

The hitchhiker's guide to ubicomp: using techniques from literary and critical theory to reframe scientific agendas

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Abstract Literary criticism places fictional work in historical, social and psychological contexts to offer insights about the way that texts are produced and consumed. Critical theory offers a range of strategies for analysing what a text says and just as importantly, what it leaves unsaid. Literary analyses of scientific writing can also produce insights about how research agendas are framed and addressed. This paper provides three readings of a seminal ubiquitous computing scenario by Marc Weiser. Three approaches from literary and critical theory are demonstrated in deconstructive, psychoanalytic and feminist readings of the scenario. The deconstructive reading suggests that alongside the vision of convenient and efficient ubiquitous computing is a complex set of fears and anxieties that the text cannot quite subdue. A psychoanalytic reading considers what the scenario is asking us to desire and identifies the dream of surveillance without intrusion. A final feminist reading discusses gender and collapsing distinctions between public and private, office and home, family and work life. None of the readings are suggested as the final truth of what Weiser was “really” saying. Rather they articulate a set of issues and concerns that might frame design agendas differently. The scenario is then re-written in two pastiches that draw on source material with very different visions of ubiquitous computing. The Sal scenario is first rewritten in the style of Douglas Adams’ *Hitchhiker’s Guide to the Galaxy*. In this world, technology is broken, design is poor and users are flawed, fallible and vulnerable. The second rewrites the scenarios in the style of Philip K Dick’s novel *Ubik*. This

scenario serves to highlight what is absent in Weiser’s scenario and indeed most design scenarios: money. The three readings and two pastiches underline the social conflict and struggle more often elided or ignored in the stories told in ubicomp literature. It is argued that literary forms of reading and writing can be useful in both questioning and reframing scientific writing and design agendas.

1 Introduction: the unacknowledged engineers of the world

Percy Bysshe Shelley called poets “the unacknowledged legislators of the world” [35]. Poetry and novels change the values of society although the effects might not be felt for one or two generations; in this way, he claimed, poets make law before Parliament does. By the same token, the makers of science fiction could be described as the unacknowledged engineers of the world. The influence of *Star Trek* on technology developers is a matter of public record. In the documentary “*How William Shatner Changed The World*”, the inspiration for a range of technologies is directly attributed to the show [38]. Martin Cooper, the inventor of the cell phone, cites Captain Kirk’s communicator as his inspiration (Ibid). Steve Perlman began his work on Quick Time after watching the Next Generation character “Data” walk into his quarters and ask the computer to play Mozart for him. Dourish and Bell’s “Resistance is Futile” [20] compares ubiquitous computing literature with science fiction but not merely to trace influences of popular shows on technologists. As in previous papers, they are concerned with ubiquitous computing literature as a genre of writing.

An earlier paper “Yesterday’s Tomorrows” identifies a number of literary conventions in the scientific papers of ubiquitous computing or ubicomp [6]. It notes, for instance,

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the use of the “proximate future” sense in many ubicomp papers in phrases such as

“We are entering a period when...”

“New technologies are emerging that...”

“Mobile phones are becoming...”.

(*ibid*)

For Bell and Dourish, this future is always “just around the corner” soon to arrive but never quite here. This kind of argument and evidence is a form of literary criticism. It identifies rhetorical procedures such as the proximate future sense, in the way that a literary critic might point out the use of, say, alliteration in a poem or a political speech. While pointing to these rhetorical strategies in the scientific literature, they argue that we already inhabit the future imagined in Marc Weiser’s seminal article “The Computer for the Twenty-First Century” [37]. They claim that the continuing emphasis on the “proximate future” means that there will never come a time when the community could say “There, that’s done” [6].

Instead, they assert, with William Gibson, that “the future is already here, just not very widely distributed yet” (*Ibid*). They consider “actually existing” ubiquitous computing as political analysts once considered “actually existing socialism” rather than imagined distant utopias. For “actually existing” ubicomp, they consider systems in Singapore and Korea. The resulting vision of ubicomp includes things far outside of Weiser’s original vision like monitoring and restricting car traffic; sensing urination in public elevators; electronic feng shui consultations and ambient prayer times on mosque walls (*ibid*). Ubiquitous computing here is heterogeneous, non-standard and messy. It is not as clear and orderly as Weiser’s vision and perhaps, for this reason, we have not noticed its arrival. This focus on actually existing ubicomp provides an alternative lens to Weiser’s original vision in the “famous Sal scenario”. Dourish and Bell are concerned not only with what the ubicomp literature represents but also with what it does not represent, its absences, for instance, empire and race.

There are also some notable absences in Dourish and Bell’s “Resistance is Useless” paper [20]. There are references to the “famous ‘Sal’ scenario” but, curiously in a work that is, in part at least, cultural criticism, there is no direct quotation. The following sections redress this absence by quoting the scenario in full in the course of three “readings” that draw on different traditions of critical theory: deconstruction, psychoanalysis and feminism. These readings will be followed by re-writes of the Sal scenarios that pastiche Douglas Adams and Philip K. Dick. These pastiches imagine the same technology depicted in the Sal scenario in very different fictional worlds. In Adam’s “Hitchhiker”, universe technology is either not working because it is broken or, more often, not working because it is too badly designed to work in the first place.

In Dick’s paranoid vision of *Ubik*, technology is either out to get you or, at the very least, it is out to get your money. The readings and pastiches are all intended to highlight not only what is said in the Sal scenario but also what is unsaid. This is not to argue for any final truth of the scenario or to make claims about what Weiser “really meant”. Rather, it is to highlight alternative frames of reference for research and design in ubiquitous computing.

2 Three readings

In the 1960s, a range of theoretical approaches to literature developed, largely in continental Europe [23]. These approaches drew on Anthropology, Sociology and Psychoanalysis to produce a range of different perspectives. Although each of these perspectives sought to supplant the others, they are now generally taught in tandem and each one is presented as useful for certain kinds of analysis. Those interested in narrative patterns, for example, might take a formalist approach to their texts; indeed, computer scientists have used such work in the development of story engines [14]. But there are a range of other perspectives which serve to highlight a range of devices and strategies at play in literary texts. This paper returns to Weiser’s Sal scenario and performs three different kinds of reading drawn from: deconstruction, psychoanalysis and feminism.

2.1 Deconstructing the Sal scenario

The term “deconstruction” was coined by Jacques Derrida in the late 1960s [18], and there have been debates about its meaning ever since. Frequently, the term “deconstruction” is used merely to mean “taking something apart”. In the last years of his life, Derrida himself rejected dogmatic definitions of the term and was happy that it was used in a variety of ways. The sense of the word most pertinent to the analysis here refers to a particular strategy of reading. This technique pursues the contradictory and incoherent elements of a given text to produce new meanings and interpretations. Marginalia and qualifications are used to unravel a text’s surface or central argument (*Ibid*).

The Sal scenario is quoted and critiqued section by section. It should be stressed that this is not intended as an attack on Weiser. The importance of Weiser’s brilliant paper is indisputable, and the acuity of his vision has been demonstrated by recent history. The Sal scenario is quoted in an attempt to unravel its original argument and consider meanings other than those suggested directly in the text. The scenario begins as the central character becomes conscious:

“Sal awakens: she smells coffee. A few minutes ago her alarm clock, alerted by her restless rolling before waking,

had quietly asked “coffee?”, and she had mumbled “yes.” “Yes” and “no” are the only words it knows. Sal looks out her windows at her neighborhood. Sunlight and a fence are visible through one, but through others she sees electronic trails that have been kept for her of neighbors coming and going during the early morning. Privacy conventions and practical data rates prevent displaying video footage, but time markers and electronic tracks on the neighborhood map let Sal feel cozy in her street”. [37]

The sentences are short, simple and declarative, but there is more in the text than that which is explicitly stated. The seemingly simple description is in fact quite complex, and the apparent simplicity is itself a rhetorical strategy. Sal sees “electronic trails” of her neighbours comings and goings. Potential alarm at the notion that our neighbours may be able to see when and where we come and go is immediately defused. Its alright, there are “privacy conventions”, criticism and alarm is then anticipated and subdued. The most emotive word of the paragraph is very explicitly soothing, Sal feels “cosy”, not curious, not suspicious, not frightened.

In anticipating alarm and providing comfort, the text operates to alert readers that they have cause for alarm. The word “cosy” is crucial here to a deconstructive reading. Sal may well feel cosy in the way that Winston Smith loves Big Brother at the end of 1984. And perhaps this renders the text more not less chilling. In this sense, the text deconstructs itself, that is, it “undoes itself while retaining a certain undeniable force” [22].

The scenario continues

“Glancing at the windows to her kids’ rooms she can see that they got up 15 and 20 min ago and are already in the kitchen. Noticing that she is up, they start making more noise”. (Ibid)

Not only can Sal monitor the exact times her children get out of bed (15 and 20 min ago, respectively) but the children can also monitor her, seeing she is up they make more noise. The economy with which the scenario is told makes this mutual surveillance appear every day “Glancing at the windows” is almost “glancing out of the windows”. Checking household behaviour monitors is almost as natural and everyday as a casual look outside. And yet, this small textual difference is important. Sal is precisely not looking out of her windows but “at” them, windows here are media, her perspectives on the world are mediated and managed.

“At breakfast Sal reads the news. She still prefers the paper form, as do most people. She spots an interesting quote from a columnist in the business section. She wipes her pen over the newspaper’s name, date, section, and page number and then circles the quote. The pen sends a message to the paper, which transmits the quote to her office”. (Ibid)

Sal engages in a twentieth century activity, circling a quote in a paper, and sends it to her office with a twenty-first century pen. The familiarity of the medium belies the shock of the message: there is a direct link between whatever Sal is reading and her office. A deconstructive reading then suggests that far from offering an assuring vision of the future the piece reflects intense anxieties about privacy at the same time that it seeks to overcome them.

“Electronic mail arrives from the company that made her garage door opener. She lost the instruction manual, and asked them for help. They have sent her a new manual, and also something unexpected – a way to find the old one. According to the note, she can press a code into the opener and the missing manual will find itself. In the garage, she tracks a beeping noise to where the oil-stained manual had fallen behind some boxes. Sure enough, there is the tiny tab the manufacturer had affixed in the cover to try to avoid E-mail requests like her own”. (Ibid)

This is an interesting moment in that it deals with broken technology for the first and only time. Again the tone is seemingly neutral describing only physical action. Although the electronic trails made Sal feels “cosy”, there is no indication of how Sal felt while tracking the beeping manual. Nor is it certain why she wanted a manual for the garage door opener though clearly it is a device requiring something rather more complicated than a key to open and close it. The focus here is on the ingenuity of the tiny tab, affixed to the lost object so that the owner can find it, not the complexity of the garage door. Again the direct message is that ingenious new technologies will allow us to find lost manuals. But equally implicit in the text is the notion that the future will be so heavily mediated by computing technology that we will be unable to open our garage doors without instruction books. There is then a premonition of a future where even door technology is “black boxed” to the point that we cannot do anything except write to the manufacturer for help if we lose the instructions. The overall tone is one of reassurance but at the same time the text betrays intense anxiety about our technological future.

“On the way to work Sal glances in the foreview mirror to check the traffic. She spots a slowdown ahead, and also notices on a side street the telltale green in the foreview of a food shop, and a new one at that. She decides to take the next exit and get a cup of coffee while avoiding the jam”. (Ibid)

The neologism “foreview” is as close to “rearview” as possible, introducing the future through the present, the unfamiliar through the familiar. Its function is not defined but rather shown in the action that follows. Again the direct message of the scenario is one of convenience and ease of use:

“Once Sal arrives at work, the foreview helps her to quickly find a parking spot. As she walks into the building the machines in her office prepare to log her in, but don’t complete the sequence until she actually enters her office. On her way, she stops by the offices of four or five colleagues to exchange greetings and news”. (Ibid)

Once more, the surveillance is benign. Arrival and departure data are used to make parking more convenient and begin logging on procedures. But why is the sequence not actually completed before she enters her room? For efficiency, perhaps, but what kind of efficiency? Could this not also be a very precise system of “clocking in” to work that allows an employer to distinguish when someone is actually working rather than just saying hello to a colleague. This is not the surface intent of the scenario yet the reading is present, and the text can never finally close down the possibility of interpretations at odds with the central message.

“Sal glances out her windows: a grey day in silicon valley, 75 percent humidity and 40 percent chance of afternoon showers; meanwhile, it has been a quiet morning at the East Coast office. Usually the activity indicator shows at least one spontaneous urgent meeting by now. She chooses not to shift the window on the home office back three hours – too much chance of being caught by surprise. But she knows others who do, usually people who never get a call from the East but just want to feel involved”. (Ibid)

It is now clear that Sal works in California for a corporation involved in the computing industry, possibly a research laboratory something like PARC. There is a hint that Sal is a fairly high-ranking employee too, she does not behave in the way that people who never get a call from the East do. She gets those calls, and clearly, there is some prestige in this because others want to feel involved in them even when they are not.

“The telltale by the door that Sal programmed her first day on the job is blinking: fresh coffee. She heads for the coffee machine”. (ibid)

Here again, the neologism “telltale” evokes a new technology with a familiar term, a device which conveys customised information, Sal has programmed it to tell her when there is fresh coffee. But this begs the question—What else can it do? What other tales can it tell? The term “telltale” is interesting because its connotations, especially in the workplace, are negative. A telltale in the school yard reports to the teacher, in the workplace, the boss. Could it be programmed to show how many cigarette breaks smoking colleagues were taking? Or when someone was getting back from lunch? The tension between convenience and privacy is at play in the neologisms throughout the text. Once more the central message is that the technology is benign and offers nothing but convenience. But the detail

of the name unravels this reading—the telltale might be locally known as the sneak-o-metre.

“Coming back to her office, Sal picks up a tab and “waves” it to her friend Joe in the design group, with whom she is sharing a virtual office for a few weeks. They have a joint assignment on her latest project. Virtual office sharing can take many forms—in this case the two have given each other access to their location detectors and to each other’s screen contents and location”. (Ibid)

Again the name of the imagined technology is ambivalent. The “tab” echoes the English colloquialism “to keep tabs” on someone meaning to watch them, and the connotation is not necessarily positive. Sal makes a “wave” to a colleague, the scare quotes emphasise that this is not an actual physical wave, which would imply some sort of video monitoring, but rather a substitute for it. Again, the tension between convenience and privacy is very clear here. The scare quotes signal reassurance—don’t worry, it’s not video. And yet, there is clearly cause to worry, otherwise why the reassurance?

“Sal chooses to keep miniature versions of all Joe’s tabs and pads in view and 3-dimensionally correct in a little suite of tabs in the back corner of her desk. She can’t see what anything says, but she feels more in touch with his work when noticing the displays change out of the corner of her eye, and she can easily enlarge anything if necessary”. (Ibid)

The scenario only mentions the way that Sal feels on two occasions. The first is when she sees electronic trails from her neighbours and feels cosy. The second is here when she sees but cannot read Joe’s work and feels “more in touch”. On both occasions, the description of Sal’s affective responses is rhetorical, using persuasive literary devices. Sal feels cosy and reassured by these technologies, but these are not the only responses it is possible to imagine. Indeed, the focus on her affective state suggests questions about Joe. How does he feel knowing that she cannot see what he is writing but can see that he is writing? Someone is looking over his shoulder to see if he is, and perhaps more importantly, is not working.

“A blank tab on Sal’s desk beeps, and displays the word “Joe” on it. She picks it up and gestures with it towards her liveboard. Joe wants to discuss a document with her, and now it shows up on the wall as she hears Joe’s voice:

I’ve been wrestling with this third paragraph all morning and it still has the wrong tone. Would you mind reading it?

No problem.

Sitting back and reading the paragraph, Sal wants to point to a word. She gestures again with the “Joe” tab onto a nearby pad and then uses the stylus to circle the word she wants:

I think it's this term 'ubiquitous'. Its just not in common enough use, and makes the whole thing sound a little formal. Can we rephrase the sentence to get rid of it?

I'll try that". (Ibid)

Sal and Joe have a joint assignment, so it would seem that they are colleagues of more or less equal standing within the organisation. However, Joe is seeking Sal's help and not vice versa. Further, Joe has been wrestling with a problem all morning that Sal solves as soon as she has read the paragraph. Joe immediately agrees with her analysis of the problem and proposed solution "get rid" of the term "ubiquitous" which suggests a power relationship and begs a number of questions left unanswered in the text. Can Joe see Sal's work? This is implicit but by no means certain. If the answer is no then the collegial relationship becomes hierarchical, Sal is literally "keeping tabs" on Joe.

But what is perhaps most interesting about this exchange in terms of deconstruction is that it focuses on the problem of how to present a vision of ubiquitous computing that does not sound "too formal". Sal's advice is the key to a deconstructive unravelling of the text: she tells him to remove the word ubiquitous because it is too formal. But formal in what sense? Too precise? Too total? Too authoritarian? It must be made more informal, more friendly. It must, in short, do what the entire scenario has done—show the technology being helpful, benign and informal, though clearly it has "formal" aspects that can never quite be hidden.

"Say, by the way Sal, did you ever hear from Mary Hausdorf?

No. Who's that?

You remember, she was at the meeting last week. She told me she was going to get in touch with you.

Sal doesn't remember Mary, but she does vaguely remember the meeting. She quickly starts a search for meetings in the past two weeks with more than 6 people not previously in meetings with her, and finds the one. The attendees' names pop up, and she sees Mary. As is common in meetings, Mary made some biographical information about herself available to the other attendees, and Sal sees some common background. She'll just send Mary a note and see what's up. Sal is glad Mary did not make the biography available only during the time of the meeting, as many people do". (Ibid)

The scenario is describing what sociologists of the Asylum called a "total institution" [27]. By this they meant an institution in which there is a paper trail which accounts for every inmate's past history and present course of treatment (ibid). Here, the trail is digital but the institution is no less total for that. The use of the word "biography" is interesting. It suggests something more than contact details and current job position. Again, the technology is presented as benign but there is a tension even here, Sal is glad that

Mary did not make the information only temporarily available. Did she mean to do that? Why do some people limit access to such details? What did Sal want with the information? Was she going to call her and ask her why she had not been in touch? This is a world in which promises at the workplace cannot be made lightly, and records are kept of every transaction. Here, formal records (biography and contact details) intersect with human memory (Joe's prompt that she said she would call). The end result is a total institution where accountability is absolute.

Although at a superficial level, the scenario describes benign technology which makes life easier at home and in the workplace, the text is littered with qualifications, asides and even direct explanations which address the threats and dangers of this technology. A deconstructive reading of the scenario then finds not a benign vision of ubiquitous computing but a deeply sinister evocation of a total institution in a surveillance society. After presenting the scenario, Weiser notes that the imagined technology had the potential to make "totalitarianism up to now seem like sheerest anarchy" and notes that marketing firms already make unpleasant use of information. These negative potentials are immediately foreclosed "Fortunately cryptographic techniques already exist to secure one ubiquitous computer to another" (Ibid). Reassurance is not merely technological and social, it is also and, perhaps primarily in this text, rhetorical.

Deconstruction as a philosophy claims that nothing is entirely itself. Within every position, however, assured, there is a counter position. Despite a central message of reassurance and optimism, there is also within this text a shadow of deep anxiety and fear. Attention to these textual anxieties makes the text more not less prescient.

2.2 Psychoanalytic reading

It is clear from the context of the rest of the article that Weiser, though concerned about potential abuses of this technology, created a scenario which made a case for its benign application. Deconstruction suggests an alternative reading of this same technology also at work in the text, a shadow or counter reading to the main argument. But, as previously noted, deconstruction is not the only interpretive strategy available in literary and critical theory. The deconstructive strategy of reading against the grain is useful in exposing anxiety and unease in a text despite surface assurance. But deconstruction rarely accounts for the power of a cultural artefact. Critics of deconstruction argue that it is a dry and pedantic form of deliberate misreading. The deconstructive reading of the Sal scenario suggests that from the very beginning, it was clear that ubiquitous computing was a dangerous idea. But it does not indicate why it was attractive, why it was compelling and

why, ultimately, it was so desirable that it came, more or less, to pass. Psychoanalytic readings of literature and film focus on desire and this section offer a Zizekian reading of the Sal scenario.

Since the death of Jacques Derrida, the best-known living cultural critic and philosopher is without doubt Slavoj Zizek. Zizek combines Heleglian dialectics with Lacanian psychoanalysis to produce startling and counter-intuitive readings of popular culture [40]. For Zizek, the purpose of psychoanalytic interpretive strategies is to produce insights about desire. In the first moments of *The Pervert's Guide to Cinema*, Zizek encapsulates his interpretive approach as follows:

“The problem for us is not - are our desires satisfied or not? The problem is - how do we know what we desire? There is nothing spontaneous, nothing natural, about human desires. Our desires are artificial, we have have to be taught to desire. Cinema is the ultimate pervert art. It doesn't give you what you desire, it tells you how to desire”. [24]

The Sal scenario has now been quoted in full, and this section revisits the text but asks a different question: what is it telling us to want? In a sense, the purpose of any design scenario is explicitly to shape technology development, so this is always a crucial question.

The discussion in the scenario of the term “ubiquitous” and the building's location in Silicon Valley position the company squarely alongside Microsoft, Apple or PARC. These organisations introduced non-hierarchical “flat” styles of management, so it might be argued that the relationship between Joe and Sal is one of collegiality and not surveillance. But as Zizek has pointed out, a boss who acts like a friend is more oppressive than one that just acts like a boss: a friend can intrude on almost any aspect of our lives, a boss has limits [42].

A psychoanalytic reading of this scenario would focus attention on the disavowed technology which enables Sal to see Joe's work without the text being large enough to actually read it. It is clear that she can, if she wants, enlarge his work but she does not do this, she is content, instead to feel connected. It is not clear whether Joe is aware that his work is being currently looked at or not. He is aware, however, that someone, some “other” might be attending to it closely. Lacanian psychoanalytic theory describes such absent audiences as “the big Other”. The big Other resides in the symbolic order, for the child it might be the Mother, for the adult it may be God. For Lacan, “there is no big Other” outside of the symbolic order, it is an imagined audience that does not exist. Zizek claims that Stalin extracted confessions from the victims of his show trials not to convince the public that the people he executed were really traitors or to convince himself or even posterity but rather to convince the big Other, an ideal audience

which never existed [41]. Colleagues in the Sal scenario who might or might not be reading Joe's work might also be considered as such a “big Other”. Although this big Other does not exist, it has the real effect of regulating behaviour. Sal does not examine Joe's work in the scenario until he asks her to, nevertheless his work is being monitored.

A Foucaultian analysis of this moment might describe it as a form of “panopticism”—the ability to see without being seen. For Foucault, this was the organising principle of the twentieth century and ensured that subjects were disciplined because they thought they were being watched whether they were or not [25]. But Sal is not explicitly policing Joe, crucially Sal only sees Joe's work when he invites her to look at it. The technology affords not the power to see without being seen as Foucault might have it but rather the ability to see without seeing. What is crucial in this scenario is not Joe's experience but Sal's experience. This is the perspective from which we view the technology and hers is the position that we are asked to desire. What is it that she enjoys here? The kernel of enjoyment is the power to monitor without feeling as if she is part of a surveillance system. What the scenario invites us to want is surveillance without guilt.

A literal reading of the Sal scenario would be that this technology will indeed provide convenience in the workplace and, so long as there are checks and balances, its effects will be largely benign. An antithetical reading might then be asserted which would look very like the preceeding deconstructive interpretation: in fact, the scenario is a dire warning of the sinister totalitarian workplace that awaits us if we allow technology to develop unfettered. For Zizek, a third interpretation would also be necessary and the key to such an interpretation comes in the following moment:

“she can't see what anything says, but she feels more in touch with his work” [37].

This sentence with its pivotal clause “*but she feels more in touch*” is emblematic of the entire approach in the scenario. There are potential dangers in this technology *but* they have been anticipated and guarded against. The ability to see a colleague's work without being able to read it is of no direct use *but* it makes the protagonist feel more connected. What the scenario also provides is a subject who wants to be monitored, Joe asks Sal to look at his work. What we must ultimately want in the age of surveillance are people who want to be watched. In psychoanalytical terms, this is a “fetishistic disavowal” that might be expressed as “I know very well but...”. Here, the fetishistic disavowal would be expressed as—I know very well that surveillance technology is always oppressive but here is a surveillance technology that is not oppressive.

For Zizek, this tendency defines our age. We want coffee without caffeine, beer without alcohol, war without casualties (on our side) sex without danger or consequence (i.e. safe sex). The seductive dream at the heart of this scenario then, and perhaps at the heart of the notion of ubiquitous computing itself, is the notion of surveillance without intrusion. The focus of this dream is the home, but more than that, the home of a woman. This suggests a further reading of the scenario based on feminist perspectives.

2.3 Feminist reading

We know almost nothing about Sal, as Cooper [16] and other critics of personas in scenarios would point out: we do not even have basic demographic information such as age or ethnicity. We do, however, have some notion of gender. Sal might be short for Sally but it may equally be an unfamiliar ethnic or future male name. Sal is a unisex moniker until the use of the objective pronoun in the sentence describing “her” street. Sal is also a Mother:

“Glancing at the windows to her kids’ rooms she can see that they got up 15 and 20 min ago and are already in the kitchen. Noticing that she is up, they start making more noise”. [37]

It is not clear if Sal is the sole caregiver. Certainly, no husband or partner is mentioned. Nor is it clear how old the children are or what happens to them after they get up. We are told that the children make more noise when they notice she is up, presumably hoping to gain her attention, it is not clear whether they get it or not. In the next line, the children have disappeared:

“At breakfast Sal reads the news”. (Ibid)

Undisturbed by the children either having breakfast or getting ready for school, Sal is free to circle a news article and send it to the office. Although the earlier reading asserts that we do not know what the article is about, we can at least assume that it is related to work. Almost from the moment, Sal becomes conscious then she is engaged in work-related activities. The tone is casual; she circles the quote because it is “interesting”. Maybe she is merely indicating that she “likes” it. Nevertheless, she is liking it to someone in her office.

Why is Sal a woman? Why does the scenario not feature a male protagonist? Would it read any differently if Sal was Saul? To answer such questions, it is necessary to consider the differences between the first three waves of feminism.

The first generation of feminists fought for the right to vote, and the second generation struggled for equal rights in the workplace. Sal’s position in the company might be taken as one of the achievements of the feminist fight for equality of opportunity and pay. In 1991 and even today, women are woefully under represented in computer science

both in industry and in academia. The scenario then can be taken as a feminist vision of greater equality and opportunity for women. But Sal might also be taken to represent the limits of second generation feminism and the critique that was imminent in the third wave.

If Sal was male and the scenario featured no new technology then it might be from the 1950s. Sal, like the career men of the mid-twentieth century, has almost nothing to do with the children. There is a peripheral awareness of them perhaps, but as soon as breakfast is underway, reading the paper comes first. There might be something “interesting” for work there after all.

Third generation feminists argued that it was no victory for women if their liberation meant only that they could or perhaps should behave like men [15]. Third generation feminists also criticised second generation feminists for concentrating on the experiences of white heterosexual upper middle class women [39]. A third generation feminist reading might also question whether Sal was male or female in traditional terms, it may be that Sal is transsexual, transgendered or intersexual. The scenario elides not only demographics like age and race but also sexuality. The scenario begins with Sal in bed but there is no indication as to whether she shares it with anyone or what the gender of such a person might be. For third generation feminism, Sal might be seen as a de-sexed corporate automaton. Women’s liberation was not merely the freedom to be exploited in the workplace. This is precisely not to argue that second generation feminists were wrong to argue for equality. Nor to suggest that women would be happier after all if they remained in the home. But rather to stress that women’s liberation should involve freedom rather than stark choices between fixed options.

Second wave feminism would position the Sal scenario as envisaging greater equality for women. Third wave feminism would critique this as the freedom of women to be exploited in the workplace. The technological links to the workplace mean that Sal’s entire home is linked to and mediated by work. The scenario presents a powerful woman who has parity or authority over male colleagues at work, and in this respect, it could be considered as a victory for second generation feminism. But it also presents a world where there is a total collapse of the public and private, the office and the home, work and family life. For third generation feminism, this would be an image of defeat and technological domination.

2.4 Multiple interpretations and meanings

There is of course no correct, fixed reading of any text, no interpretation could ever be final. Insights gained from a feminist or psychoanalytic readings do not supersede or disqualify any other. Meaning is a gestalt between the text

and what the reader (or the critical perspective) brings to the text [23]. In the Sal scenario, the reader is told that there is sunlight and a fence through one of the windows but there is also grass on the lawns, tarmac on the roads and cement on the sidewalk. It is not necessary to list such detail. The reader fills such gaps in the text themselves. With great skill, Weiser also leaves the details of the technology as blanks or gaps in the text. The words “liveboard”, “tab” and even “wall” will cover whatever technology the reader can imagine. Neither the deconstructive nor psychoanalytic nor feminist “reading” could be described as correct, or for that matter, invalid. What is clear from these alternative readings is that meaning is not determined by what the author “meant” to say nor is it confined to the words on the page.

At one level, the Sal scenario is very simple, describing several new in the 1990s technologies:

- A bed monitor with a coffee making machine
- A window-based display showing neighbourhood and home activity.
- A pen-based copy and paste email facility.
- An identification tag for finding things
- A car display showing traffic snarl ups and nearby amenities.
- A window display showing weather conditions and forecasts
- An office-based document sharing facility.

At the same level, the context of these technologies is also simple. Each is used by a female employee of a technology firm in Silicon Valley. At other levels, the scenario is much more complex.

Just as grass, tarmac and cement are implicit in the scenario without being named so too is a broad social context. Implicit is some version of the Western liberal democracy that Weiser was living in. Living in the “actually existing” twenty-first century the provocative vision of data trails might seem even more disturbing than it did then. Although concern about this technology is anticipated, the scenario is essentially presented as reassuring and comforting. In future, privacy might be even better protected because we will have “digital pseudonyms”. This move is only possible if the reader accepts a benign future political context. As Dourish and Bell have argued, the point is precisely not that context is absent; rather it is taken for granted. The preceding sections have demonstrated that not only is there an implied historical context but also an implied ideological and political stance towards that context.

When we imagine new technologies, we always also imagine the social contexts in which they operate. If we are Americans working in Silicon Valley, we are very likely to picture some kind of extended present for future

technologies to operate in. What is the alternative? One alternative is to make preconceptions about imagined social contexts explicit. One means of doing this in scenarios is to use pastiche.

3 Pastiche scenarios

Pastiche is an imitative form of writing which borrows style, setting and characters from source material to produce new texts. Pastiche scenarios, then, draw on existing narratives in order to create richer and more resonant descriptions of users and technologies. Such scenarios can be used to explore the complex social and cultural issues raised by technological innovations [8]. The uses of the technique have been explored in depth elsewhere [9, 10]. In order to illustrate what Weiser’s vision might look like with a different set of assumptions about the social context, the following sections retell the Sal scenario in the style of Douglas Adams and Philip K Dick.

3.1 Arthur Dent and the computer for the twenty-first century

Although the comic science fiction writer Douglas Adams frequently mocked technology, he was also deeply enamoured of it and, in later life, abandoned writing novels to become “chief fantasist” for a company he set up which produced among other innovations “H2G2”, a collaborative encyclopaedia which can be seen as a precursor to Wikipedia. Adams created a richly imagined comic universe which spanned many books and formats. One of his best loved and most quoted creations is the “Sirius Cybernetics Corporation” whose idiocies continue to stand as stark warnings to those of us who have been tempted to make fridges speak.

“The Hitchhiker’s Guide to the Galaxy says of the Sirius Cybernetics Corporation products that ‘it is very easy to be blinded by the essential uselessness of them by the sense of achievement you get from getting them to work at all.’ In other words – and this is the rock-solid principle on which the whole of the Corporation’s Galaxywide success is founded – their fundamental design flaws are completely hidden by their superficial design flaws”. [1]

Inherent in the comic stance to technology is a critique of design that is, arguably, very useful. The overturning of expectations applies not only to technology but also users:

“A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools”. (ibid)

This form of comedy ensures that the readers’ expectations of people, technology or indeed the universe, will not be met. A standard device of any comedy is to build

expectations up in one direction and abruptly go in another at the last moment. In a comic universe technology is likely to at least surprise the user if not outright fail. Arthur Dent lives in worlds of very broken technology. It ages, it breaks down and it is usually extremely badly designed.

The following pastiche retells Sal's scenario and the technology she uses as

The Hitch Hiker's Guide to Ubiquitous Computing.

Arthur Dent awoke to the smell of something almost, but not quite, entirely unlike coffee. A few minutes ago his alarm clock, alerted by him rolling over in his sleep, had asked if he was feeling just swell today and further enquired if his enjoyment of the morning might be enhanced by a cup of coffee. Arthur had mumbled vague threats of violent retribution if the alarm clock did not shut up. The alarm clock explained that it was only programmed to understand "yes" and "no" before asking again if a coffee might help him relax and feel better about the whole business of waking up and getting on with a super day. Arthur reprogrammed the alarm clock by bashing it repeatedly against the wall and was very disappointed to discover that even this determined act had merely returned the device to some sort of sleep mode. With intense nostalgia and a profound sense of loss, Arthur recalled the "off" buttons of his youth. The alarm clock enquired, in a mangled yet still surprisingly cheerful voice, if he would perhaps prefer tea.

Arthur looked out of the window or rather he looked out of the small corner of it that was not displaying helpful information such as: which of his neighbours were having affairs, the number of salesmen who would call that day to ask if he wanted to switch his electricity provider, and what the odds were against a light meteor storm striking the planet later that afternoon and wiping out all of human civilisation or at least, the most fashionable part of it.

At breakfast Arthur read a newspaper article about a rift in the space-time continuum that had opened at a Disaster Area Concert and caused leading physicists to speculate that the "big bang" might well have been caused by a particularly ferocious bass solo. Arthur waved his pen at the paper warily and attempted to send the article to Ford Prefect but instead sent multiple copies of the advertisement next to it which offered to reveal the secrets of eternal happiness and at the same time cure erectile dysfunction.

After discovering that he had sent the message not only to everyone on his address list but everyone he had ever made eye contact with, Arthur opened an email from the company that made his garage door. He had lost the instruction manual and been unable to get to his car for several months now. After intense negotiations with the

automated Help division of the Sirius Cybernetics Company he had finally been put through to a human being, or at least a sentient being of some kind and they had sent the complete forty volume set of the manual as well as a code for finding the old abridged version. After entering the code and following a high pitched whine that had clearly been designed for use during enhanced interrogations, Arthur found the book where, in a fit of pique, he had buried it in soft peat.

It is possible that Paul Nancy Millstone Jennings, the author of the very worst poetry in the world, might have equalled the tedium and obscurity of the prose in the garage door manual, but she would have had to work very hard at it, harder at least than she worked at her poetry which came to her in flashes of, what she thought of as inspiration, but turned out later to be irritable bowel syndrome. During the months of negotiation with the help system Arthur had been making careful physical and spiritual preparations for this encounter with the manual. It was with a serene sense of Zen like calm then that he studied the instructions until teatime and finally discovered, in a reference to a footnote of part 4.1 of the thirty-third appendix, a means of resetting the password and finally opening the garage door.

With a curious sense of what he suspected might be triumph or possibly even elation Arthur drove his car into the sort of sunset that looked as if it were about to really let its hair down, and set about painting the town red. But the joy of the open road rather quickly became the nervous irritation of the hectic dual carriageway and finally the infuriated resignation of the very busy urban centre. The car's doleful voice dutifully informed him that he was sitting in a traffic jam.

"Yes robot" Arthur replied curtly "I can see that, thank you very much."

"I think you ought to know" it said "that it's not going to get any better further along."

"Really?" said Arthur tartly, still determined to enjoy himself.

"Yes, traffic jams all the way. You might as well give up."

"I think not."

"It's hopeless, you'll never get there, not in rush hour. There's a coffee shop just round the corner."

"Is there?"

"Yes, shall I pull over? We could have a bit of a rest and a think."

"No thank you."

"You could have a sandwich perhaps. And I could take the weight of my chassis; I have a terrible pain all down my left panels you know."

"Yes, so you said the last time you were out of the garage."

“Shall we go back then?” the car asked hopefully
“It’ll take ages and me with this terrible pain—”

Arthur turned the radio on and attempted to ignore the car’s continued whining as an advertisement for the Sirius Cybernetics Help Division boasted that it had recently expanded to a third planet in order to cope with popular demand.

Getting Arthur’s car out of the garage almost strains the internal logic of the Hitchhiker books to breaking point. Here, almost all ambitions are thwarted, and unco-operative technology is more often abandoned than mastered. It seems unlikely therefore that Arthur would ever arrive at his destination, so this might be as good a place as any to end the scenario.

This is an imagined world in which technology is broken, design is poor and users are flawed, fallible and vulnerable. The difficulties of the protagonists are caused in this universe, more by incompetence than maleficence. The world of Philip K Dick is less comforting. What if the designers of these technologies are not merely incompetent?

3.2 Joe Chip and the computer for the twenty-first century

Since his death, critics have called Philip K Dick, the Shakespeare of Science Fiction [28]. But during his lifetime, his work was rarely taken seriously and he produced stories at an astonishing rate to pay his bills. Film versions of his work, such as *Blade Runner*, *Total Recall* and *Minority Report*, have ensured that he remains one of the most popular as well as the most critically respected sci-fi authors. Weiser’s term “ubiquitous computing” references the Dick novel *Ubik* so it is perhaps appropriate to retell Sal’s story in that novel’s paranoid world. *Ubik* is centred around Runciter’s “Prudential Organisation” which offers “anti-psych” services to protect against “telepaths” and “precogs” employed by the Hollis corporation for industrial espionage [19]. Russiter employs anti-psyches to block such spies. The novel’s central protagonist, Joe Chip, has no anti-psych talent himself but works for the firm testing new recruits.

The “Ubik” of Dick’s novel is a multi-functional aerosol spray. Advertisements for the mysterious product begin each chapter. The *Ubik* ads promise a wide range of uses for the product. Each of the first sixteen chapter headings describes *Ubik* obliquely as something like: beer, coffee, salad dressing, a cure for head and stomach ache, a shaver, a plastic coating to protect household surfaces, a savings and loan scheme, a hair conditioner, a ten day deodorant, a sleep medication, a snack, a bra, a plastic food wrap, a cure for bad breath and a breakfast cereal. It is

described as some form of food or drink six times and some form of medicine or tonic five times suggesting something that it is at least edible. However, it is also described as a plastic coating, a bra, a shaver and some sort of financial service. Every advertisement carries a warning stressing that *Ubik* must only be taken as directed. The meaning of *Ubik* then is multiple and throughout there is a dual emphasis on functionality and the dangers of excess.

Early in *Ubik*, there is a similar breakfast to the one in the *Sal* scenario. It introduces Joe Chip a typical Dick protagonist, single, working class and broke. Joe works for a firm which offers to block the abilities of “precogs” and “telepaths”. The following scenario is then a pastiche of what Philip K. Dick’s ubiquitous computing might look like.

Ubik-uitable Computing

Can’t get your article past peer review? Spray on Ubik before submission. Perfectly safe if used as directed.

Joe Chip woke up with a start and stared bleary eyed at the alarm clock. Through the haze of his hangover he realised he had overslept again.

“Why didn’t you wake me up like I asked?” He moaned as he climbed out of bed.

“The cost of a wake up call is five cents” the alarm clock said.

“I told you I don’t have any change!” Joe yelled
“Besides, what I pay you is a gratuity! I don’t have to give you a tip.”

“I think otherwise.”

Joe got to his feet and put on his gay pinstripe clown –pyjamas.

“Just gimme a coffee will you?”

“Fifty cents please” the clock said.

“I’ll pay you tomorrow.”

“All credit has been suspended.”

Joe looked out his windows at the neighbourhood. He peered suspiciously at the sunlight and fence visible through one of them. Was it really the day or was it a hi-res simulacrum installed by the repo-men? It was an old trick. Let the debtor think there wasn’t a cloud in the sky or a kid on the street as the vans pulled up and the men took their places ready to kick the door in. The data trails on the other side of the window were no more reliable but he checked them anyway out of force of habit. His stomach cramped as he noticed time markers showing that Pat Conley had been outside the house late last night. What the hell had that bitch been doing there?

In the debris and clutter of his uncleaned-up apt he read the business section of the news. There was another op ed

demanding more stringent registration and control of telepaths to protect privacy. Joe tapped the article, sending it on to his office at the Prudence Organisation and who knew how many of Hollis's spies.

He opened an email from the company that made the garage door opener saying that they would not be supplying him with any further services until his bill had been paid in full. The Credit Auditing Agency had put out a general alert on his profile and they would neither send a replacement manual nor release the lock on the garage door until all outstanding debts were settled. Resigning himself to walking to work again Joe got dressed and searched for some coins to open the door. Finding none he took a screw driver to the handle.

"I'll sue you" the door protested as the screws fell to the floor.

"Yeah I know" he replied.

Joe ran most of the way to work keeping his time on the street to a minimum, more than fifteen minutes would mean getting picked up by the traffic police again. At the Prudence Organisation Joe looked down at the police cars which had stopped outside the building. He could not afford the advertisement free window so most of the view was taken up by messages from sponsors.

"Visit your dead wife in Half Life. Take out a policy today to make sure you don't lose your loved ones when they die. Our same-day cold pac storage service means that even Death won't part you now!"

The telltale on the door showed he had incurred his third warning of the week for being late. If he wanted coffee now it would be on his own time.

GG Ashbury waved his tab at Joe to indicate that he had already updated his report on Pat Conley. Joe sat down and added a note to Ashbury's entry on the new recruit.

"Dangerous and Treacherous. Do not trust."

Ashbury noted the change and responded instantly.

"This was my find Joe! First you try and steal the credit and now you just outright undermine me! Pat Conley is one of the most talented anti-psych's I've ever scouted!"

"I don't deny it" Joe responded calmly "She's so powerful she could destroy the entire organisation." Runciter's face appeared on the screen.

"She already did."

Joe rubbed his eyes and squinted at the screen, the face of his dead employer remained stubbornly where he thought he had seen it.

"I don't know how to tell you this Joe" the old man looked uncomfortable "Hell there's no easy way to tell a man he's dead."

The world of *Ubik* is in some senses a world of seamless communication technologies like the one Weiser envisions. What is missing from the Sal scenario which is all too present here is money. Sal can be presented as living in something like a Utopia because she is somewhere near the top of the social organisation. The same technology is profoundly dystopian if it is experienced from somewhere near the bottom.

4 Discussion

One of the staple devices of science fiction is to focus in on a particular individual and introduce the new world through their eyes. Philip K. Dick typically begins his stories with a description of a blue collar worker engaged in some task which is, to the reader, extraordinary (e.g. administering tests which show the difference between an android and a human) but is, to the character, utterly tedious and menial. Arthur Dent is a stranger in a strange universe and the reader meets it through his bewildered eyes. In the Sal scenario, we are introduced to the technology by someone somewhere near the top of the social hierarchy. Sal is not alarmed or bedevilled by the technology, she has absolute social and technical control of it.

Another staple device of science fiction is the invention of new words and argots. The prose of Philip K. Dick is littered with so many neologisms, "conpat" "pape" "precog", for example, that it is, at first, almost impenetrable. These neologisms are not defined, they are addressed as if to contemporaries of the characters who would understand them perfectly because they inhabit that world. It is as if readers of science fiction are eavesdropping on the future and so must make sense of it as best they can. Weiser employs the same device with neologisms like "foreview", "telltale" and "tabs". Just as the term, ubiquitous references *Ubik* so the term foreview recalls "precog". Indeed, technologies like the "telltale" and the "tabs" echo the paranoid tendencies in all of Dick's writing.

Early in *Ubik*, Joe Chip and other employees of the Prudential Organisation are victims of a bomb attack in which their employer Runciter is killed. As they attempt to get Runciter into "half life", they notice strange incidents of physical decay, cigarettes dry up and flake away, time begins to run backwards and images of Runciter begin to appear everywhere. The dead man's face appears on a coin or TV, later he begins to send messages, his words appear, for instance, in a prescription for medication. As in many of Dick's novels, it is not clear whether the characters' world is real or not. Indeed, it is not even certain whether the protagonists are alive or dead. In order to hold back the process of decay, Runciter tells Joe that he must get hold of a can of *Ubik* and spray himself with it. In the last chapter,

the tone of the Ubik advertisements becomes quite different:

“I am Ubik. Before the universe was, I am. I made the suns, I made the worlds, I created the lives and the places they inhabit; I move them here I put them there. They go as I say, they do as I tell them. I am the word and my name is never spoken, the name which no one knows. I am called Ubik, but that is not my name. I am. I shall always be.” [19, p 223]

Ubik then is the beginning and the end, the alpha and the omega: the organising principle of the universe, whatever that universe is. This amorphous shifting commodity ultimately becomes the meaning of life. Joe’s sole purpose at the end is to find and consume it. He must spray himself with Ubik in order to reverse the process of decay that is destroying his world whether it is imaginary or not. As in most of Dick’s work and especially the later novels, it is never clear what the final reality is.

As a counter cultural figure of the late 1960s, Dick is often taken as a critic of late twentieth century western society. At one level, his concern with deceptive appearances is clearly a critique of the cycles of consumption which rely on endlessly re-created desire. As in Douglas Adams, there is an almost structural scepticism about the promises of technology.

We know very well that it is unreliable but –

We know very well that it is open to abuse but –

The identification of the fetishistic disavowal—we do not want surveillance technology but here is the surveillance technology that we want, is important because it echoes throughout the later ubicomp literature.

This tension between convenience and privacy persists in ubiquitous computing. Sengers et al.’s [33] Affecter for instance offers co-workers distorted video images of each other to convey presence and perhaps mood without showing exactly what they are doing. In the Weiser scenario, Sal could not see Joe’s work but she felt more in touch, likewise users of the Affecter cannot see a clear video feed of colleagues but there is a fuzzy distorted image and they likewise feel more in touch. Similarly, Gaver et al.’s Home Horoscope took home activity monitoring data and turned it into ambiguous statements in the form of a horoscope [26]. Weiser’s recourse to affect was to echo throughout the years, particularly when ubicomp turned its attention to the home and care of the elderly. Here, the central question has been—how do we monitor older people without intruding on their privacy? Many variations on Weiser’s strategy have been proposed since. Romero et al.’s Tableau Machine, for instance, takes home activity monitoring data and turns it into a work of art [31]. Monk’s Virtual Frosted Window likewise takes a video feed and distorts it, so that only outlines and vague

movement is visible, as if the users were looking at a granny flat at the end of a garden [36]. Each takes monitoring data in the home, disguises it and makes it in some way unavailable. Each does the same rhetorical work of the pivotal moment in Weiser’s scenario:

“she can’t see what anything says, but she feels more in touch” [37]

Each of the actually existing modified surveillance technologies can be thought of as fetishistic disavowals: we do not want these monitors but here are the monitors we want. From Sal’s tab to the distorted images of Affecter, the Tableau Machine and the Virtual Frosted Window, each of these technologies provides information which is immediately limited. It is monitoring data without being monitoring data. It is only possible to imagine the use of such technologies in benign social contexts. Consider the Sal scenario or any of these technologies in less idealised use situations and their *raison d’être* changes profoundly. The comic and paranoid context of Adams and Dick suggest perhaps exaggerated problems and potential abuses but less extreme alternative contexts also undermine the rhetorical work of their presentation. Consider Weiser’s data trails in the America of George Bush Jnr rather than George Bush Snr. Even this relatively minor difference of political extreme has deeply troubling implications.

5 Conclusion

The readings of the original Sal scenario demonstrated that although scenarios might be written in a seemingly simple, objective style, they are far from simple or objective. Identifying the rhetorical tropes of scientific literature is a standard procedure in the history of science [e.g. [29]]. Reading ubicomp literature as a genre is itself a rhetorical move. There is no neutral vantage point outside of language from which to comment [40]. This paper, like the others, is also rhetorical, it makes an argument. Taking a position in an argument immediately involves the adoption of a (broadly) political or ethical position. Although labelling certain arguments as “deconstruction” “psychoanalysis” or “feminist” is somewhat crude, it makes plain the position being adopted.

It is usually assumed that designers are ethical, and the context of use is benign. Dunne and Raby provocatively suggest that design is not benign and their critical design work produces anti-human proposals. Considering the potential for meat grown in laboratories from animal cells, for instance, they speculate about what the commercial implications of such a technology might be: how much would it cost, how long would it take to grow, could you use cells from your own body so that you could have an “eat yourself party” [21]. Nano- and bio-technology

suggest much more obviously ethical design spaces but digital and electronic technologies can be equally troubling, for example, a jumpy, neurotic robot is proposed for use as security (Ibid). Such visions are much closer to the science fiction of dystopia than the ubicomp scenarios of utopia. Utopia is a very difficult subject for science fiction; this is partly perhaps because in true idylls there would be very little to write about “happiness writes white” which is to say that a fundamental component of narrative is struggle or conflict. Far more often the futures imagined by science fiction are dystopias in scientific accounts utopia is more accessible [28]. Why this radical difference in the two literatures?

Ubicomp scenarios are still, for the most part, written in the simple style of Weiser’s Sal story. Such scenarios resemble science fiction except for the omission of conflict, the basic foundation of all narrative [13]. The key difference between science fiction and ubicomp scenarios is the explicit acknowledgement of social conflict and struggle. This element of narrative is too often elided or ignored in the stories told in ubicomp literature. More than other sciences, ubicomp is involved in the construction of narrative. Not just in papers writing up what was done but in proposals on what to do and actual technological interventions. A critical understanding of narrative is becoming increasingly necessary, and there is a small but growing body of work which draws on critical theory [e.g. 2–5, 7, 11, 12, 17, 30, 32, 34]. For the most part, this literature argues that critical theory must be incorporated to better inform design. It may also be that it must be incorporated to do what it was originally intended which was to inform criticism.

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