Communication, technology and society

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For my uncles and aunts:
Philip and Gail, Colin and Jackie, Richard and Anne,
David and Carol, and Edith;
and in memory of Ted, Kay and Tom, and Lucinda.
There's nothing quite like the extended family. Thank you all.

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Contents

book will help stimulate debate and encourage conversants to contribute to the wider exploration of hopes and fears, options and opportunities as they are played out in technology and policy debates of the future—and in the choices we make concerning our cultures and our societies.

1

WHAT FUELS TECHNOLOGY CHANGE?

THE MYTHOLOGY OF TECHNOLOGY

Technology has a central role in all human culture and society. Whether the domestication of fire or the depictions of complex hunting rituals that adorn the caves at Lascaux, France, the beginnings of significant technologies tend to be mythologised. This is as true of the light bulb and the computer as it is of the Trojan horse of the ancient Greeks. The mythologising of technology means that we tell stories about how technologies started and the people who invented them. Such myths may have a foundation in fact, but their role is to celebrate these developments as important in our lives. They are created and sustained within our popular culture.

You will be aware of the story of Archimedes in the bathtub shouting 'Eureka!'—he had realised that a mass, immersed in water, displaces its own volume. In other words, he got into a full bath of water and it overflowed . . . Eureka! Archimedes suddenly understood that if he collected the water that overflowed his bath, he would be able to measure the precise volume of his body, even though it was irregular in shape. Similar tales are told of Thomas Edison and his work to perfect a filament for the electric light bulb. Edison's scientific method was one of 'trial and error'. He tried hundreds of potential filaments before he eventually found the right materials to deliver the properties he knew he needed. The specifications of the ideal filament, however, had been worked out long before the trial and error began, and that (intuitive and) deductive process will be discussed shortly. It is the Eureka moment that

is mythologised, however, so our culture associates progress with individual inventors and moments of understanding and discovery.

What is rarely included in these myths of scientific and technological advancement is a sense of the *social environment* in which the discoveries are made. It is as if the advances happen in a vacuum, as if Newton were the first person to be hit on the head by a falling apple. Newton's flash of insight into the principle of gravity had more to do with the time and culture in which he was working than with him being bopped by a piece of fruit. The issue of gravity was on his intellectual agenda—just as issues of global warming, HIV/AIDS, cancer and globalisation are on ours.

Leonardo da Vinci is another thinker whose work has been mythologised extensively. Da Vinci's scientific work included an exploration, in principle, of the physics behind flight, the bicycle and the submarine—inventions which were not to be realised until hundreds of years later. For these inventions to be adopted, the cultural environment had to support the development of da Vinci's ideas, and nurture them to the point where they could become integrated into everyday life. The environment in Renaissance Italy acknowledged da Vinci's genius but chose to concentrate on the support and development of several of his other projects. Why are some ideas championed and developed while others languish for centuries—or never see the light of day?

Twenty years ago—and it may partly have been as a result of the feminist revolution in intellectual thought—the mythology of technology development and adoption was reconsidered. Donald MacKenzie and Judy Wajcman (1999 [1985]) collected together a number of case studies of different technologies and used them to argue that the vital ingredient determining which technologies are adopted, and which languish, is the *social circumstance*. This term 'social' includes economics, politics and existing infrastructure. MacKenzie and Wajcman's point is that it is wrong to see any given 'technology' as something that is as inevitable as the law of gravity. There was no necessity that computers would exist, or that—once existing—they would be connected into an Internet, or used to administer the taxation system. The reasons why things develop as they do are not technological reasons, they are social reasons.

The old way of looking at things was one of *technological determinism*. This perspective argued that it was the features of the technology that determined its use, and the role of a progressive society was to adapt to (and benefit from) technological change. The new way of looking at

technology is *social determinism*. This suggests that society is responsible for the development and deployment of particular technologies. The technocultures in which we participate reflect the choices of elites in our societies, the people who have most say in how we plan for the future and how we allocate our resources.

Is technology neutral? Mythology and gun control

At times when technology was perceived as being outside society, it made sense to talk about technology as neutral. It was as if technological progress and development were inevitable. No one could stop technological development, and no one could be blamed for the way it progressed. This viewpoint can be summed up in terms of the perspective that 'guns are neutral, it's up to us how we use them'. Such a perspective ignores the development of the whole military–industrial complex, and the incentive to create weapons that can kill at a distance. A case study of a 'mindless massacre' will help illustrate the debate about the neutrality of technology.

In 1996, madman Martin Bryant murdered 35 people in the Port Arthur massacre in Tasmania, Australia—and ignited international debates about guns and human fallibility. In Australia, the disaster led to much stricter gun controls (Stockwell 1997) as part of the nation's reaction to the horror of the events. In the United States, the same event has been taken by some to show that there should be more guns in society. Had gun ownership been more pervasive in Australia, the argument runs, then Bryant might have been shot before the death toll spiralled. (As it was—and it happens rarely in such cases—Bryant was captured alive.)

The different ways of looking at such events—arguing on the one hand that guns cost lives, and on the other that guns save lives—polarise people and communities. They represent differences of perspective and of belief, underlining the fact that our beliefs are formed and expressed through our social interactions with other people and the world around us. So which perspective is 'right'? Do guns cost lives, or do they save them? My personal belief is that guns cost lives, but that's not relevant to the discussion here. What is relevant is the social dimension to why we hold the beliefs we do about technology and technological artefacts (such as guns), and what it means to

live in the twenty-first century in terms of our experience of 'being postmodern' (see below).

Sadly, the carnage of Port Arthur was not an isolated incident, and Stockwell has suggested that Bryant himself may have been influenced by 'the intense media coverage of the Dunblane massacre [in Scotland, of a group of primary school children and their teacher] in the weeks before the incident and earlier stories about the easy availability of high-powered guns in Tasmania' (1997, p. 56). In Scotland and the rest of the United Kingdom—as in Australia—the shooting tragedies prompted a reconsideration of the neutrality of guns as a technology. Guns are designed to target, kill and maim (whether for food, sport, defence or murder). In terms of life and death, there is nothing intrinsically neutral about guns. In terms of 'good' or 'bad' outcomes, it is a mechanical matter of who shoots first, or who shoots more accurately, rather than a 'moral' outcome of the 'good' person being protected by the technology.

In the United States, the recurring instances in 1998–99 of school children shooting classmates traumatised the nation, but no clear consensus on gun control has emerged as a result. On the contrary, US society has become increasingly divided over the issue. As repeated tragedies have strengthened the anti-gun lobby, so they have also galvanised the NRA—the powerful National Rifle Association (www.nra.org/ [April 2000])—to organise in defence of the Second Amendment: 'the right to bear arms'.

In March 2000, the NRA sparked an international semi-incident by linking crime in Australia to tougher gun laws following Martin Bryant's rampage at Port Arthur. This is the report on the NRA website:

> Rather than acknowledging one man's insanity, opportunistic gun control activists and scared politicians, rushed to blame 'loose gun laws' . . . In a March 22, 2000, letter, Australia's Attorney General Daryl Williams raised objections to an NRA video (www.nralive.com/gunban/gunban.cfm) . . . Williams said NRA was using 'misleading' statistics to make its case against gun control. He also claimed 'the national firearms agreement has succeeded in removing more than 640,000 dangerous weapons from circulation in the community' . . . The video shows real people protesting their loss of liberty and loss of the right to self-defense. Those people are Australians. And the statistics presented in the NRA video were reported in real newspapers—Australian newspapers. Attorney General Williams should look closer to home if he truly objects to 'misleading' the public policy debate. In fact, he should look directly at the anti-gun group Gun Control Australia (GCA). When the Sporting Shooters Ass'n of Australia (SSAA) recently ran a TV campaign that promoted the shooting sports as activities for the whole family, GCA spokesman Randy Marshall said: 'People should not be fooled by pretty images of family life enjoying shooting—shooting is about practising to kill—that's why guns are manufactured. Every person who joins SSAA helps destroy the gun laws which protect Australians'.

Gun control is self-evidently a complex issue with social, cultural, technology and policy ramifications. I use the gun control debate here to illustrate that it is possible for different societies and different people in those societies to hold opposite beliefs about the nature of the technology: 'neutral', 'good' or 'bad'. The beliefs held by an individual about guns and gun control say more about that person and how they see the world than they do about the technology of the gun itself. To argue that any technology is neutral is to ignore the social and cultural circumstances in which that technology was developed, and the policy and regulatory regimes under which that technology is deployed. Neither technology nor culture is neutral—both reflect people and society, the power of different social groups and the outcomes of competing priorities.

Technology's relationship to power and privilege

MacKenzie and Wajcman's (1999) argument is that a technology is only neutral insofar as no one knows what the technology is used for, and insofar as it is never used. Effectively, guns would only be neutral at the level of a sculpture, in a society where there was no knowledge of their function or their genesis. Naturally, no such society exists. Once knowledge comes into play, technology is implicated in social processes, and there is nothing neutral about society. Differences of gender, wealth, power and education—to say nothing of the First World/Third World divide—all determine that knowledge is political. Where knowledge is associated with power—such as with new technologies—it is vigorously protected. Copyright, patents and intellectual property rights, along with

industrial espionage, arms embargoes and lists of prohibited technological exports, are all elements which indicate that those who develop technology and enjoy the advantages of technological ascendancy are loath to forfeit the benefits of these advantages. For them, technological advance means increased power and privilege.

Technology advance is often the result of years of investment, research and development. The laws of patents, copyright and intellectual property exist to protect that investment and ensure that developers have some prospect of recovering their venture capital. If technology were neutral, and if it offered no specific benefits to its developers, then it is hard to see why individuals and corporations would continue to develop it in the ways they currently do.

The knowledge of how to create and enhance technology, and of how to use technology, is *socially bound knowledge*. Each society operates to determine who will acquire this knowledge, and in which circumstances. In most western societies, access to knowledge is granted through a combination of education, application and ability. At one level, this appears to be access through merit. Increasingly, however, education and access to knowledge closely reflect indicators of social and economic advantage within society. Knowledge is no more neutral than technology.

Thus MacKenzie and Wajcman (1999) argue that even if the physical object of a technology were neutral, as soon as this was combined with knowledge of what the technology was used for and/or how it worked, it would be implicated in patterns of privilege and exclusivity. These patterns are further emphasised when a newly developed (hi-tech) technology is actually used. Users of such a technology are a specialised subset of those who have knowledge about the technology. Issues of access, power and gender determine who uses a technology and in which circumstances, even more than knowledge does. MacKenzie and Wajcman's argument is that there is no useful sense in which technology is neutral. Their argument that 'the social determination of technology' makes much more sense than 'the technological determination of society' is now generally accepted. These general principles—that technologies express the priorities of those who champion them—will be explored by reference to the specific case study of Edison's electric bulb. The social elite most evident in the development of electricity for domestic power and light is that of corporate capital—excluding those elements of corporate capital backing the development of domestic gas!

THE METHOD AND THE MYTHOLOGY OF THE ELECTRIC LIGHT BULB

Thomas Hughes' study of Thomas Edison and the electric light is one of the examples included in MacKenzie and Wajcman's collection (Hughes 1999, pp. 50–63). Edison's name is remembered in the screw fitting for electric bulbs—ES, or Edison Screw. Edison was passionate about developing a system for the household delivery of electricity which, at that point, was not established as a domestic power source and was well behind gas, which had been developed for domestic consumption. Hughes calls Edison an 'inventor-entrepreneur', not because Edison developed electric light to make a profit (although he did do that) but because Edison's drive was to do more than invent electric light—it was to develop a coherent system for the delivery of electric light and power.

In the mythology of technological advance, inventors are generally portrayed as inspired geniuses. This was not Edison's viewpoint. It was he who, speaking from experience, coined the saying that invention 'is 99 per cent perspiration and 1 per cent inspiration'. Hughes argues that Edison's search for the elusive filament material for his incandescent light was conditioned as much by economics as by science:

> Wanting to reduce the current in order to lower conductor losses, [Edison] realized that he could compensate and maintain the level of energy transfer to the lamps by raising the voltage proportionately [energy transfer = current (Amps) 2 volts]. Then he brought Ohm's Law into play (resistance = voltage divided by current). It was the eureka moment, for he realized that by increasing the resistance of the incandescent lamp filament he raised the voltage in relationship to the current . . . Hence his time-consuming search for a high resistance filament—but the notable invention was the logical deduction; the filament was a hunt-and-try affair (Hughes 1999, p. 59).

The moment Edison realised the need for the highly resistant filament was the moment at which his vision for an electrical power and lighting system became potentially realisable. The mythology of technological advance, however, sees the ultimate achievement as being made on the day that the ideal material for the incandescent filament was actually discovered. Further, the myth (helped by Hollywood) identifies Edison as the individual carrying out the research at the moment of discovery.

Yet Edison was far from acting alone. He headed up his own research laboratories and led a team of 'electricians, mechanics and scientists and cooperated with associates concerned about the financial, political and business problems affecting the technological system' (Hughes 1999, p. 52).

What is clear from Hughes' account is that the intuitive genius which led to the development of electric power only resulted in an operational technology through the systematic labour of a number of people over a number of years—aspects of invention underplayed in mythological retellings. Further, Edison was not scared of sharing his idea at the concept stage, and went public with the vision in 1878—some years before the system was developed. The mythology is that good ideas should only be made public once they have been proven, otherwise they might be stolen and developed by others. The reality is that the electric light system envisioned by Edison required huge amounts of financial investment, and was itself a triumph of public relations. Without the public relations, the money to fund the research and development would not have been forthcoming. Edison's genius included being able to sell his idea to a corporate elite who invested their money in his research laboratories. This corporate investment enabled Edison to run his research laboratories, needed for the painstaking hunt-and-try research and development which eventually resulted in the electric bulb and domestic electricity.

My purpose in discussing Edison's invention of the electric light is to illustrate that social processes determine technology for social purposes. There was nothing technologically inevitable about the way in which the domestication of electricity developed. Economic opportunism was the driving force behind the technological developments, and the domestication of electric light and power was shaped socially first, and technologically second.

If technology were entirely neutral, and the result only of scientific progress, then there would be no point in debating it. It would be as amenable to debate and regulation as the law of gravity. Technologically determinist sayings such as 'You can't stop progress', 'You can't turn back the clock', and 'The runaway juggernaut of technology' all imply that we are unable to control technology. They suggest that we are as powerless against technological progress as the Danish King Canute was against nature, when he put an end to the sycophantic flattery of his courtiers by demonstrating that—King though he was—he was incapable of stopping the tide from coming in.

Helpless/hopeless perspectives become a self-fulfilling prophecy.

People who assume that technology advance and adoption are beyond social control apply few checks and balances. Areas where the uncontrollability of technology *is* challenged—for example, in terms of genetically modified (GM) food, human embryo experimentation and performance-enhancing drugs—confirm that social controls (and social sanctions) are possibilities. Around the world, genetically modified crops are regulated by labelling and other legislation, by consumer concern, by direct action (e.g., by Greenpeace) and by the growth of market niches for organic and non-GM foods. Research ethics committees and legislation control the artificial creation of, and experimentation upon, human embryos. Performance-enhancing drugs are often banned by national law, and are regulated in competitive sport by international sporting bodies. Regulation is underlined by random tests of athletes' urine and other biological markers, and through the banning of athletes found guilty of artificially enhancing performance.

The perspective of the social determination of technology leaves open the possibility that people can make a difference to their technological future if they are interested and get involved.

THE ABC OF TECHNOLOGICAL ADVANTAGE

When we discuss the social determination of technology, it is easy to imply that this is a democratic, inclusive way to develop technology. Such a perception is generally erroneous, however, since some visions of the future are more inclusive than others. The visions which tend to attract funding, anticipation and active commitment from the social elites who have power in western society are those visions which offer these elites the greatest benefits. In fact, it is arguable that population-wide 'progress' is only ever an accidental spin-off of some powerful group's self-interest. Technology is developed as a result of specific choices made by influential power brokers representing a limited rage of social elites. These can be summed up as the A, B and C of social power:

- A = armed forces
- B = bureaucracy
- C = corporate power.

Even where there are other elements (such as academia) which may appear to be hot-housing technological change, the funding which

supports those institutions tends to be attributable to one or more of the A, B and C power blocs. Thus technology, as it develops, represents the priorities of the elites which sponsor it, rather than representing the society as a whole. (The Internet has been heralded as a potentially liberating and democratic technology, but such benefits can only occur after the Internet user has access to the technology, and the skills and resources to use it. Initially, these restrictions made Internet use an elite activity.)

The empowerment of A, B and C through technological change is not a necessary situation. It is possible to democratise technology development and choice; but it is not in the interests of A, B or C to do so. Politically and economically A, B and C gain advantage from powering technological research and development according to their own priorities, and for their own benefit. In this they are supported by free market philosophies which enshrine the principle that 's/he who pays the piper calls the tune'.

As well as identifying the power elites in a society by investigating which groups benefit from the technologies that are produced, we can judge the priorities of a society's social elites from the technologies developed. Affordable, renewable energy and an efficient public transport system say different things about a society than do power stations (conventional or nuclear) and high rates of prestige car ownership. The way in which domestic electricity was trialled and developed, for example, indicates that the environment was not high on Edison's list of priorities (even if he was unaware of global warming at the time). Current searches for solar, wind and wave power systems indicate that we do care about the environment. Nonetheless, comparatively few people seem prepared to pay more to have their electricity generated in greener ways.

Historically, the A, B and C elites use their advantages to build their power in national contexts. With the advent of globalisation, these elites also build power internationally. The technologies they develop and sponsor affect their own society, but they also have effects in the societies to which the technology 'transfers'. In particular, it is more than the technology which is transferred. The creation of a computer centre in a transnational corporation's (TNC) head office in a Third World country, for example, involves the virtual creation of a First World environment dislocated from its immediate geographical/social context. This is because a computer centre requires reliable 24-hour power, a dust-free work space, competent operators with First World levels of education

and competitive rates of pay, and tight security. The technological umbilical cord may end in a Third World country but it remains firmly attached to the western industrial placenta.

It is as if the technology, in international technology adoption, works as the genetic material (DNA) of the social elites that create it. Technology, transplanted into a new location, necessarily replicates certain of its operational conditions without regard for the social, political and cultural context of the country to which it is transferred. It also transplants elements of the A, B and C social elites from the First World into whichever society adopts the technology concerned. Like a baby cuckoo in a nest, it is possible to construct First World technology as depleting the resources of the Third World to the continuing benefit of the techno-corporate powerbrokers located elsewhere.

Shareholders of TNCs have been major financial beneficiaries of technological progress. Economist Dick Bryan observes that 'Communications technology relates to our understanding of TNCs in two ways: communications technology is central to the internal organisation of TNCs; and the companies which produce communications technology are themselves often TNCs' (1994, p. 146). The growth of financial markets, media corporations and other late twentieth century conglomerates means that almost all big players in free-market economies have some offshore presence and rely upon communication technologies.

Electronic communication across frontiers becomes both easy and necessary in the global environment. For those with technological competence and technology access, political borders become essentially irrelevant to information flow. Further, where bottlenecks occur in the communication process, these act as a spur for the refinement and incorporation of technological solutions to overcome the logjam, conferring further political advantage. Global social change is increasingly both a cause and effect of technological change in information and communications contexts.

Ramifications of such a situation are political as well as technological. If poverty-stricken countries use their best land to grow crops for export, to meet interest repayments on international debts acquired as part of a communications modernisation program, then there may well be insufficient food to feed their people, and poor people in that country starve. Within affluent western cultures it may be that, as the rich get richer, the welfare state kicks in to offer a social safety net to the poor. But this is a wealthy-country phenomenon. There is no safety net for the poor in the developing world. In these circumstances, technology is so far from neutral that it comes with a life-or-death price tag. As with gun

control, however, some argue that it is only through modernisation that food, water, health care and education will eventually be delivered to the world's poor. In the meantime, a lucrative contract for a western communications giant can represent long-term debt for a Third World nation.

Progress—for whom?

Progress in one area is often bought at the expense of impoverishment elsewhere. This is not a new phenomenon—futurist Ian Miles described its operation in the mid-1980s:

> It is clear that the so-called 'developed' nations are far from being in a state of timeless perfection, and that the alluring models of material progress they offer the rest of the world are seriously flawed. It is likewise evident that the term 'developing nations' is inappropriate to many of the countries to which it was so readily applied in the recent past. In many respects, the Third World seems to be importing most of the social problems of the industrial countries, but failing to acquire much of their material affluence. Increasingly, attention has been drawn to the linkages between material prosperity in one world region and poverty in another; and those between the emphasis on satisfaction (and unlimited extension) of material needs and the discounting of more social relations, political and non-material aspects of well-being. Across and within countries the world displays an inequitable and lop-sided pattern of development and repression of human potentialities. It is maldeveloped (Miles 1985, p. 10).

Social and equitable definitions of progress continue to be sought, and contemporary futurists ask whether, in anticipating the future, we are attempting to foresee it, to manage it or to create it. The philosophical distinctions between these perspectives provide very different rationales for our actions when we wish to influence the future. According to futurist Graham May (2000), attempts to foresee, or predict, the future—for example, by extrapolating trends—presuppose that in some very particular ways the future already exists and/or is closely related to the forces evident in the present and the past. May further suggests that managing the present with the future in mind accepts that present

actions and decisions influence the future, and that the future does not exist and is capable of being influenced by our choices. The creation of the future—through techniques such as 'creative visioning'—works on the basis that once situations that do not exist have been imagined, they can be brought into existence. These three approaches, separately and in parallel, offer ways of negotiating the uncertainty and essential unpredictability of the future. In the meantime, however, while the future is being revealed, the question generally begged by the concept of progress, both now and for the future, is 'progress—maybe—but for whom?'

Approaches to technology and technology transfer, which draw upon the past as a way of defining 'progress' for the future, may have a distinguished academic pedigree but they are not the only way of looking at these issues. Such models offer what might be termed a very 'modern' way of viewing technology development. Postmodern perspectives are one way to explore alternative and fruitful ideas.

Being postmodern

Current notions of progress are clearly contradictory. The sense of things getting better and better—with greater prosperity, choice, education and opportunity—travel in tandem with local and global evidence of incredible disparity between the unbelievably rich and the death-rattlingly poor, and with evidence of growing rates of depression and suicide in the western world. A postmodern notion of progress sees no contradiction between celebrating new car registrations, or a rise in building permissions, at the same time as worrying about the depleted ozone layer or global warming. The 'progress' from agricultural, to industrial, to information society (to be outlined in Chapter 4) may have been technologically and materially beneficial for the First World, but a price has been paid, although it is likely that we will never know exactly what it was.

Postmodernism offers a way of holding the paradoxes and contradictions we experience in our daily lives in creative tension, recognising truths which may appear to cancel each other out. Guns can be good in some situations, bad in others, but this doesn't make them 'neutral'. Opponents of postmodern perspectives (there is nothing unitary about postmodernism) claim that the postmodern doesn't exist, and that the phenomenon dubbed 'postmodern' is a new phase of the modern: 'late

modernism' or 'late capitalism'. Postmodernists retort that the controversy about the status of the philosophy proves its usefulness. They go on to argue that the postmodern condition is one of uncertainty and internal contradiction, and it is not entirely relevant whether postmodernism 'really' exists. Notions such as 'right', 'wrong', 'truth' and 'objectivity' become positional statements. What is right/wrong/true and objective depends upon who is speaking and in which circumstances.

This apologia for postmodernism can quite legitimately attract derision. If there is no truth or certainty, what is the point of trying to understand anything, or say anything? Technologists, philosophers, lecturers, students—we might as well all pack our bags and go home. Not so, claim postmodernists. Truth may be relative, but it is still relevant and anyway, who said that the postmodern can't exist side by side with modernism and the premodern? Postmodernists aren't claiming that they're right, or that the modern is wrong—that wouldn't be postmodern—the best they can claim for postmodernism is that 'the postmodern *is*'. But postmodernism is more than happy to accept that postmodernism *is* postmodern in a very fractured, partial, surface and contradictory way.

Paradoxically, there are signs of optimism in the postmodern chaos. For centuries, up to the start of the modern era (some put this at the invention of printing, others at the French Revolution), there was no positive notion of 'progress'. On the contrary, the world was deemed to have been created in perfection and to have been steadily deteriorating ever since, mainly due to the twin activities of a fallen mankind and the Devil. It was generally assumed that things would go from bad to worse to the point where the world ended and Judgement sorted the sheep from the goats, damning some and sending the chosen to Paradise. Compared with this sense of continual deterioration, the idea that there is any progress at all is optimistic.

A postmodern perspective helps us appreciate the sense of sitting in physical isolation, tapping into a computer connected to the Internet, and feeling as if we are surrounded by a multitude (Wilbur 1997). It offers a framework for understanding virtual reality, non-physical places and online community.

We return to these issues in following chapters—especially in Chapters 10 and 12. As it is, postmodernism offers one way to look at progress, at technology and at culture as if these concepts were composed of contradictions held in creative tension.

THE CHALLENGE OF CHANGE

Technology change can often have implications for the past—as well as the present and the future. Our experience of everyday life is so different from what was anticipated a generation ago that some sense has to be made of the shock of the new. One way in which societies make sense of the present is to revisit what was going on in the past and try to rewrite history with the benefit of the new perspectives—with the wisdom of hindsight. We do this because we know that the present has its genesis in the past. If our current life is not what people anticipated 20 years ago, it is because they were concentrating on other issues, or looking for the evolution of different things. When we focus on the preoccupations of those past generations we do so in a 'revolutionary' manner—we are not 'evolving' from where we were; we are changing the perspective, looking for different patterns, and for ingredients other than those which seemed most important at the time.

Thomas Kuhn, Professor Emeritus of Philosophy at the Massachusetts Institute of Technology until his death in 1996, wrote an influential book some 40 years ago [1962] on the 'paradigm shift'—the moment when things are seen differently. It was called *The Structure of Scientific Revolutions* (1996, 3rd edn), but has implications far beyond the realms of science. Different ways of seeing things, resulting from the incorporation of new material into established understandings, are no accidents. We try to make sense of information that challenges our understanding of the status quo (even if only by saying 'It's just another manifestation of postmodernism'). Edison knew enough about electricity to be certain that it had the potential to be a domestic power source, but it wasn't until he had seen the whole picture—and verified the finding of the appropriate filament material—that the paradigm of domestic power provision shifted from gas to electricity. Now it's hard to imagine that a fridge or a washing machine could be gas-powered.

Philosophical cues—ways of looking at the world—engender mental shifts. Once a shift in understanding has been made, it is impossible for us to return to the former state. Although we can appreciate how we once saw something, we also appreciate that an alternative viewpoint is possible. Psychologists have established that, as well as working to achieve a conceptual understanding, we seek to make sense of our environment through our perceptions. The ability to do this is central to human cognition and the examples I am about to offer use perceptual cues to create ambiguity, stimulating a struggle to understand the whole.

Here are a couple of examples of perceptual 'paradigm shifts'. The first (Figure 1.1) is well known. This image can be perceived as the left cheek and jaw line of a young woman with her face turned from the observer, with a narrow throat choker, wearing a feathered hat backed by lacy tulle, and with an oversize furry coat or cape draped off her shoulders. (This is essentially a mid-shot—top of the head to mid-torso.) Alternatively, the image can be constructed as a close-up of a much older woman. The young woman's cheek and jaw become the older woman's nose. The choker becomes a thin-lipped mouth. The young woman's ear becomes some lines under the older woman's left eye, and the young woman's décolletage becomes the older woman's hooked chin. The old woman huddles down in scarf or shawl, which protects her head and the back of her neck from the cold.

The same information is used to construct two very different images. As the reader of this text, instructed to look for competing images, you knew that what you saw at first glance was not the only possible interpretation. Were you aware of a struggle to see an alternative picture? Once the change in perception has been achieved, how difficult is it to go back? Is it possible to be a 'naïve' viewer again?

Figure 1.1 Wise old woman: 'the crone', and/or young woman with feathered cap and choker

Arguably, change, discomfort and ambiguity are intrinsically related. As information accumulates which indicates that things are not as they once were (for example, marriage is no longer necessarily a commitment for life), so people and society painfully adjust to make sense of the new situation. Vested interests give way to the new circumstances. Old laws are applied to novel situations until the point at which they magnify the problems instead of providing a solution. For example, the 'clean break' philosophy allowed a divorcing couple to end their financial connections, but it left children of the relationship vulnerable to a cycle of poverty. In some societies, a legislative response (such as the Child Support Agency (CSA) in the United Kingdom and Australia) was instigated to deal with the issues arising, 'taxing' the non-residential/non-custodial parent to ensure they contributed towards the costs of raising their children. (The British CSA website is www.dss.gov.uk/csa/ [June 2001].) The bureaucratic response to changing circumstances often

Figure 1.2 Mystery image (see end of chapter for explanation of this image) Photographer: R.C. James; from Lindsay and Norman 1977

involves the application of central computer data banks that process information relating to income, employment and taxation. Western society is still coming to terms with what these technologies mean in terms of individual privacy, security and independence from the state.

Trying out remedies to address new problems involves exposure to more change and uncertainty. Kuhn describes a cycle of growing discomfort with the changing circumstances, and the trial of new tools to suit the paradigm shift:

> The emergence of new theories is generally preceded by a period of pronounced professional insecurity. As one might expect, that insecurity is generated by the persistent failure of the puzzles [or the problems] to come out as they should. Failure of existing rules is the prelude to a search for new ones . . . As in manufacture so in science—retooling is an extravagance to be reserved for the occasion that demands it. The significance of crises is the indication they provide that an occasion for retooling has arrived (Kuhn 1996, pp. 67–8, 76).

A recent example of a socio-economic paradigm shift occurred in the 1960s–1970s, with the second wave of feminism. Once the contribution of women to society was perceived as being circumscribed by rules about what counts as work, or by what counts as important, it was clear that women's historical contribution was invisible to the people who had seen themselves as recording history—mainly men. A growing academic concern with uncovering women's contribution to history prompted a whole new way of looking at the past, as well as the present and the future. Historical documents, which had previously been seen only in terms of economics, or politics, or religion, were found to also contain valuable information about the women of those times. Sometimes the fact that women weren't mentioned was as informative as if they had been! A generation of scholars has now created a space for women in history to speak to people in the present and in the future.

An equivalent investigation of technoculture is likely to establish that the A, B and C power elites have acquired and exercised the naming rights of what counts as technology, privileging the mythological high-tech boundary-pushing artefacts and ignoring the baby bottle and human language. Back when Thomas Kuhn's arguments about the paradigm shift were gaining ground, cultural theorist Marshall McLuhan (1964) was arguing that 'the phonetic alphabet alone is the technology

that has been the means of creating "civilized man"—the separate individuals equal before a written code of law' (1964, p. 84). An inclusive definition of technology, like McLuhan's, makes more of us technologically able, and empowers us to voice our opinions regarding technology policy and debates.

Returning to the original question of the chapter—'What fuels technology change?'—the answer lies in other changes; changes in policy, culture and society among them. According to Wajcman (1994), Marx credited capitalism with fuelling technical change. Effective innovation generates more capital, which funds greater innovation. At the same time, innovation does not prosper in a vacuum—it only generates capital if it produces goods that people want to buy, and can afford to purchase.

Capitalism is an essentially modernist way of looking at history—it is an example of an over-arching coherent narrative that denies the experience of coincidence, piecemeal advance and the interplay of contradictory forces, containing them instead in the myths of technological change. Markets, and the structure of the marketing and diffusion of technology, fit well into a modernist perspective. This is the substance of Chapter 2.

Conclusion

In this chapter we have identified that cultural myths surrounding technology place value upon change and advancement, and celebrate the lives and the achievements of famous innovators. Technological determinists might argue that it is 'scientific progress' that fuels technological change. Social determinists would counter that it is powerful social elites such as the armed forces, bureaucracy and corporate power that play the role of change agents. Postmodernists might suggest that the notion of 'change' is a paradox, since change is a constant and to live is to change.

The notion of the passage of time and technological advance as progress, rather than disintegration and decay, is a secular phenomenon and differs from the medieval conception of a perfect creation that has been constantly breaking down following humanity's fall from grace. A Third World perspective calls the notion of technological progress into doubt, while the concepts of First/Third World and progress/decay are themselves oppositional dualities characteristic of modern (rather than postmodern) thinking.

Using a variety case studies, this chapter has demonstrated that 'technology' is not neutral. Neither is culture—later in the book we will be addressing the different constructions of culture: high culture, low culture, popular culture, folk culture, etc. Since neither technology nor culture is neutral, it is unsurprising that technocultural tools—writing, the phone, the computer—express the priorities of the elites that champion them.

We have also examined the notion of the paradigm shift, which explains how one world-view is ousted by a new way of looking at the same information, resulting in very different perceptions and ideas. This book celebrates technology and culture as being shifting, and capable of analysis from multiple perspectives.

Note

Figure 1.2 is an over-exposed photograph of a Dalmatian dog, in speckled shade, sniffing at the ground.

2

Technology Adoption and Diffusion

Piecing together an understanding of technoculture

What is technoculture and how can it be explored? We have already seen that technology is a value-laden and multi-faceted concept; so too is culture. Both ideas demand explanation and investigation. The topic is too big to be grappled with globally. Instead, we will address it on a case-by-case basis, looking at specific instances of communication, technology and society often involving consideration of policy.

Case study narratives offer a flexible, shifting and intuitive way to discover more about the relationships between culture, society and technology by answering questions such as: 'What stories do we tell ourselves about . . .?' and 'How would this be different if it had been invented by . . .?'. Sometimes a story will spoof, in a very serious way, the operation of a technology by reversing the cultural roles in the pattern of technology testing and adoption. Such a device serves to illuminate aspects of culture we might otherwise take for granted. That is the technique adopted here by Judy Wajcman:

> The newest development in male contraception was unveiled recently at the American Women's Surgical Symposium held at Ann Arbor Medical Centre. Dr Sophie Merkin, of the Merkin Clinic, announced the preliminary findings of a study conducted on 763 unsuspecting male students at a large midwest university. In her report, Dr Merkin reported that the new contraceptive—the IPD—was a breakthrough in male contraception. It will be marketed under the trade-name Umbrelly (Wajcman 1994, p. 10).