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The Hacker Ethic and the Spirit of the Information Age*

Graeme Kirkpatrick

Abstract
This paper develops a historical analogy between the pioneers of personal computing, or 'hardware hackers', of the 1970s and the seventeenth-century Protestant sects described in Weber's classic study. The psychological, cultural and sociological affinities of the two groups are emphasized, as are their roles in history. As Weber's Protestants are said to have instigated cultural changes conducive to capitalist development, so the worldview of the hackers contributed the idea – embodied in the personal computer itself – that has enabled capitalism to exploit information technology. The similarities between the two groups extend to the ironic historical fate of their respective belief and value systems. According to Weber, the Protestant sects were victims of their own success. Their stern advocacy of religious practice made possible a society whose dynamic principles tend toward the elimination of religious belief, while the Protestant emphasis on a life of diligence guided by reflection becomes valued for its utility rather than its intrinsic associations with virtue. Similarly, the hackers advanced the goal of ubiquitous personal computing because they invested their practice with a moral significance that revived older ideas of autonomy and empowerment through the exercise of reason. These ideas are effectively neutralized by design features of the con-temporary personal computer, especially its interface. The hackers' ideals seem almost anachronistic, while their advocacy of hard work with a PC has become a mere necessity of life for most people. In both cases, however, the radical, rationalist spirit at the core of the movement furnishes critical perspectives which, when reworked by subsequent thinkers, may inform critical practice.

Introduction

In his *The Hacker Ethic and the Spirit of the Information Age*, Pekka Himanen makes 'playful' (2001: 142) use of the title of Weber's classic study of the social and ideological origins of capitalism.[1] However,

* I am grateful to Alan Carling, Andrew McCulloch and Sam Whimster for their generous comments on, and criticisms of, earlier drafts of this essay. An anonymous reviewer for *Max Weber Studies* also made a number of helpful comments and suggestions.

1. The original draft of this paper was written before the publication of Himanen (2001), but has been revised to take account of that work and the unsatisfactory use made of Weber therein.

Himanen does not engage with, or make productive use of Weber's thesis as an argument about history and the role of ideas and idealists in social change. Instead, he conflates Weber's discussion of the 'Protestant ethic' of seventeenth-century Europe with contemporary, pejorative uses of that phrase. Himanen simplistically associates the Protestant ethic with a driven attitude to work and a kind of system-conformist personality type. His idea is to oppose the beliefs and values of computer hackers – the 'hacker ethic' – to this. Hence, he writes that, 'The original meanings of the terms *capitalist* and *hacker* pull in different directions' (2001: 36). While this serves Himanen's political and polemical ends rather well,[2] it represents a missed opportunity as far as making productive use of Weber to analyse contemporary social phenomena is concerned. It also has the effect of obscuring the irony in Weber's account of historical processes.

Weber's book is a piece of historical sociology, in which he emphasizes that the Protestant ethic was itself *not* pro-capitalist (1974: 89). The irony is that it fed into the development of capitalism and that this system generated social outcomes which were profoundly deleterious to the spirit of Protestantism. Himanen's approach misses the opportunity to see a similar process of disenchantment at work in the fate of 'hackers' who pioneered the development of personal computers (PCs). In its place we are offered a superficial idealization of computer hackers as the source of an 'oppositional ethic' in the information age.[3] A more rigorous employment of Weber leads us to a deeper grasp of the relationship of the hacker and hacking to the elaboration of a critical perspective on the information society and its technological basis, the networked PC. I argue here that, far from being intrinsically opposed to the 'Protestant ethic' (whatever that is, nowadays), the hackers and their ethics occupy a similarly ambiguous and contradictory relationship to the development of capitalist society to that held by Weber's historical Protestants.

I begin by developing an analogy between the hacker pioneers of personal computing and the seventeenth-century Protestants described by Weber in his *The Protestant Ethic and the Spirit of Capitalism* (Weber 1974). This analogy clarifies the relationship between hackers and 'informational capitalism' (defined below) and facilitates a measured understanding of the historic role of the original hackers and the sociological significance of contemporary hacking. The hackers should not be canonized as romantic rebels – nemeses of network capitalism – nor relegated to a footnote in the history of personal computing. Examining

2. And those of Manuel Castells – see the latter's epilogue to the book.

3. Gabilondo (1995) anticipates the kind of 'liberal fantasizing' that we encounter in Himanen and counsels strongly against it.

their attitudes and beliefs in connection with the personal computer, however, does furnish us with the basis for a critical perspective on the diffusion of personal computers and other intelligent artefacts. Like the Protestants of early modern Europe, the American PC enthusiasts of the 1960s and 1970s founded a new and distinctive worldview. This worldview profoundly saturated the existence of the PC pioneers, moulding their experience of the world in a way that is thoroughly comparable to the impact on the members of the seventeenth-century Protestant sects of their religious beliefs. Moreover, just as Protestantism has been assigned a fundamental explanatory role in the development of modern capitalism, so the worldview of the PC pioneers has been objectively significant for the shape of world history since the 1970s and 1980s.

In what follows, Section 1 develops the analogy between the Protestants and the hacker subculture of the 1960s and 1970s. Both groups valued intense diligence, rational thought and constant reflection as keys to personal virtue. Both emphasized these qualities over more conventional indicators of the moral quality of one's character and behaviour – such as kindness. While they each assumed that their new beliefs would augur positive changes in society at large, this was the priority for neither of them – their primary orientation was solitary and inward. Both bequeathed to society a powerful basis for the quickening of capitalist modernization processes, though neither could be said to have intended this outcome, and its effects were deleterious for the belief and value systems of both groups.

From the late 1980s onwards the PC came to occupy a pivotal role in the development of the economic, or systems, sphere of society. In the process, the PC was transformed from an austere, demanding machine into something 'friendly' and 'easy to use'. In Section 2 I argue that this kind of PC has become socially ubiquitous principally because it is the form of computer technology that is most consistent with the interests of key economic players. The impact of the new technology has led some to argue that we are now living in a new mode of production: 'informationalism', or 'informational capitalism'. This new economy presupposes that computers' processing power is easily available to individual workers. The discrepancy between computers as they were conceived by radical hackers, and modern PCs is found to be consistent with the central analogy being drawn by the paper. Just as in capitalism consumption supplants religion as the basis for the diffusion of the work ethic, so in informationalism the interface displaces the hackers' reasons for engaging with technology and replaces them with the promise of an aesthetic, pleasing experience.

In Habermas's reading of Weber, the notion of an ironic, historical

disenchantment of the Protestants' beliefs is particularly emphasized. This emphasis motivates the analogy with the PC hackers, since the fate of their vision has been conspicuously similar. Just as *religious* Protestantism created the juridico-legal and subjective psychological context for the emergence of an utterly *secular* social system, so the computer-loving hackers created the technological foundation of a society in which human enthusiasm for and mastery of advanced technology is ironically negated. In conclusion, the paper argues that the analogy is useful for the development of a critical sociology of the contemporary PC. The mode of presentation of PCs and other artefacts needs to be checked by a more cautious, circumspect and critical approach to the social context of interface design.

The Hacker Subculture and the PC Idea

There is consensus among historians and sociologists of the computer that the first personal computers were developed for hobbyists and enthusiasts by hobbyists and enthusiasts.[4] Ceruzzi's (2000) definitive history of twentieth-century computing notes that the hobbyist culture took the lead in exploiting the rapid improvements in integrated circuitry associated with the rise of the 'microchip'. Neither chip producers nor computer manufacturers saw any market for small interactive computers that might be marketed to private individuals (Freiberger and Swaine 1984: 58; Ceruzzi 2000: 223-24). The first PC, the Altair, came in the form of a DIY kit which was sold by mail order through an advertisement in a popular electronics magazine in the US in 1975 (Levy 1984: 191-93; Ceruzzi 2000: 226). The purchaser had to understand how to build the machine out of an assortment of mechanical bits and pieces. These included a tiny processor, a small memory and limited input/output capabilities – there was no screen, just an array of lights, and no keyboard (Freiberger and Swaine 1984: 38). The poverty of this interface makes these early machines barely recognizable, from a contemporary perspective, as PCs.

Early enthusiasts of the PC were not captivated by the interface as we are, however. They were not held in thrall to graphical, animated, sound-enabled light shows. For them, 'What would come out of these systems was not as important as the act of understanding, explaining and changing the systems themselves...' (Levy 1984: 192). This attitude towards computing characterized what Levy calls the 'hardware hack-

4. Comments to this effect can be found in Ceruzzi 2000; Freiberger and Swaine 1984; Goldberg 1988; Levy 1984; Pfaffenberger 1988; Raymond 1999; and throughout the sociological literature on computing and the cultural impact of computers.

ers' of the 1960s and 1970s. They were a loosely affiliated group, distributed across the US, who pioneered the development of personal computers. According to Sherry Turkle, the hardcore computer enthusiasts of this period were more like 'priests or poets' than traditional technologists.[5] Their motivations had more to do with experimentation and self-expression than self-aggrandisement or money. She writes, 'hackers play a significant, though controversial role in the history of computation. What sets them apart is that they work for the joy of the process, not for the product' (Turkle 1984: 210).

Nowadays, we tend to understand the dispute between 'hackers' and orthodox computer scientists in terms of such issues as privacy, intellectual property rights and so on. The 'hackers' of this period, however, were remarkable not for any cavalier attitude towards other people's machines and files but because of their attitudes to and beliefs about computers; their desire to see others use computers, and their distinctive way of interacting with the machines.

In what follows I argue that these pioneers of personal computing were similar to the Protestants of early modern Europe. The similarities encompass the psychology of individual members of each group; their social (or antisocial) priorities; and, ultimately, their historic function in inaugurating a new kind of society. I discuss the first and second of these in 1.1 and 2.2 respectively, and develop the thesis of a historic parallel further in Section 3.

A Life Guided by Constant Thought

Just like the early Protestants (Weber 1974: 137), hackers set a positive moral value on diligence. It was not possible to be esteemed as a bona fide enthusiast without putting in the hours. Exceptional single-mindedness and determination to keep plugging away at a problem until the optimal solution had been found are well-documented traits of the early hackers. Willingness to work right through the night on a single programming problem are widely cited as features of the early 'hacker' computer culture (Levy 1984: 35, 84-85, 220; Turkle 1984: 207; Weizenbaum 1976: 117; Chandler 1996: 230). Moreover, just as being theologically learned was, for the seventeenth-century sects, no proof of one's elect status (Weber 1974: 129) so paper qualifications, even in computer science, were also no substitute for what was known as the 'hands-on' principle (Levy 1984: 157-58; Freiberger and Swaine 1984: 22).

This love of interacting with the technology for its own sake perhaps defines the hacker's attitude to computers to this day. It aligns the

5. Even Bill Gates was not motivated by money at this time (Freiberger and Swaine 1984: 23).

pioneers with the Protestants who, while making legitimate acquisition of wealth socially acceptable, did not allow themselves its pleasures and insisted that work should be motivated by virtuous character and not its material rewards (Weber 1974: 68, 137). For hackers, the computer came to feel like an extension of themselves. They experienced a sense of 'fusion' with the machine (Levy 1984: 218) and perhaps even started to 'think' in programming language. In this sense, they were absorbed in an ongoing dialogue with the machine.

Himanen argues that the intensity and passion of hacker activity turns on social recognition: 'For hackers...the basic organisational factor in life is not work or money but passion and the desire to create something socially valuable together' (Himanen 2001: 53).[6] However, this assertion seems to be based on his knowledge of Linus Torvald's work on the LINUX operating system, rather than study of the sources we have on the hackers of the key period in the formation of the PC. It overlooks the intensely solitary nature of what those hackers actually had to do in order to achieve anything. According to Weizenbaum, even a short program could take between 20 and 30 hours to write for the machines of that period. He observed that the hackers in his faculty would 'not converse with anyone but the computer' (1976: 118, 120).

Computers have always tended to isolate the people who use them—a fact that is implicitly acknowledged by Himanen elsewhere (2001: 134). There is something intrinsically fascinating about the complex behaviour of the machine and the challenge of making it do what we want it to. Sherry Turkle noted that this could sometimes become a trap (1984: 214). People who lacked social skills could be drawn into a relationship with the machine that would impair their psychological development and inhibit both their capacity and desire to understand others. In terms of development psychology, people who were trapped in this way would probably be best described as locked in at what development psychologists call the 'traditional' stage of moral development—they were rigorous rule followers. For hackers, dialogue with the computer became an undemanding substitute for human companionship: 'The hacker culture', Turkle writes, 'is a culture of loners who are never alone' (1984: 219). These people had evolved a kind of coexistence in which no one judged anyone else, but no one took much interest in anyone else either. This echoes Weber's comments on the profound loneliness of the Protestant sectarians and on their individualism (1974: 104, 106). A climate of moral indifference to one another characterized the 'obsessive' wing of the computer culture in the 1970s and early 1980s. It is completely con-

6. Himanen even claims that hacker unsociability is a myth (2001: 52).

sistent with the ethos of early Protestantism, in its individualism and its emphasis on toleration.

Turkle reports that the members of this culture allowed each other a 'great deal of psychological space'. In this space, idiosyncracies were allowed to develop which, in other social contexts, might have incurred negative peer judgments. Levy and Weizenbaum both describe hackers as unwashed, dishevelled, socially inept to the point of rudeness and singularly oblivious to other peoples' feelings. One of Levy's hackers is described as announcing one day that he had decided to get married, though upon further questioning it turned out that the lucky woman had not yet been identified (Levy 1984: 86). In a similar way, Weber describes the Protestants as having supplanted a compassionate attitude towards others with a judgmental one. For the pioneers, it seems that the computer plays the role of God, whose requirements took priority over the human ones of sentiment when it came to assessing one's duty to others (Weber 1974: 226 n. 34).

Like the early Protestants, the computer pioneers prioritized rule following, methodical conduct over pleasure. What pleasures they would allow themselves were of a purely cerebral nature; the thrill of getting 'the right solution' to a programming problem. This has much more to do with the 'ecstatic bliss', which some Protestants conceived as the absolute antithesis to sensual indulgence (Weber 1974: 119, 139, 151) than social recognition. Indeed, if Turkle's characterization is correct—and it is based on extensive studies in the late 1970s and early 1980s—then there is an analogy with the recognition of the 'elect' in the Protestant sects, a thoroughly secondary feature of actually being elect.

The pioneers placed such emphasis on understanding the machine level because only such an understanding could truly empower the computer user; frippery and extravagance would divert his[7] attention from what was really going on in the machine. Investing their understanding of logical detail with moral connotations, the computer pioneers revitalized an idea that we associate with Kant, namely, the notion of autonomy as living in accordance with the demands of reason. The effort to comprehend the machine level became a living analogy with the Enlightenment's moral injunction to become autonomous by following one's own reason, rather than bowing to convention. This ideal is the key to the aspirations and beliefs that the pioneers shared in relation to computers. For them, the computer was a means of encouraging people to live a 'life guided by constant thought' (Weber 1974: 118). If other people

7. Hacking has always been an almost exclusively male activity. I do not attempt to explain this here. For interesting discussion of the issue, see Turkle 1984.

could be persuaded to engage with the machine in its glorious, digital-logical complexity then they too might be empowered. The computer offered opportunities for 'the act of creation, the benevolent exercise of power in the logical, unambiguous world of computers where truth, openness and democracy existed in a form purer than one could find anywhere else' (Levy 1984: 192).[8] Ultimately, coming to understand the machine offers the human being a sense of personal empowerment or, as Turkle puts it, 'the computer supports growth and personal development' (1984: 214).[9]

Hackers were parsimonious in their attitude towards the machine's resources. They esteemed only the 'best' programming solutions because these represented the most economic use of the computer's limited capabilities. Where hobbyists might have settled for programs that worked, hackers wanted programs that were elegant and efficient. Their search for new functions required that they minimize expenditure of the computer's memory and processing power. Hours of experimentation and frustration in pursuit of a solution would be followed by yet more tortuous hours refining it and making it *the best one possible*. For them, the effort of achieving this strange perfection was more important even than the function or effect being worked on. The PC pioneers would eschew wasteful solutions (programs that used more lines of code than was strictly necessary, for example) or exaggerated effects, as these separated users from the machine level (Levy 1984: 43; similar observations, though not cast in these terms, can be found in Weizenbaum 1976: 120).

Once again, this prompts comparison with Weber's Protestants, who famously renounced ritual and symbolism in favour of the methodical conduct that was virtuous living. They despised theatre and conspicuous public displays of colour, because such activities were distractions from God (Weber 1974: 104-106, 169). This emphasis on austerity, an ethos of refusing to be concerned with the inessential, conflicts with Himanen's thesis that the hacker placed great emphasis on working hard in order to make time for play (2001: 26).[10] Himanen suggests that hackers were

8. Freiberger and Swaine refer to 'the clean edge of the logic and *the fairness of the game* of programming' (1984: 23, my emphasis) as fundamental to its addictiveness.

9. Weizenbaum also comments on the attractions of this empowerment for hackers or, as he calls them, 'computer bums', though he sees it as essentially pathological (1976: 115).

10. Ceruzzi makes a similar claim when he writes that, 'the first thing they did with the[se] machines, once they got them running, was play games' (2000: 230). This is strange as he is unwilling to generalize about other hacker traits, arguing that, 'there was no such thing as a typical member of the Homebrew Computer Club...' (2000: 216), for example.

particularly interested in writing and playing computer games. But there is a sharp distinction between writing games programs and playing computer games in an indulgent way, seduced by the illusions that the game creates at the interface. Torvalds, in his preface to Himanen's book, makes the distinction clear when he says that, for hackers, the behaviour of the computer is intrinsically entertaining, *not* games and *not* the 'pretty pictures on the Internet' (Himanen 2001: xvii). The hacker's enthusiasm for writing games reflects the fact that computer and PC technology had entered a phase in their development during which 'solutions' outnumbered problems. Thomas Hughes and others (in Bijker *et al.* 1989) have shown that such phases are common in the history of technology. Their *intense dabbling* made hackers important players in the development of the PC and *not* their interest in trivial games.[11]

Computer Power to the People

Like Weber's Protestants, the computer pioneers were certainly not 'pro-capitalist' and occasionally they even understood their beliefs in relation to the computer as implying a degree of opposition to that social system. Their aspirations were sometimes expressed in anti-capitalist terms, and this was not exclusively to do with issues that we understand as motivating contemporary 'hackers' – copyright, software piracy, and so on. The radicalism of the pioneers was much deeper than this. Their idea was that computers would make people more autonomous while at the same time making more information available to more people. The outcome of such a fortuitous combination could surely only be progressive, perhaps even revolutionary.

It is important to place the hackers in the context of 1960s youth culture. The project of appropriating computer technology and making it accessible to individuals could probably not have taken root in any other situation. The hackers were a subculture within the 1960s counterculture, which was concerned to challenge the prevailing deference to technological expertise. According to Theodore Roszack's seminal, contemporaneous account, the hippies and students of 1960s America were attempting to challenge a society in which 'the citizen, confronted by bewildering bigness and complexity, finds it necessary to defer on all matters to those who know better' (1968: 7). From the point of view of

11. Neither Weizenbaum (1976) nor Turkle (1984) even mentions games playing in their contemporaneous accounts of the original hackers. They are also not mentioned in Freiberger and Swaines 1984 study of the early history of personal computing. This indicates that Himanen is probably projecting traits of those he identifies as hackers now back on to the PC pioneers – a move that is consistent with the major error in his work (see above).

most radicalized youth, technology had created a situation in which power was invested in large, centralized structures that could only be understood by experts (Roszack 1968: 206). This overweening system placed the role of values in human affairs in jeopardy. The hippy revolution was supposed to overturn the 'machine'.

In this context, the hackers clearly occupied a paradoxical position. They were young, looked and smelled like hippies, and were at home in the milieu just described. And yet, far from being anti-technological, they were fixated on technology. What they seem to have glimpsed was the possibility of overturning the bigness and the centralization of technology in the hands of the powerful, without losing the power of the technology. In other words, they saw the possibility of giving computer power to ordinary people as a weapon that might actually undermine the authority of the expert and the hold of the monolithic system. Herbert Marcuse had called for qualitative social change of an order that 'would alter the direction of technical progress – that is, develop a new technology' (1964: 227). This was the radical social and political context of the PC idea.

Some hackers wanted computers that would realize Ivan Illich's ideal of 'tools for conviviality' and facilitate community-based education networks. The Community Memory Project is a particularly good example. The project set up a proto-terminal with a cardboard shell in a record shop. Essentially an evolving database, the computer allowed people to enter information about themselves and to search for things, people and services they were interested in. It quickly attracted large numbers of people and vindicated the pioneers' notion that 'the very presence of computers in accessible places might be a spur for social change, a chance to see the possibilities opened up by new technology' (Levy 1984: 179). For some of the pioneers, like Lee Felsenstein, the political radicalism of the Community Memory Project was overt and explicit. Others were, perhaps, drawn by a vaguer sense that the computer could be a kind of material support for a society based on cooperation and community. The radical aspirations of the computer pioneers and their self-identification with the hippy counterculture are clear from the names of their associations and publications. The 'People's Computer Company' (PCC), for instance, was named with ironic reference to Janis Joplin[12]. The club produced a publication of the same name which carried articles inciting people to get involved in computing and to determine the shape of the technological future. One of PCC's associates was Ted Nelson, author of a book entitled *Computer Lib* and of the slogan, 'Computer Power to the People!' (cited in Levy 1984: 169).

12. Big Brother & the Holding Company (1965).

Similarly, Steve Wozniak, creator of the AppleMac, says that he came from a 'group of beatniks or hippies' who 'were going to totally change the world' (quoted in Himanen 2001: 188).

The hackers invested their hopes for social transformation in the PC, in much the same way that more numerous people placed similar ideological investments in pharmaceuticals. Timothy Leary's call for a 'revolution of the central nervous system' was no less dependent upon twentieth-century science. Roszack argued that, ironically, this made the drugs culture essentially continuous with the middle-class mainstream:

> The gadget happy American has always been a figure of fun because of his facile assumption that there exists a technological solution to every human problem. It only took the great psychedelic crusade to perfect the absurdity by proclaiming that personal salvation and the social revolution can be packed in a capsule (1968: 177).

These remarks could have been applied with even greater irony to the hacker sub-group.[13] Nonetheless, the radicalism of their ideological investments in the machine and the influence of the countercultural context on their beliefs should not be overlooked in attempts to comprehend the history of the information age.

While the pioneers were evangelical about their machines, we should not exaggerate the extent to which their aspirations in connection with them were conceived in overtly social or political terms. As Roszack emphasizes, a significant feature of the 1960s counterculture was its subjectivism – its capacity for transforming political questions into psychological ones. Most hackers simply wanted people to use computers and seem to have assumed that the consequences of such a diffusion of the technology would be benign. Again, this mirrors the attitude of the Protestants, who, Weber tells us, were not interested in projects of social reform. Their only concern was with the saving of souls (Weber 1974: 89). Whatever the radical aspirations of the pioneers of personal computing, they depended for their realization upon the development of computers that were sufficiently powerful and accessible and a human population that would be willing to learn to use them. As Felsenstein emphasized in 1975:

> The convivial approach I suggest would rely on the user's ability to learn about and gain some control over the tool. The user will have to spend some amount of time probing around inside the equipment, and we will have to make this possible and not fatal to either the equipment or the person (Lee Felsenstein cited in Levy 1984: 238).

13. Wozniak's comment (above) also makes him 'decadent' on Roszack's definition (1968: 270).

Felsenstein's anxiety was that the PC revolution should be carried through by machines that allowed people to experiment, to find out for themselves how computers worked. He saw that people who did not understand computers would be at a fundamental disadvantage when it came to living in a society based on extensive computer use. The ideal of machine transparency was fundamental to the experience of autonomy that could be had through interaction with a computer. As the Protestants stressed the importance of reading the Bible for oneself, so hackers argued that people could not be empowered by the machine if they did not know how it worked.

Transparency was also intrinsic to the use of the computer as a convivial tool; a means of identifying others with similar interests, communicating with them and coordinating activities with them. A situation where everyone could not do this equally well would be socially exclusive. The implications for democracy of inequalities of access to the machine would be profoundly regressive. Felsenstein and his comrades denounced the idea that computers could be built for use by people who did not understand their inner workings as the philosophy of 'Design by geniuses for use by idiots' (quoted in Levy 1984: 238).

Social Selection and the Development of the PC Idea

As Turkle's comment on the importance of hackers to the history of computing suggests, the computer pioneers played a crucial role in promoting the computer as a technology with diffuse social applications. Ceruzzi writes that 'The assertion that hackers created modern interactive computing is about half right' (2000: 215) and argues that the hackers, 'provided an infrastructure of support' (2000: 224) which was essential to the development of the PC as a viable commodity. They were also responsible for key innovations in the development of the technology, such as the use of keyboards as input devices and television screens for output (2000: 231). Even Weizenbaum, who took a very negative view of the hackers he encountered in the 1960s and 1970s, grudgingly acknowledged that 'were it not for the often, in its terms, highly creative labor of people who proudly claim the title "hacker", few of today's sophisticated computer time-sharing systems, computer language translators, computer graphics systems, etc., would exist.' (1976: 119). However, the social diffusion of PCs since the early 1980s cannot be explained simply with reference to functional diversification and improvements in the performance of the technology. The PC was only one, experimental manifestation of computing practice and not one

that computer manufacturers viewed with any great enthusiasm. Personal computing seemed, in the 1970s, unlikely to be anything more than a minority pursuit. What changed this was the realization by key players in the economic system that the PC was the best way for them to exploit the potential benefits of computer technology.

The Social Transformation of the PC

Just as the Protestants contributed to the emergence of a legal and ethical context that was peculiarly conducive to capitalist accumulation, so the hackers' ideal – personal computing – has enabled capitalism to exploit computer technology. As late as 1984, David Burnham (1984: 88-89) observed that the full range of information-processing techniques were still not available to individual computer users. It was only when this situation was changed that the new 'informational spirit' could take over. The use of PCs in the construction of the networked capitalist economy is so extensive that it seems to have realized the hacker ideal of ubiquitous computing. However, most users of PCs in the informational economy do not have the hacker love of computers. The appropriation of PCs by key players in the economic system and the social diffusion of PCs more generally since the late 1980s, have been expedited by the development of machine interfaces that do not allow the kind of exploration and experimentation so valued by the early hackers. In place of the hacker ideal of empowerment through struggle with the digital-logical complexities of the machine, we find an altogether more pragmatic model of user empowerment articulated in the work of interface designers.[14]

Before the early 1990s, in the computer culture, interface design was considered trivial (Laurel 1993: 48), even 'sissy' (Negroponte 1995: 90) compared to the rigours of hardware engineering or mathematically informed programming. The hackers who dominated that culture were intolerant of lazy people who would not work to gain control over the machine, and they viewed attempts to make computers more accessible as wasteful. Just as the sectarian Protestants viewed sin not as a reminder of their own moral vulnerabilities and weakness, as in traditional Christianity, but as evidence of the damned status of the sinner (Weber 1974: 122), so the hackers were highly disparaging of the technically inept. Nicholas Negroponte, an early advocate of the 'friendly' interface, describes his struggle against elements within the computer culture in suitably religious terms: 'In my opinion there was a subconscious effort

14. Ben Schneidermann, for instance, a leading interface design theorist writes that users 'strongly desire *the sense* that they are in charge of the system' (1997: 75, my emphasis). Similar comments can be found in Preece *et al.* (1998: 310).

to keep it [computing] mysterious, like the monopoly of the monks, or some bizarre religious rite in the Dark Ages' (1995: 90).

Similarly, Steven Johnson refers to the anti-interface attitude of DOS programmers as a kind of 'snobbery' (1997: 58), while Turkle describes purist advocates of the older interfaces as members of an 'epistemological elite' (1996: 54).

In their struggle to transform the PC, the interface specialists eventually won out over this priesthood. Consequently, the guiding principle of modern interface design is that the ordinary PC user does not need to know what is going on inside the machine in order to feel empowered by using it. A user can experience a sense of being in control without being challenged by the computer and without having to respond by thinking hard about how it works. Instead, empowerment is now defined in terms of the user's ability to achieve practical goals that have nothing to do with computing. According to Turkle (1996: 61) even computer programming no longer requires an understanding of the detailed workings of the machine.[15] A standard part of the Java programmer's work, for instance, is the importation of files that provide services for the program they are working on at the time and which are publicly available over the Internet. The contemporary programmer is cutting and pasting, albeit it at quite a technical level, rather than probing the depths of the machine. Even quite complex software engineering problems have been made 'easy' (I use the word advisedly) by the development of special applications which to some extent write the code for the user.[16]

The computers that the vast majority of people use come with interfaces that actually deny them access to the underlying machine. Instead of the austerity esteemed by the hackers, colours, sounds and pictures are all deployed to render the experience of using a computer pleasurable and unchallenging. Without having to acquire any programming knowledge, users can manipulate these variables to their own tastes. It is through the medium of this interface that the PC has been inserted into almost every conceivable social location during the last

15. This is certainly an exaggeration on Turkle's part. Contemporary programming languages, such as Java, have elements in their syntax that are almost 'natural' in their relation to the effects they can produce. The command 'system.out. println', for instance, will tell the machine to generate the line of text that follows it as output to the computer screen when this point in the program has been reached. There remains, however, an enormous difference between writing a program in Java and composing an essay in natural language, or even reading a map.

16. If we consider HTML a programming language, then web authoring tools like 'FrontPage' do this. A better example, though less well known, is the 'Rational Rose' program which is used in the software engineering industry.

decade. This 'seductive' interface (Turkle 1996) is radically at odds with the parsimonious computational aesthetic of the computer pioneers. It encourages users to 'play' and allows them to indulge themselves in a way that is wasteful with regard to memory and processing power. This interface is seductive in the fullest sense, however, being both attractive and deceitful. As Brenda Laurel points out (1993: 105), the user of a modern PC encounters an environment full of implicit rather than explicit constraints and obstacles. Instead of inviting people to discover the 'pure democracy' of the machine, the PC now presents as something other than a machine – as a 'person or a new town' (Turkle 1996: 23), as a new kind of novel (Johnson 1997), or as a form of theatre (Laurel 1993). This deception of the user is, perhaps, harmless enough. It is, however, deeply implicated in the process whereby the economic system has been able to capitalize on the PC idea. The implicit constraints that are written into the program interface are carefully calibrated to ensure that the user is guided by the application she or he is using to successful accomplishment of a predetermined task. The hacker ideal of achieving *true* mastery is neutralized by the 'easy to use' interface, which embodies a prohibition on the very kind of thinking that was so important to the hacker pioneers of personal computing.

The ideals and aspirations of a radical subculture were, as we have seen, embodied in the PC. It mediated their aspirations, carrying them to the broader society. But in the process, the machine itself has been mediated and transformed into something quite different. Just as the individualist, disciplined and diligent ethos of the Protestant sects infused and energized early capitalism, so the social spread of the PC has revolutionized contemporary social relations. However, as capitalism created the conditions under which religious belief seems increasingly anachronistic, so the modern PC is not any longer the kind of object that the pioneers envisaged as the bearer of their socially progressive ideals.

Systems-Level Appropriation of the PC

Thomas Hughes distinguishes radical from conservative technological innovations in the following way:

> Inventions can be conservative or radical. Those occurring during the inventive phase are radical because they inaugurate a new system; conservative inventions predominate during the phase of competition and system growth, for they improve or expand existing systems (in Bijker *et al.* 1989: 57).

The PC was radical technology. It inaugurated a new economic era in which production and distribution processes were accelerated. As the interface has grown in sophistication, however, the PC has been used to

enhance management control over these processes, and to 'steer' the actions of human operatives at all levels. Conservative interfaces stymie and inhibit shop-floor innovation and reduce the likelihood of further, hacker-style, experimentation with PC technology. In this way, the PC helps consolidate and stabilize social relations. In Habermas's terms, the PC idea has been selectively retained[17] by the social system; rational deliberation has been displaced by the needs of money and power in determining the form taken by the technology.

The idea of personal computing—placing the power of the computer at the disposal of each individual—was intended to contribute to 'progressive rationalization' of the cultural lifeworld. The pioneers envisaged the PC as an agent of autonomy, of empowerment through the use of reason. However, the computer power that has been devolved to the level of the individual workstation has been carefully designed to limit workers' access to it. This partial implementation of the idea of personal computing ensures that it contributes not to the rationalization of workplace culture in a progressive sense, but to efficiency gains in the economic system. It is in the context of a critical understanding of how the two dimensions of social evolution interact that we can grasp the social implications of the PC. The irony in Weber's historical thesis is the classic illustration of such a critical understanding at work.

Modern corporations use the computer's information-processing power to identify patterns and regularities that represent opportunities for more effective business performance. It is now possible, for instance, to source the cheapest supplier of any part for any manufacturing process worldwide in a matter of moments.[18] Such information gathering is vital to competitiveness. The rapid spread of computer technology and its use to carry out this kind of activity have altered the focus of economic practice all over the world. The scale of this change and its qualitative impact in reshaping production processes has led some to argue that we now live in a new mode of production—informationalism (Castells 1996: 95). Michael Carnoy, for instance, writes that:

> Production in the advanced capitalist societies shifts from material goods to information-processing activities, fundamentally changing the structure of these societies to favour economic activities that focus on symbol manipulation in the organisation of production and in the enhancement of productivity (Carnoy *et al.* 1995: 5).

These changes have also been associated with a significant increase in

17. The discussion of selection in Esteban (1991) is extremely useful.

18. Similarly, data on consumers' behaviour can be collated and searched to establish more efficient ways of classifying and targeting markets.

the rate of profit (Castells 1996: 85). By placing the information processing power of the PC at the disposal of individual workers, capital has been able fully to exploit the possibilities of the computer revolution. Every worker is 'networked' and plays his or her part in the flow of information that makes possible flexible, optimal, 'just-in-time' responses to dynamic global situations.

Castells and Carnoy maintain that work in this economy requires more sophistication and a higher degree of education than was widely available under previous forms of capitalism. In fact, though, the interface has been designed to relieve the worker of 'cognitive burdens' associated with real computing. As Perelman points out, spending on public education in the developed world has actually fallen in the informational era and in some areas the authorities are spending more on prisons than they do on schools (Perelman 1998: 25-27). Most contemporary work with computers is dull and routine. This dramatically negates the hacker ideal of autonomy through enlightenment gained from working with the PC.[19]

The interface also relieves employers of the need to train employees in the proper use of the technology. 'User-friendly' applications enable the modern firm to perform any number of information processing practices without hiring experts or training staff. The PC has been instrumental in creating conditions of endemic job insecurity (Greider 1997: 28, 16-121; Klein 1999: 242-44; Perelman 1998: 56). Computer databases contain the knowledge that is essential to company performance, knowledge that used to be stored in workers' heads and was part of the 'informal culture' of organizations. As Mike Hales predicted, information processing technology 're-works the map of knowledge in the workplace' (1980: 142), actually limiting workers' discretion and reducing company reliance on employees' knowledge by subordinating everyone's actions to the imperatives expressed by the machine. The 'front end' of the application can be relied upon to 'operationalize' this knowledge by guiding the worker to successful completion of the task. The worker remains in more or less complete ignorance of the underlying mechanics throughout. By making such tasks 'easy' for untrained workers, the new interfaces also represent a triumph of the endemic short-termism of contemporary capitalism – better-trained employees would probably be able to achieve the same tasks and more with their powerful PCs.[20]

19. Pfaffenberger (1988) saw that hacker ideals were being negated in the practice of popular computing, but did not identify the changing nature of the machine as a factor in this – viewing it instead as the inevitable fate of all technology to serve power.

20. I have argued elsewhere that working in MS-DOS or UNIX environments is

The messages that appear on the computer screen take on a kind of authority for the worker, they cannot be ignored and are likely to determine their subsequent actions.[21] This can be seen most clearly in service sector operations where employees find that they cannot give us what we ask for because 'the system' will not allow it. A number of studies have highlighted the role of the computer as a bearer of reified, symbolic significance in social space. Woolgar describes a process in which 'users have a configured relationship to...[the PC], such that only certain forms of access/use are encouraged' (Woolger 1991: 89). Callaghan and Murphy (Murphy *et al.* 1986: 14-26), argue that the computer serves to reinforce the notion of a single, oppressive reality that the worker must conform to at all costs. According to Kumar, computerization extends the reach of Taylorism (Kumar 1995: 20), deepening its grip on those already subject to it and incorporating new layers of workers, including managers. As Michael Perelman writes 'While the modern information economy weakens the power of isolated individuals to understand, let alone assert their class interest, the same forces have been reinforcing the power of the ruling classes to wield class power' (Perelman 1998: 33).

The near ubiquity of PCs in the modern workplace adds a whole new dimension to Marcuse's observation that, in high-tech economies 'ideology is in the process of production itself' (1964: 11). Put simply, the PC interface steers individual workers where their employers want them to go.

The 'friendly' interface allows even the most naive user to relate to the global network of computer networks as if it were merely a large library—offering a nice, familiar little window for his or her search strings. As Steven Johnson points out (1997: 150), the interface acts as an information filter which sits between the user and the underlying network of data packets and streams and enables the user to 'select' out only that information that will be useful to him or her. Some kind of filtering role for the interface is probably a technical necessity because of the sheer quantity of data that is available on contemporary networks. The filtering process is also about social control, however. The vast majority of programs in industry are written 'in-house' (Raymond 1999), p. 142 and, through them, corporations present their employees with the kind of information they want them to have and the kinds of decisions they want them to make.

Hard work, which was a Puritan virtue, had become for the people of

more efficient (see Kirkpatrick 2000).

21. Marcuse writes of the 'image' suppressing rational reflection on what to do next, as 'the technological veil conceals the reproduction of inequality and enslavement' (1964: 32)—20 years before the first Graphical User Interface.

Weber's time merely a necessity of life: 'The Puritan wanted to work in a calling: we are forced to do so' (1974: 181). This happened because the Protestant ethic transformed social relations, binding diligence and worldly success together. However, this transformation reacted back upon Protestantism itself. Work ceased to be 'virtuous' and became mundane, detached in the minds of those who had to do it from positive religious connotations. Protestantism, like all religions, became menaced by the atheistic ethos of capitalism. As John Wesley put it, 'although the form of religion remains, the spirit is swiftly vanishing away' (cited in Weber 1974: 175). Similarly, people are now obliged to use computers because of the pivotal place the machine holds in systems-level processes. We develop competence in our work with computers for reasons that have nothing to do with the principles of the pioneers. Under the guise of the friendly, controlling interface, the computer has become implicated in the paradoxes of social rationalization.

The hacker aspiration that everyone should use computers is close to being fulfilled in the rich countries of the world. However, this cannot be attributed to the radical ideas of the PC pioneers. Much as the Protestant ethic prepared the ground for the social acceptability of a more orderly, acquisitive orientation which was then transmitted by the success and spread of capitalism, so the PC has become socially diffuse as a consequence of its usefulness in streamlining contemporary economic and administrative processes. The radical spirit of the PC pioneers is a memory – in so far as it remains to haunt the modern PC user it is in the mythic figure of the 'hacker', or information pirate – while their basic article of faith has become mundane and uncontroversial.

Conclusion

Habermas, in his reading of Weber, argues that Protestantism was a victim of what he calls 'the irresistible irony of the world-historical process of Enlightenment' (1995: 155). It would appear that a similar fate has befallen the benign worldview of the computer pioneers. The purpose of this essay, however, has not been to advocate a return to the ideals of the PC pioneers. Transparency at every interface is probably neither attainable nor desirable if society is to benefit from computer technology. We should, moreover, be suspicious of attempts like Himanen's to eulogize the hacker and turn him into some sort of oppositional icon. However, if hackers' beliefs now seem somewhat anachronistic, they form the basis for a critical and realist perspective on the whole question of how machines and human society mesh. Just as Kant expressed Protestant insights in a moral philosophy that speaks to

secular concerns, so the hackers' ideals may be reworked as the basis of a critical perspective on computers and society.

The importance of recovering a sense of transparency as 'seeing the machine' lies in its realism. No one who uses a PC every day really believes that they are doing anything remotely like going to the theatre or talking to another person. When assessing the social impact of an interface we need to ask whether it facilitates the best possible use of computer resources. The truly empowered worker is one who can get the most out of his or her tools, not one who is seduced by them. At the same time, there are many social situations, especially in the systems sphere, wherein it will be objectively preferable for people to use technically opaque PCs—situations involving professionals who do not have time to become computer scientists, for instance. The interface is a heterogeneous phenomenon. It is not a simple matter to say where the line should be drawn between transparent and opaque, open and closed systems. Even command line operating systems like MS-DOS represent data as 'files', when they are actually flipped bits in a stack. Which descriptive level we want to work on is a matter of pragmatic judgment. The degree of choice and the underlying issues at stake, though, increase in complexity and importance as the descriptions become more metaphorical. Paradoxically, as the PC interface becomes more loaded with symbols and simulated contexts of meaning for users, it seems to consolidate systematization.

There is, then, an ongoing politics of the interface. In certain contexts, austerity is undergoing something of a revival. IBM's recent decision to make LINUX its platform of choice, should be seen in this light. Similarly, the 'open source' movement, which involves the widespread sharing of programs via the Internet, perpetuates some of the ideals and ethos of the early hackers.[22] The legacy of the conflict described in Section 2.1 has not been the straightforward triumph of one kind of interface (the user-friendly 'desktop') over another (the text-based black screen). In fact, people who work with machines on a daily basis naturally come to value the kind of power that more challenging systems offer them in their work. The battle of the interface has not, therefore, been lost so much as it is being re-fought in the larger world.

Which kind of interface goes where is being determined locally, by the needs of money and power, but also by people in practice. The friendly interface encourages us to relate only to it, but this conflicts with our

22. A good example of this is the 'VIM' wordprocessing program, which is an austere alternative to mass-produced, 'off the shelf' packages like 'Word'. VIM is freely available from: www.vim.co.uk

practical experience, which tells us that we need to comprehend the machine. This discrepancy represents a space within social experience. In this space, the true experience of the thing – its creation through the labouring activity of humans – comes to appear in an inverted, passive and yet controlling image of that thing. This space used to be discussed in terms of commodity fetishism, or reification. There is scope here for a political contest over the future shape of PCs and other technological artefacts and, as just indicated, this contest is ongoing. Marcuse's vision of a new technology that might open out onto a more liberated form of social life may not be the task of an oppositional elite. It may instead fall to all of us as PC 'users'.

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