3 Power Tools

'If she can type your letters, she can control our computer.' Seeing such a condescending statement in any kind of brochure today is unthinkable, but in 1976, a computer brochure produced by Lomac Adam used these words as the USP for their latest product. Moreover, the intended operator of the computer was not even considered as being more important than the machine itself: 'Just about anywhere you'd locate a typist would be okay for LOMAC ADAM . . . Just plug into regular power and switch on.' Such innate sexism, unacceptable today, was not uncommon at the time, and was not restricted to computers, nor even to the workplace. It does appear particularly marked in this context, though, perhaps because we now expect objects that are sold primarily on their technical capabilities to be somehow neutral.

In fact, the vast majority of the visual material promoting computers prior to the mid-1980s clearly displays strongly gendered attitudes highlighting the wider socio-political agendas and stereotypical work practices of the time. In 1986 two computer historians analysed magazine adverts to assess how they reflected the perception of the computer by the public. They concluded that: 'The campaign strategy of presenting novelty within the context of the familiar means that advertising involving the office uses accepted stereotypes and reinforces conventional views of occupational and sexual roles.'[1] As a

Brochure for Lomac Adam Computers, 1976.

new and highly expensive piece of technology brought into the office, the computer was sold to those in charge, irrespective of who would actually use it. Consequently, more than one manufacturer produced brochures depicting female office workers draped over computers in the same irrelevant way that female models were photographed alongside high-performance cars.

Closer analysis of this visual material uncovers a direct relationship between different forms of computers and the roles of their expected users. Office computers were not the homogeneous products they are today. Different computers were employed for specific purposes, and they reflected the relative level of status and power of their users. The designed forms of computers displayed physical elements specifically aligning them to stereotypically gendered roles. In one form or another, in the office, in the home or on the move, the computer played the part of a signifier of importance, a role-setting object and a lifestyle icon. Far from being meaningless, anonymous objects, they had agency. Computers were not just neutral props in the background of a sexist stage – they were instrumental actors in playing out social issues of power, control, status and gender.

Girl Power

Though seemingly remarkably sexist when viewed through the politically correct eyes of today, adverts containing text such as 'Behind the range of advanced NCR computers is an even more important product – the men whose knowledge and experience can put computers to work in your business with speed, efficiency, economy' were not intended to be contentious in any way, and did nothing but reflect the socio-political mores of the day. They come from a different world, where men were portrayed as executives, managers, scientists and engineers, while women were portrayed in subservient roles,

as office juniors, secretaries, operators and assistants. Brochures depicting females using computers inevitably continued existing practices and showed them performing typing duties or inputting data using keyboards in exactly the same, familiar way that they were previously presented using the traditional office typewriter. In a similar way, when males and females were shown together in the vicinity of computers, the familiar subordination of women to male bosses in the office was portrayed and reinforced. Women sat at computers working away typing, while men stood watching, handing work to them, or looked over their shoulders, checking all was well. Such images mask a little-advertised truth. In reality, the women in these positions had greater technological competence and more power over these computers than their male superiors. Male managers deliberately distanced themselves from these technologies 'lest they be seen to be performing a "low-grade" function'.[2] Certainly, the use

Brochure for Muldivo 'Digiputer' Computers, 1968. Office computers were advertised with models draped over them as if they were sports cars.

of computers by women was presented in the media as a low-grade role of data input, or at best secretarial support for male managers, which interestingly, reflects a dual history of the association of women with computing.

The relationship of women to the roles of word processing and of data input have separate, if related roots, depending on the equally valid views of the office computer as either a development of the typewriter or a development of the mechanical calculator. It has been well documented that women have been associated with the role of typing since the introduction of the typewriter into the office towards the end of the nineteenth century. Females were cheaper to employ to fulfil the required roles created by the huge increase in demand for office labour. Between 1861 and 1911, the number of male office clerks increased by a factor of five. In the same period, the number of female clerks increased by a factor of 500.[3] The departure of men into the armed forces during the First World War only served to fuel this expansion and consolidate typing as a feminine activity.

Similarly, despite the fact that a number of celebrated females played a key role in the early development of computing technology,[4] women were more usually associated with the low-level activity of inputting computer data. The Electronic Numerical Integrator and Computer (ENIAC) developed at the University of Pennsylvania and completed in 1946 was constructed in order to relieve a bottleneck in the production of military ballistics information during the Second World War. This clerical role was previously performed using desktop mechanical calculators and, like typing in the office, was seen as a suitable activity for well-educated women to carry out. At one point, the US Military employed 'more than 100 female students to carry out firing table calculations'.[5] Input data for the ENIAC was fed into the machine via punched computer cards using an IBM card reader,

ICL Text 25, 1982.

Olivetti DE 520, 1976. Computers used by female operators were advertised as an extension of the office typewriter.

NCR 8100 Series, 1978. Male managers tended to distance themselves from the operation of computers as it was seen as a low-grade job.

Computer Ancillaries Ltd Mael 4000, 1977.

and the practice of preparing those cards with card punches was transferred to, and therefore became associated with, the female workforce already in place.

Thus, when they arrived in the workplace, computers were already charged with socio-political overtones, and the functions of computers designed specifically for word processing and for data input had socially constructed reasons to look markedly different to computers that were designed for providing management information.

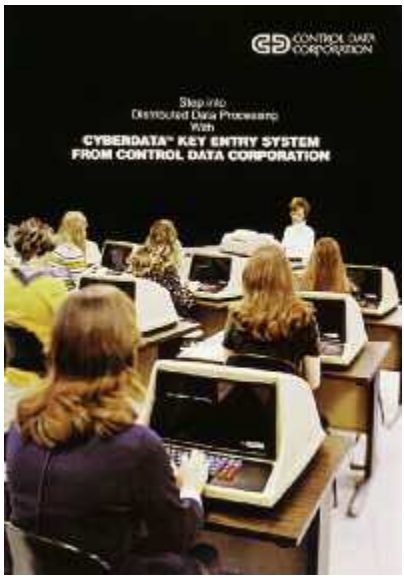
Early office computer terminals quickly appropriated the semiology of the office desk and typewriter, and the explicit use of these forms framed their operation as a feminine activity. Office computers were used to automate and streamline many monotonous standard business procedures, such as invoicing, accounting, payroll and record keeping, and women operated and programmed those computers 'at a time when those activities were considered mundane . . . tedious and

Burroughs E101, 1955. As soon as they appeared in the office, computers took the form of office desks and typewriters.

repetitive'.[6] Computers did not start to be commonly used for word processing until well into the 1970s, and when such systems did appear, they continued to emulate the typewriter in order to provide a level of continuity and familiarity for typists. In many respects, they were designed with female operators in mind, as they 'brought electronic technologies to the typewriting task, rather than taking text production technologies to the computing activity'.[7] The view that 'the processing of text was, of course, "women's work"'[8] held sway, and the relationship between the typewriter and the office computer meant that women's skills became labelled as non-technical and therefore undervalued. This issue of technical competence has been seen as being central to the 'sexual and class politics of technological work' because it conferred 'potential or actual power'.[9]

Office computers intended for clerical work continued to appear as little more than futuristic typewriters throughout the 1970s, and

LogAbax LX2500 Minicomputer, 1977.



manufacturers' brochures carried images of large groups of female operators that appeared little different to photographs of the typing pools of an Edwardian office; each operator reduced in significance by identical repetition, slaving away, inputting text or data. As a result, the association of office computers with female operatives was reinforced and normalized to the extent that a 1977 brochure advertising training for operators could justify stating: 'Consider the data preparation area of a computer project. This is almost certainly staffed by young and frequently inexperienced girls.'[10]

Not all computers in the office were used purely for clerical work. Managers did use computers although for very different reasons. Unlike today, however, computers used for these different functions, particularly from the mid-1970s to the mid-1980s, were specially designed and marketed in clearly different ways. Computers designed to be used for data input or word processing stressed the keyboard element of their design over that of the monitor, and were deliberately visually aligned with the typewriter. Occasionally, the keyboard

CDC Cyberdata Key Entry System, 1975.

Kenrick & Jefferson MDS 9000 Data Entry System, 1977.

IBM 3740 Data Entry System, 1976.

GEC Datacom 30 Viewdata Business Terminal, 1978.

even formed an integral part of the desk surface itself, tying the typing function permanently to the form of the secretarial desk. These computers were marketed as 'Data Systems', 'Data Entry Systems' or 'Data Entry Terminals' and given names such as 'Datapoint', or were termed 'Key Edit' or 'Key Entry Systems'. In contrast, attempts were made to differentiate computers specifically designed for executive use from machines designed for clerical work through their physical appearance and their nomenclature. One brochure even advertised a white plastic-cased computer as being for 'Data Entry' by the workforce, and exactly the same computer in a walnut finish for 'Data Inquiry' by the management! Management terminals more usually emphasized the monitor elements of their design, prioritizing the screen output of information over the keyed input of data. They bore names such as 'Data Screen' or 'Viewdata', but they struggled to find a relevant stylistic reference point that would distinguish them clearly from 'feminine' office workers' computers. *Design* magazine in 1981 featured a new computer designed specifically for executives that attempted to counter this problem. The author stated:

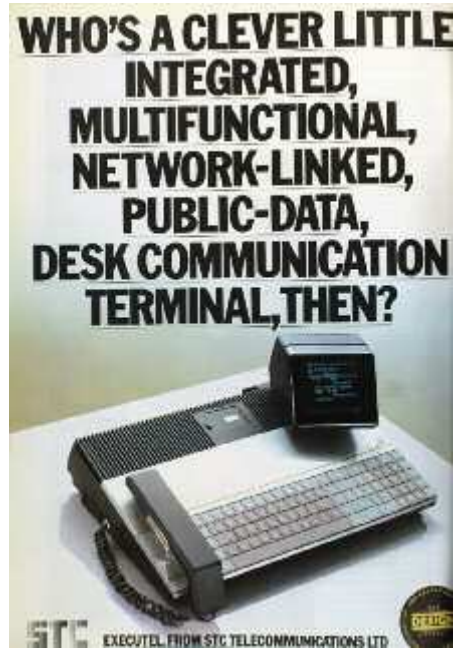
> Ergonomically optimised for long periods of key bashing by specialist operation, computer terminals aren't usually suited to use by company executives. What's more, rather than building up a desirable space-age corporate commander image, most of them look likely to lower a manager's status to that of the lowly VDU worker with managerial pretensions.[11]

The technological appearance of the QED MT-02 was intended to express 'sophisticated engineering', and it used advanced electronics to enable the keyboard to 'talk' to the monitor via an infra-red transmitter. The sharp, clean and precisely detailed styling of the terminal

casing deliberately aimed to endow the computer with the same executive and masculine connotations as a finely engineered watch or camera.

The activities of managers were perhaps less tangible and more difficult to relate to particular physical forms, which may go some way to explaining the expansion of the role of 'masculine' office computers and the appearance of confused objects such as the computer as telephone or computer as intercom. Such devices were blatant attempts to indicate status in the workplace, and the ability of the office computer to act as a status symbol requires some clarification. Usually, for an object to work as a status symbol, there has to be a recognized monetary value the owner has expended, and it is this recognized value that is translated into a symbolic value of the owner's status. However, in the case of the office computer no personal economic investment has been made, merely an investment by the company, and the computer is therefore weakened as a status symbol. What status there is comes from the company's selection of who is and who is not provided with such 'executive' objects. It is an endorsement of status by superiors, which may or may not be permanent.

QED MT-02, 1981. A computer terminal designed for executive use.



Expected masculine behaviour also perhaps explains the text and imagery in brochures of computers aimed at male managers having a markedly different bias from those intended for clerical work. The business benefits of the computer were sold explicitly, stressing the strong performance, how versatile and adaptable the machines were, and how 'effective'. The brochure for the Racal-Redac 'Redac Executive' stated: 'Individual video display units are provided for the managing director, production director/manager, financial director/chief accountant, and marketing director/manager. These units are located in the individual's own office, and are always ready for immediate use.' Moreover, the use of the term 'control' was extensive, whether it was 'production control', 'budget control' or 'record control'. These brochures, containing images of men working alone on computers, were not as common as those with images of women working alone, suggesting that although used for managerial control,

ICL One Per Desk, 1984. Computers for managerial use had no precedent of form to follow. Was it a typewriter, a telephone or an intercom?

STC Executel, 1984.

UNIVAC Uniscope 100, 1975. Male managers were not usually shown typing when using a computer, but reading, writing or speaking on the telephone.

Racal-Redac 'Redac Executive', 1977.

it was still considered as less than 'executive' for men to be seen with an object operated by typing.

The association of computers with low-level and low-status typing work accounts for the presence of a range of other objects that are almost always present in images of men working at computers throughout the 1970s and into the 1980s. To indicate their importance, distance themselves from the role of typing, and perhaps to retain their masculinity and power, men were depicted using a telephone, writing on clipboards or pads of paper, and if touching the keyboard at all, only ever using one hand to enter commands. The computer was depicted as subordinate to their need to talk and write, its role being to provide supporting information to make managerial decisions. The text of these brochures confirms that managers consulted computers to obtain forecast data, not to input information.

In addition to these socially constructed differences, technological developments throughout the late 1960s and 1970s also had a marked impact on the use of computers in the office. The advent of commercially available integrated circuits in the second half of the 1960s shrank the size of computers significantly. Computers began to appear as more human-scale products, less incomprehensible and more 'friendly' than isolated, distant mainframes. Remote computer terminals on office desks had been the only access for workers to such machines, as their requirement for an air-conditioned environment meant they were necessarily separated from the office itself. Even when mainframe computers could be seen through the glass walls of their enclaves, lowly workers were not allowed near them.[12] This was a privilege reserved only for specialists. But the continuing reductions in the size and expense of electronic components meant that computing power in the mid-1970s was roughly one hundredth of the cost of a decade earlier. Gradually, this reduced the economic arguments for timesharing computers and enabled remote terminals connected

to centralized machines to finally be replaced by self-contained computers. For a while, such elite machines were only made available for professional applications in engineering or scientific research ('portable power for specialists everywhere'!),[13] but eventually appeared for general management use towards the end of the 1970s. The easier availability of smaller magnetic storage devices also led to many computer terminals and workstations acquiring archiving capabilities on removable media such as cassettes or disks. Predictably, the main impact of this was to turn the computer into an electronic filing cabinet as well as an electronic typewriter, and only served to reinforce its association with low-grade, female clerical work. Obviously aware of this standing and hence the morale of its users, the manufacturers of the Kode DataVet presented computer storage capabilities as a way of expanding the appeal of the computer operator's role. Somewhat unconvincingly, their brochure stated: 'DataVet keystations are designed to reduce the keying workload and motivate the operators, the tangible end product – a cassette – helps each operator to feel involved and of value.'[14]

Nixdorf 8820, 1977.

Kode DataVet Keystation, 1976.

Yet despite these various technological developments, the provision of significantly different computers performing discrete roles for different divisions of the office remained in place well into the 1980s, even following the launch of the IBM PC in 1981. From this point, desktop computers became widely known as 'personal computers', and became a more common element of office topography. Yet regardless of their multi-functional capabilities and their potential value to management, they and their clones were still usually shown being used by female secretaries for the increasingly popular application of word processing. Changes in the representation of office computers in manufacturers' literature that were indicative of wider social changes slowly appeared as the decade progressed. The 1980s saw a marked increase in sexual equality in the workplace, as attitudes instigated and reinforced through legislation took hold.[15] These social and legislative changes gradually reduced the distinction between male and female roles, and the depiction of women undertaking menial roles in the office and men holding positions of

ICL Personal Computer Model 30, 1982.

IBM System/36 'Team Computer', 1987. It finally became acceptable for males to use the same computers as females towards the end of the 1980s.

authority became less evident. By the mid- to late 1980s men and women started to be shown using the computer together as equal members of a team.

Nevertheless, a noticeable change from the production of different computers for workers and management only occurred at the start of the 1990s. This was when the impact of the Graphical User Interface and the computer mouse really started to be felt in the workplace, although why they should have become so popular in the office environment in the first place is not as obvious as one might think. The cost of computing technology, although constantly reducing, was still high enough that by far the largest market for 'personal computers' was in business – and in business, skilled female typists operated the vast majority of the installed base of computers. The widespread use and momentum of text-based software, operated in a manner so closely related to the typewriter, should have theoretically made the adoption of an unfamiliar, visually based, icon-driven system very difficult. Certainly, it is quite clear from the literature supplied with the first Apple Macintosh machines and from third-party texts that the introduction of the mouse was a huge change for existing computer users. The first manuals for the Macintosh devoted entire sections on how to use them, reassuringly stating: 'Using the mouse might feel a little awkward at first, but it will soon be second nature';[16] and: 'If you can point, you can use a Macintosh.' Whole books were written to convince Mac owners of the benefits of using a mouse:

> If you're like most people, you're probably muttering one (or more) of the following complaints about mice: 'Mice are stupid; they slow things down'; 'My desk is too small and crowded to make room for a mouse'; and 'You have to take your hand off the keyboard to use the mouse.' A fair warning: Don't be quick to condemn the Mac's mouse before you've tried it – *really* tried it.[17]

But using a mouse with a Macintosh that had a graphical interface specifically designed to be used with a mouse was a very different story to using a mouse with a PC. Mice had been available for use with the IBM PC since Microsoft produced one in 1983, but they failed to have any impact as the only operating system they could be used with was the text-based MS-DOS (Microsoft Disc Operating System). This is not surprising considering that the expected practice was for users to write their own mouse menus for existing programs using software provided. When Microsoft launched their copy of the Macintosh interface, 'Windows 1.0', in 1985, they even incorporated free programs to help people become familiar with using mice. These included Notepad, a mouse-based text editor, Piano, an on-screen piano keyboard that could be 'played' with the mouse, and later a simple mouse-operated drawing program called Doodle, but to no avail. Early versions of the Windows operating system were slow and clunky as IBM PCs were just not designed to handle graphics. After five years on the market, mice were still only used on less than ten per cent of all PCs.[18] This state of affairs changed drastically when a viable version of a graphical interface for PCs – 'Windows 3.0' – became available in 1990.

Of course, what the GUI and the computer mouse did achieve was to allow the association of the computer with the typewriter to disappear altogether. No matter how powerful or how small word-processing computers had become, they were operated purely by typing and remained associated with female operators. Computers designed for managerial work, as we have seen, struggled to differentiate themselves from workers' computers, and their use by male managers remained problematic. With the introduction of the GUI and the mouse, this problem disappeared altogether. The office computer could now be perceived as a completely new piece of technology that could acceptably be used by both female office workers

and male managers as it was operated in a totally different way. The computer with a mouse was suddenly a new, multi-functional device that had broken free of its predecessors and had no specific association with a particular gender. Although it did not completely remove the need for a keyboard, the use of a computer mouse was empowering. It allowed the direct manipulation of information with one hand only. Rather than 'type' or 'input', the relevant words became 'point', 'click', 'drag' and 'drop' – the very terminology of command and control. It was the computer mouse, not equality legislation, that allowed a single form of office computer to take hold.

In addition to losing its gender associations as it became a single product used by all, the office computer lost its ability to infer status. Theories of status and emulation[19] rely on 'reciprocal differentiation' – in which there is a constant move to a new position by a superordinate group, providing a new target to be achieved by a subordinate group. The ability of the new, singular office computer to function as a role-setting object or a status symbol was effectively removed by the fact that any of the now identical machines could be running any software. A male or female using a computer in an office could be either a secretary using a word-processing package or a financial director using budgeting software. It was no longer possible to distinguish between the two using the computer as an indicator, as it had now become a completely 'natural' and neutral part of the office environment.

Toys for the Boys I – Home Computers

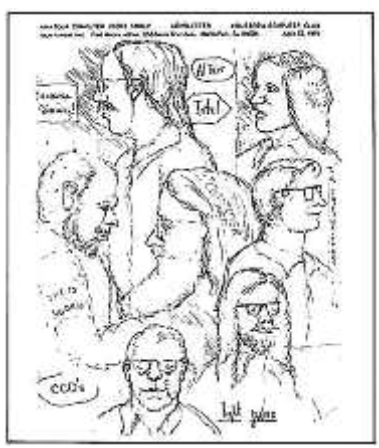
Ironically, while the vast majority of computers in the male-dominated environment of the office happened to be controlled by women, computers in the home were almost exclusively the reserve of men. Here, they functioned far less readily as status symbols or role-setting

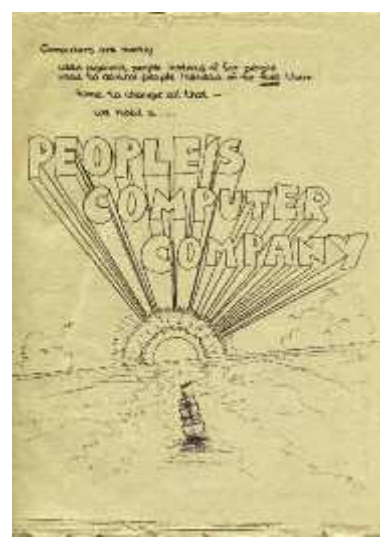
objects than their office counterparts as they were more private goods, seen only by immediate family and friends. Their use, however, like many other domestic technologies, was heavily gendered. Stereotypically gendered roles were, of course, as common in representations of domestic environments as they were in representations of work environments. It comes as no surprise then, that images and writings about early home computers displayed similarly sexist attitudes to those in brochures for office computers. An early article on the potential of computing in the home in a 1970 issue of *Life* magazine related the story of Dr Rodman, a specialist at Temple University medical school in Philadelphia, who brought home a Teletype terminal connected through a telephone line to a timesharing mainframe computer 90 miles (145 km) away in New Jersey. The intention was to use the terminal to be able to carry out medical research while spending more time with his family, 'but then his family found it could also plan mortgage payments, help out with homework, even play with the children'.[20] The images accompanying the article showed the

Early adopters: the Rodman family with their Teletype computer terminal, 1970.

males of the household programming the computer to achieve a whole variety of tasks, including a program to generate weekly meal menus, while Mrs Rodman (despite being a career woman in her own right) settled for using a computer-generated shopping list in the local store and making use of computer print-out paper as an alternative to gift-wrap![21] Similarly, in 1977, a very telling pair of images appeared advertising the Apple II computer. A sales brochure showed the computer being used in the home by a happy couple to play computer games together. Yet in *Scientific American* magazine a few months later, the same couple were shown in an advert where the Apple II was being used for the 'serious' work of checking the Dow Jones Index. Here, it was operated solely by the male, while the female of the household was shown undertaking a stereotypically feminine domestic role of preparing a meal.

The association of home computing with male users lies with its origins being so different to computing in the office. The office





Homebrew Computer Club newsletter no. 2, April 1975.

People's Computer Company Newsletter no. 1, October 1972.

computer was initially developed from scientific research equipment, which over time became information-processing machinery used for carrying out everyday business procedures. As such, it was a product of the establishment, and their use was largely associated with female operators. In contrast, the home computer (which has now arguably disappeared as a discrete product type) had its roots in male hobbyist activities as an extension or development of the pastimes of do-it-yourself radio enthusiasts and electronics devotees. Women's views of such pastimes are not always complimentary:

> In general male hobbies can be distinguished from female hobbies in that the latter need little capital outlay and have a useful end-product (they are often related to pre-industrial crafts), such as knitting, sewing, embroidery, even flower-arranging, whereas the former need a large capital outlay and produce little or no end product, being done for the pleasure of the activity itself, for example, fishing, photography, ham radio and electronics.[22]

Unfortunately, exactly how 'useful' flower arranging is is not clarified. Similarly questionable is the view that male-oriented do-it-yourself activities provide no useful end product, particularly in the areas of ham radio and electronics. The magazines supporting these practices were (and still are) largely based around practical projects to produce functional goods and devices (irrelevant of their standard of finish). Yet, the home computer in the early 1970s was far removed from the office computer of the same period. They were not attractively designed objects – a typical home computer was a mysterious small steel box covered in switches, lights and buttons – and it has to be admitted that they were used for little else other than experimental programming. There was a direct lineage from male hobbyists involved in the construction of electronics projects

who gave up their old interests to become 'immersed in the world of microcomputing', and the take up of the microcomputer by 'early [male] adopters . . . helped to give the home-based machine its "masculine" image'.[23]

These hobbyists, as well as communicating through specialist magazines and self-published newsletters, gathered together outside the home to discuss their interests with other like-minded enthusiasts at male-dominated computer societies and self-help clubs. The most famous of these were based in San Francisco: The People's Computer Company of the early 1970s and its later spin-off, the Homebrew Computer Club of 1975. Both of these not only acted as meeting points but also had the (then rather subversive) aim of bringing computer technology within reach of the average person. The association of the Apple computer to the Homebrew Computer Club is the reason for that particular group being considered one of the two birthplaces of personal computing (the other being Xerox PARC, where the Graphical User Interface was developed). A number of writers have argued that the subversive, or counter-cultural attitude prevalent in San Francisco at this time was central to the development of personal computing. Its influences can be traced back to Stewart Brand's anti-establishment *Whole Earth Catalog* of 1968, and earlier to 'the extraordinary convergence of politics, culture, and technology that took place in a period of less than two decades and within the space of just a few square miles'.[24]

But a much earlier and very different type of male-dominated social network played an influential role in the development of home computing, despite its focus initially being in quite a different area. The Tech Model Railroad Club (TMRC) was founded in 1947 at the Massachusetts Institute of Technology. MIT was the home of hugely significant research work into radar during the war, as well as post-war developments into digital computing in the form of the

'Whirlwind' and 'TX-0' computers created for the American Military. In turn, these influential computers led directly to the long-serving SAGE Air Defence System for the United States Air Force and later to developments in speech and handwriting recognition, interactive computing and computer graphics.

The TMRC was based in Building 20, the old Radiation Lab where radar research had been carried out. As a 'temporary' flexible space, Building 20 ended up as the home of many of the more radical, untested programmes of study and research, bringing together a range of disparate intellectual mavericks under the same roof. Alan Kotok and Peter Samson were students at MIT in the late 1950s and early 1960s, and were active members of the TMRC. The club's model railway was already a hugely complex layout, and club members routinely scavenged components from other departments to create circuits to control the model trains. These circuits included electromechanical relays from research projects in advanced telephone switching systems, which were being developed for companies such as Western Electric. Using these 'unofficially' obtained parts, the club built the first control system of its kind, which would allow multiple controllers to simultaneously operate trains on different sections of the same model railway network.[25] Samson is also credited with being the first ever computer 'hacker', as he sneaked into another MIT building to break into the IBM 704 mainframe computer housed there, and used its keypunch machine to program the railway switching system.

In 1959, Kotok and Samson were among the first cohort of students on MIT's earliest course in computer programming. During their studies, they learned about the interactive research computer, the 'TX-0', that was built there. They became proficient in programming it, and wrote a number of visually based computer games for it. In 1962, with the help of others including Steve Russell and

Martin Graetz, they worked on a DEC PDP-1 computer to develop the first ever digital video game, called *SpaceWar!*[26] The *SpaceWar!* program was distributed between enthusiasts working at different universities, and inspired a lot of people to develop their own games. One of these enthusiasts, Nolan Bushnell at the University of Utah, went on to found a computer company called Syzygy in 1971 and turned the *SpaceWar!* idea into the first ever coin-operated arcade video game, *Computer Space*.

Though *SpaceWar!* had been popular with specialist computer enthusiasts, the response of the public was more restrained. *Computer Space* was a disappointing commercial flop, largely because it was a very difficult game to learn to play. Meanwhile, Ralph Baer, a television engineer working at Sanders Associates had had the idea that televisions could be used for something other than just watching TV programmes. Since 1966, he had been working on developing a 'Television Gaming Apparatus', the first version of which was so basic, it just generated two spots of light on a TV screen. The aim of the game, called *Fox and Hounds*, was for one of the spots (the hound) to chase the other spot (the fox) until it 'caught' it.[27] The spots of light became 'balls' and a whole series of computer-generated ball games were developed. The final product was launched in 1972 by Magnavox as the 'Odyssey Home Entertainment System' and was the earliest video game console. On seeing the game *Table Tennis* on this system, Bushnell realized the key to its attraction was the game's simplicity. He changed the name of his company to Atari and quickly launched the famous *Pong* coin-operated tennis arcade video game. In the first bar where it was installed, the game suddenly stopped working after a few days. On checking, it became apparent that it had been so popular with customers that the cashbox had overflowed with coins and jammed the machine.[28] Convinced by this response, Bushnell founded a whole factory to build the games and

started a whole industry. Although people who had never witnessed a video game before considered this new phenomenon revolutionary, few of them realized that the concept behind *Pong* actually went back many years. In 1958 Willy Higinbotham, an employee at Brookhaven National Laboratory in New York, had developed a similar analogue computer tennis game purely in order to entertain Open Day visitors to the site who were bored by seeing a static mainframe computer![29]

Because the activities of the members of the TMRC and entrepreneurs such as Nolan Bushnell led more to games and software development than to computer hardware itself, their relevance to the development of the home computer might be easily overlooked. However, they were important in a number of ways. They had the maverick outlook often stated as the key feature of Silicon Valley entrepreneurs, and they were among the first to hijack computing technology for leisure activities, which would otherwise perhaps never have been seen as a legitimate line of development by the mainstream computer industry. The creation of games provided a popular and much sought after 'practical' application for home computers, and as CRT monitors were still relatively expensive, such video games created an alternative use for television sets, bringing the home computer out of the closet of the computer enthusiast and into the living room of the whole family. Through such use, reinforced by advertisements showing families playing video games together, the home computer became legitimized as a household product rather than an obscure hobbyist item.

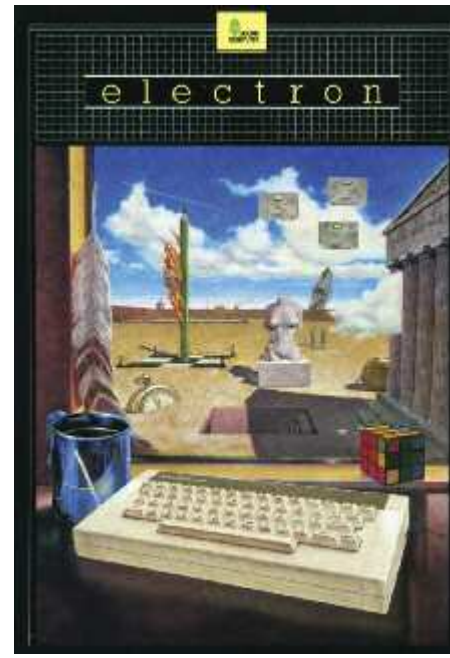
Yet, despite this legitimization, it has been noted that even by the mid-1980s, 'interest in home computing remained heavily gendered, with an emerging preponderance of male teenage users'.[30] This association was reinforced by the view of early home computers at that time (certainly in Britain) as little more than machines for playing

games.[31] According to a 1983 article in the American computer magazine *Byte*, microcomputing was more popular in Britain than it was in America by some way, although those interested were 'still almost exclusively men and boys'.[32] The author explained that the British public's enthusiasm for microcomputers resulted at least in part from a government-sponsored public education programme involving the British Broadcasting Corporation, a series of television programmes and printed material, along with an 'official' microcomputer, the BBC Micro; and also in part to the 'pivotal work of one man: Clive Sinclair'.[33] The article compared Sinclair to the American Adam Osborne (creator of the Osborne 1 portable computer) as 'the creator of a product whose price is so low that the competition finally accepted it as the price to beat'.[34] Sinclair Research had launched two black and white home computers, the ZX80 and the ZX81 (in 1980 and 1981 respectively), which became 'the most popular microcomputers in Britain (and for that matter, in the rest of the world)'.[35]

Atari 'Home Computers' brochure, 1983. The use of the family television as a monitor for playing computer games brought the home computer out of the hobbyist shed.

Despite this achievement, the contract to produce the BBC Micro was awarded to another British company, Acorn Computers Ltd. Sinclair went on to successfully produce his submitted design for the government-approved computer as the colour-capable ZX Spectrum in 1982, while the BBC Micro was adopted as an educational computer by the vast majority of UK schools. This should have fostered a genderless interest in home computers for applications other than game playing, but the BBC Micro was a lot more expensive than its competitors, and realizing this, its manufacturers produced a less capable, less expensive version called the Acorn Electron. The first page of the user guide stated this machine 'can be instructed to do a great variety

BBC Micro advert, 1982.



of things'[36] – playing games being the first in the list. The home computer's main use remained a male-oriented recreational one.

The phenomenon of male bias in the consumption of technology in the home has been well documented,[37] and is still present. Yet while it might be difficult today to accurately ascertain the home usage of computers by gender, it is not as male-dominated as described above – particularly amongst younger users brought up with computer technology and exposed to it as an educational tool. Even in the area of computer games, Nintendo, with the launch of the Nintendo DS and the Wii, has had a significant impact in moving the demographic of computer game users in the home to include both older users and female users. This is a recent shift, however. Only a few years ago, a book chapter titled 'Is the Home Computer Pink or Blue?' stated:

Sinclair Spectrum, 1981, with the 1983 ZX Interface 1 and ZX Microdrives.

Acorn Electron brochure, 1983.

> Computers are, in many ways, still designed and manufactured in ways that exclude or discourage women and girls. Parents complain of the difficulty of finding computer games suitable for their daughters, and powerful role models for women are less visible than the stereotyped gendered representations of computer advertising.[38]

Home computers, then, were heavily gendered objects rather than status symbols. The creation of the home computer was the result of a multiplicity of disparate, yet almost exclusively male social networks operating at different times, and in very different spheres. Networks of ham radio and model railway enthusiasts with shared interests and experience in assembling electronic components for their own ends, communicating not only through the airwaves but also through self-published newsletters and professionally published specialist magazines; informal and formal social and educational networks of students and enthusiasts that nurtured programming talent in the development of gaming software; established business networks supplying electronic components, which provided a ready distribution chain for computer kits and parts at affordable prices; and, perhaps most significantly, social networks in the form of hobbyist computer clubs, whose members not only had shared interests, but shared values in that they strongly believed in easy access for all to computing technology. The home computer came from grass-roots activities mostly indulged in by men, and in many ways carried an anti-establishment attitude that removed it from any association with the office, the typewriter and its associated socio-political agendas (although it clearly developed a socio-political agenda of its own). This distance, along with the historical connection to hobbyist activity in electronics, imbued the home computer with its own aesthetic and socially constructed identity, and allowed it to move easily into the realm of being a consumer electronic product quite distinct from the office computer.

The bias of manufacturers in developing the games capability of home computers over its more 'serious' abilities meant that once the home computer had to all intents and purposes become the games console, and the office computer had become a single machine without the associations of hierarchical work roles, the office computer started to appear in the home to perform those more serious functions, further expanding its role as a 'universal' machine. Thus the home computer and the office computer became one and the same object. The only differences between the two were software related, with cheaper, 'cut-down' versions of office software appearing for home use. The office computer and the 'new' form of home computer remained indistinguishable until 1998, when Apple launched the Jonathan Ive-designed iMac.

The iMac made great play of its colourful credentials, and as the media adverts and brochures revealed, was overtly aimed at domestic users. Intended to exploit a significant increase in the use of the Internet in the home, it was sold as an 'amazingly simple' product that was 'Internet ready'. Designed to be used straight out of the box, it came with all the necessary software pre-loaded. The iMac could easily have had the effect of separating the trajectories of the home computer and the office computer once more into clearly discrete product ranges, and indeed, it did influence a number of manufacturers who launched colourful computers in wildly different forms aimed at domestic use. However, the beige box of the office computer proved a difficult precedent to change, and the majority of manufacturers stuck to what they knew. Additionally, the iMac was readily adopted in many more 'design aware' workplaces as a welcome change to the boring predictability of the universal machine, and consolidated the position of Apple computers as the products of choice by those working in the creative industries. While the iMac freed the computer from necessarily being an identical product everywhere it

Coloured Apple iMacs, 2000.

appeared, the boundaries between the home computer and the office computer remained confusingly blurred.

Toys for the Boys II - Mobile Computers

In 1995, the cartoonist Scott Adams drew a *Dilbert* strip where his downtrodden computer engineer attempts to cover over his adoration for his laptop computer. Many a true word is spoken in jest, and Dilbert's love affair with the laptop is no idle joke – there is a close personal relationship evident between men and mobile computers. Historically, this relationship has understandably been very different from the relationship between users and office computers and between users and home computers. These differences stemmed largely from the status afforded by the various types of computer, which in turn was a function of the extent to which they were displayed to and seen by others. Until the mid-1980s, the form of computers in the office clearly displayed the hierarchies of their users, but they were in the main seen only by other members of the office workforce or by invited visitors to the workplace. Home computers were largely devoid of associations of status, as although they were an overt display of technical knowledge and superiority; they were seen only by the immediate family or by like-minded members of computer clubs. Mobile computers, on the other hand, were something else.

They were from the outset an object that would be blatantly displayed, seen by anyone and everyone. They instantly said a great deal about the person carrying them, and so were deliberately intended to project a suitably high-status image that could be easily read by all.

Long before the technology became available to create a really suitable product, numerous manufacturers had clear intentions to produce portable computers. Manufacturers understood that, given the costs involved in bringing the latest advances in computing technology to

Packard Bell 'Le Div@' home computer advert, 2000.

the marketplace, such a product would have to be a business machine purchased for use by the higher echelons of the corporation. Such a customer would in any case be one of the few people who had a legitimate requirement to use a computer when not in the office. Consequently, early products in this market were aimed solely at the travelling business executive, who at that time was almost exclusively male. An expensive portable computer would not only act as a status symbol, it would also clearly indicate that its owner was travelling as a business user, and had the necessity, authority and freedom to work away from the confines of the workplace.

The difficulty facing those advertising these products was that portable computers were a completely new class of product. It could not be assumed that the reader of a brochure would understand what the product was, or the value it should carry in terms of status.[39] This is especially true as the products themselves were inside carrying cases and looked to all intents and purposes the same as large executive briefcases. Additionally, because they were deliberately intended for use outside of the office, there was no recognizable environment in which portable computers could be placed to provide a familiar context. Instead, a process of associative transference was adopted. The unique status of portable computers was projected by associating them with other objects – ones that were already understood by observers as having certain high-level qualities and attributes. By placing portable computers alongside aerial vehicles a whole series of associations were transferred from one to the other – the desirability of cutting-edge technology, the convenience of freedom of movement.

Dilbert strip by Scott Adams, 1995.

And not only were associations made between the computer and these existing objects, but their 'distinctive or superior qualities'[40] were transferred to the owner of the computer: the exclusivity of ownership, the privilege of independence and the wealth to afford the high cost of luxury. Such objects act as symbols of the self, and

Transdata 'Executive Terminal', 1974. The computer as status symbol. Executives carrying portable computer terminals were shown as 'playboy adventurers' who took a private plane or helicopter to work.

Texas Instruments 'Silent 700, Data Terminal', 1972.

'stress the unique qualities of the owner, his or her skills and superiority over others'.[41] They also act to differentiate their owners from the crowd and integrate them into a set of people sharing a similar social standing – an elite group of the higher echelons of executive life. In this process of differentiation, the potential users of portable computers were portrayed as high-flying 'world citizens'. These people were something really important, somebody really special. Not for them the mundanity of a mere car – these people travelled to work by private aeroplane or helicopter.

Such integrated groups of users have nothing to do with existing class structures – the status of the group is 'bought with products, not with money'.[42] The process is, however, a very subtle one. Customers do not just buy these products in order to become a part of the group they represent. They must already feel as though they naturally belong to such a group and will therefore buy the product in order to display such belonging. It is not so much the product itself that is the attraction to owners, but 'the self-illusory experiences which they construct from their associated meanings . . . the imaginative pleasure-seeking to which the product image lends itself'.[43]

In the case of the executive 'world citizens' in their private aeroplanes and helicopters, this 'imaginative pleasure-seeking' stemmed from popular culture and its distinctive representation of masculinity in the increasingly technological world of the 1960s and 1970s. The self-image of the male and his relationship to technology and society were underlying themes of films and television programmes at this time on both sides of the Atlantic. The particularly pervasive persona of James Bond and his latest gadgets, along with other male role models such as Simon Templar in *The Saint*, Steed in *The Avengers*, Napoleon Solo and Illya Kuryakin in *The Man from U.N.C.L.E.*, and Jim Phelps in *Mission: Impossible*, all played an important role in redefining masculine identity and its

associated expectations of technological competence. These men were agents for an 'upwardly mobile jet-set', encapsulating a lifestyle promoted through the increased advertising and consumption of the time. Breaking the shackles of office boredom, they moved in a 'mythologized world of hedonism, consumer pleasure and individual autonomy'.[44]

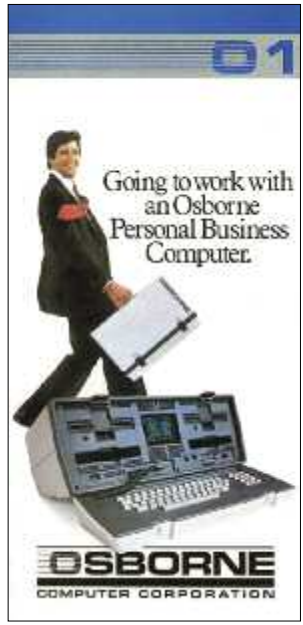
These images of early portable computer users provided escapism through the promise of adventure – a life to be lived away from the drudgery of the desk. The truth of the situation, though, was somewhat different. As can be seen from closer examination of the images, 'portable data terminals' were not as portable as might be hoped. The Texas Instruments 'Silent 700' terminal, for example, was sold as being particularly lightweight for the period, weighing 'only' 13 lbs (nearly 6 kg), and that was just for a terminal without any power source or memory of its own. By way of comparison, a laptop weighing less than half of this would be considered 'heavy' by today's standards, yet would be fully self-contained and powered. Products such as the Osborne 1 were only used as portable computers under duress, and as soon as a more suitable alternative appeared, 'luggable' computers were exposed as a completely unsuitable product type and vanished almost overnight. The technology of portable computing, advanced though it was, was not enough on its own to secure acceptance among the target market of mobile executives. In order to succeed as a product, the physical form of mobile computing had to reflect the 'high technology' fashions of the 1970s, and in particular the glamorous image of masculinity emerging from the notion of the 'playboy adventurer'. Through displaying ownership of a mobile computer, owners had to be able to present themselves as an upwardly mobile climber of the corporate ladder. Consequently, the image of portable technology promising a 'James Bond' lifestyle of independent freedom was a strong and clearly attractive one. Numerous manufacturers

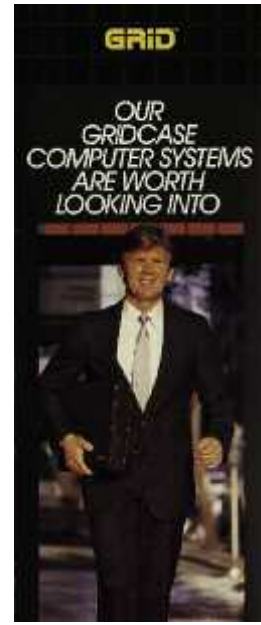
strove to create a suitably high-status portable computer that could fulfil this promise. The 'Compass' Portable Computer by GRiD, relabelled as a 'Briefcase Computer' in promotional material, was the first product to achieve this. By utilizing the very latest advances in computing technology, GRiD produced a portable computer that was highly desirable as well as highly functional, fitted easily inside a standard briefcase and was a duly fashionable signifier of executive status. Portable computers never really took off until they took this 'executive briefcase' form, and the clamshell design of the 'Compass' computer quickly became the norm for the whole industry. Where other product types had singularly failed to project the image of a 'playboy adventurer', the laptop succeeded.

The blatant signification used to promote early portable computers is quite understandable in retrospect, as a market for the product still had to be nurtured and developed. As portable computers started to become more commonplace and more easily recognized as such, the requirement for associative imagery to connote their status was reduced. Brochures for laptops in the 1990s, for example, showed the computers on plain backgrounds. The associated text didn't sell the benefits of owning such a machine as the benefits were well-known. Instead, they merely described the technical specification of the particular model shown. As the laptop became more of a mainstream product, its familiarity and popularity meant that its ability to act as a status symbol became diluted. As with the depiction of office computers, gender also became less of an issue. Adverts and brochures began to show women using laptops, although still nowhere near to the extent that they showed male users. If brochures showed both sexes using mobile computers, the male was usually shown on the front cover of the brochure and the female hidden away inside.

The self-image and body language of the use of mobile technological products was a far more significant element in their success

or failure than has previously been acknowledged. The semantic associations of the use of the laptop as described above, for example, were far more in tune with the role-setting expectations of the product than were the associations of operating, for example, the military field radio-like Osborne 1. A red-faced, sweating executive struggling to carry such a thing would have impressed no one, and it is no surprise that they were very quickly dropped. The proposed successor to the laptop, the tablet computer, had a similarly problematic issue. These devices were widely lauded by the computing industry as the products of the future, but the relevant users just did not accept them. In essence a large touch-sensitive panel, tablet computers tended to be carried in the cradle of one arm, and written upon with the remaining free hand. As such, they bore a remarkable resemblance to that stalwart of bureaucracy, the clipboard. This was not so much of a problem when the products were more rugged and aimed at field workers in the insurance industry, where the clipboard was a commonly used and readily accepted piece of equipment. But when the same product type was aimed at an executive audience the result was absolutely disastrous. The clipboard has been called 'the Power Plank', its visual prominence the main reason it acted so strongly as a hierarchical marker and as 'an essential means of enforcing the strict social structure'[45] of various institutions. It could not be hidden away, and so carrying one instantly betrayed the owner's limited role and jumped-up status. Male executives should have seen the fact that tablet computers didn't have to be typed on as a benefit, as until the 1990s typing was still considered to be a feminine activity, but it seems that the requirement to write with a stylus on a glass screen was not popular. This might have been due to purely technical issues, such as the 'feel' of writing on glass compared to paper, or problems with efficacy of the interface software itself. But it might just as easily have been the case that carrying these products and





writing on them semantically associated the owner with the less than executive role of completing pro-forma questionnaires and ticking off checklists. Even the 'obvious' advantages of such a product in business meetings where they could be quietly written on rather than noisily typed on[46] does not detract from the fact that executives might have thought that they should not be the one being seen to take minutes. Although they remain in production as niche products, tablet computers clearly failed (and still fail) to portray a suitably fashionable self-image for the executive user. Yet they do seem to be more readily accepted in other markets such as healthcare and for educational use, where status is not so much of an issue. Only time will tell if Apple's new iPad tablet computer changes this position and finally breaks this elusive market.

Brochure for Osborne 'Personal Business Computer', 1981.

Brochure for GRiDCase Computers, 1985.

The technology contained within the tablet computer was transferred fairly easily to far smaller, handheld personal digital assistants. These were accepted far more readily than tablet computers ever were and were much more successful, quickly spawning an industry all of their own.[47] Specialized devices such as the Palm Pilot and the Blackberry were less traditional computers than devices aimed specifically at time management, personal data organization and communication, and as such could have had far less in the way of gender associations, yet even here gender bias was still evident. By 1997, the language used in the brochure for Apple's later version of the Newton, the MessagePad 2000, was more politically correct, stating that the product was aimed at 'anyone who spends time away from their desk',[48] but tellingly, all the images still depicted the device being used by males in business suits. The size of the product was obviously part of its appeal, and being seen to write on a discreet handheld object resembling a reporter's notepad was clearly far more acceptable than writing on a large object resembling a clipboard.

So, the desire by executive business users to project a suitably exclusive self-image through the use of technological products as role-setting objects and status symbols was a significant factor in the success or failure of different forms of mobile computers, and subsequently affected their physical design in the wider marketplace. Yet despite an ever-increasing range of related products including tablet and handheld computers, the most successful form of all remains the laptop computer. The laptop has proved to be a remarkably durable and popular machine. Its flexibility as a product coupled with its portability, functionality and semantic associations have made the laptop the general-purpose computer product of choice. The now ubiquitous nature of mobile computing means that the market for laptops has diversified greatly since the product type's introduction. Lower-priced laptops are now marketed by department stores purely

as commodity items, and lower-spec laptops are routinely given away 'free' when purchased with a broadband contract. The competition for providing laptops at the lowest possible price is fierce. At the other end of this scale of commodification, more advanced and expensive versions of laptops remain objects of desire. In 2007 Sony published a series of full-page adverts for their upmarket Vaio range of laptops, which appeared in full colour in a number of glossy magazines and national newspaper weekend supplements. The images, bearing the strapline 'be like no other', clearly delineated the Sony products from their more mainstream competitors and, denying the

Brochure for the GRiD 'Briefcase Computer', 1985.

products' existence as the result of the mass production process, suggested that to own these particular laptops would transfer to the owner a level of individuality and status reserved only for those owners of high-end luxury items. This has similarities to the associative use of aeroplanes and helicopters in manufacturers' brochures a quarter of a century earlier, but on a much more accessible, more easily attainable scale. It is more in line with those companies that appropriate widely recognized celebrities to endorse their products in adverts, suggesting that to own one of their company's (for example) wristwatches will at least associate the owner with (if not transfer the lifestyle of) a famous actor or sportsperson.

The images of the Sony laptops were associated not with a well-known personality, but with unidentified models. The models, though, were clearly exactly that – they were not taking the role of a 'typical

Sony Vaio Laptop adverts, 2007. The laptop as fashion accessory for both sexes.

user' in order to contextualize the object in its intended environment or explain the use of the product to an unfamiliar audience. This was fashion photography, and the models displayed a carefully selected wardrobe of clothes and accessories. Despite being the central focus of the advert, the laptops here acted as markers of brand affiliation – fashion accessories, yet accessories of such standing that their value was not in question. Their value was in fact amplified by this context. The unique quality transferred to the potential owner of the Sony laptop was to be more than acceptably stylish. Upward mobility made tangible. This is technology as fashion, technology as identity, individuality and self-image. Computers on the catwalk. There was also an element of regendering the laptop in these adverts. Many of the more elite models of laptops became available in a number of different colourways or patterns in a similar fashion to mobile phones, as manufacturers strove to attract the attention of a much younger and more discriminating audience. Surely it was no mistake that the male model had a blue computer and the female a pink one? Certainly the different adverts appeared in magazines aimed at the relevant gender.

As well as being a fashionable item to be seen with, and in spite of its long history and now ubiquity, certain laptops still manage to retain a cachet of cool. 'Executive' business versions are still advertised that certainly have a level of kudos above that of their desktop counterparts. The man in the Panasonic Toughbook advert of 2008 may be more Jason Bourne than James Bond, but the fact remains that although there is a perfectly justified market for rugged portable computers, for field workers from building sites to oil rigs, the average executive needs their capabilities as much as they need an off-road 4 × 4 with bull bars to drive around city centres. In this context, the macho image of the rugged portable computer is all. It seems that even if it is no longer quite the status symbol it once

was, at least to some, the laptop remains a signifier of excitement, freedom and adventure.

Across the course of its history, then, be it in the form of the office computer, the home computer or the mobile computer, computers have had an element of political power as a direct result of the socio-political landscapes in which they operated. These landscapes have, of course, changed dramatically since the computer first became a part of people's lives, and as a result, computers now have less agency than they did. This is largely because they have become so commonplace that computers now slip below our cognitive radars. In the workplace, computers are so familiar that they are now only noticeable by their absence. Managers have even been known to remove their computer to be operated by a secretary and reclaim the valuable real estate of the surface of their desks in order to display

Panasonic 'Toughbook Executive' advert, 2008. For some, the laptop remains a signifier of excitement, freedom and adventure.

managerial authority. In the home, the computer is not a luxury but a very real necessity for many. Their extensive use by children and teenagers for education and internet access, in particular for social networking activities,[49] is such that those without them consider themselves to be at a distinct social disadvantage. The sheer ubiquity of mobile computing, be it in the form of laptops, PDAs, Blackberrys or smartphones has, for the most part, made it a completely quotidian activity. Although, as can be seen from the furore with which the latest models are advertised and the enthusiasm with which they are sought out,[50] such products retain a high level of desirability and are often displayed with pride. Computers may no longer have the same status or gender associations they once had, but they still play a significant role in defining who we are.