrust of new technology and of the professions behind the technology. Informed consent seeks to 'fully inform' and interpretations can vary as to whether participants should simply be informed of the task at hand, or given more detail. It has been argued in the previous section that especially with disappearing technologies users should be briefed on the technology, its capabilities, the behind the scenes operations (in non-technical terms) in order for them to be able to engage with the technology at the proper level – and with the knowledge they need to be a real 'participant' in a study, rather than someone who fits the description of user and is a number for the research statistics.

In concluding it is worth repeating that informed consent is more than policies, process and principles, it is an attitude that begins when the facilitator greets the participant and continues until the participant leaves.

Developing technologies and new contexts raise research issues that can take us by surprise – social studies into Internet Chat rooms are a classic example that have raised issues of covert observation and misrepresentation. In light of previous experience we should be giving some thought now to the issues that we are likely to face with the next level of ubiquitous, pervasive and invisible technologies.

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