Leslie Haddon

The home computer: the making of a consumer electronic

Article (Accepted version) (Refereed)

Original citation:
Haddon, Leslie (1988) *The home computer: the making of a consumer electronic.* Science as Culture, 1 (2). pp. 7-51. ISSN 0950-5431

DOI: 10.1080/09505438809526198

The Home computer: The Making of a Consumer Electronic

Leslie Haddon

Haddon, L. (1988) ‘The Home Computer: The Making of a Consumer Electronic’, in *Science as Culture*, No.2, pp.7-51.

Where did the home computer come from? It is well known that its production became possible through a process of miniaturization geared to military and commercial requirements. Today's home computers are designed and marketed for quite different purposes, though many of the more recent machines have been promoted as having equally utilitarian value. The use of the home micro for word-processing in particular has made the machine into a potent symbol of the 'labour-saving' benefits that high tech supposedly offers society as a whole.

However, the early home computers and the hobbyist machines, dating from the mid-1970s, had no such simple utilitarian image. In contrast to its current main image as office equipment that can be used in the home, the early home micro was promoted for less tangible uses. This essay will outline its trajectory - from a marginal, esoteric, hobbyist item, to yet another addition to the familiar product range called 'consumer electronics

If we are to understand the home computer as a product, we will need to broaden our notion of what such a thing is. A product, especially a technological one, is often considered simply as a physical object, a black box, a mere gadget. Innovation is seen simply as innovation in technical design, with marketing aspects tacked on afterwards.

A wider notion is exemplified by trade slogans such as 'Advertising is the product too'. That wider definition involves not just the physical object but also a set of meanings that construct the consumer as well as the product. The car, for example, is not just a means to get from one place to another. The automobile can also be a symbol of personal style, among other connotations. A whole variety of companies' activities contribute to those meanings. These include priorities in design, the industrial design image conveyed by appearance, the advertising, the channels through which the product is marketed, and the very image of the company itself.

Using this broad conception, we can reformulate the issue of the development of the home computer: how did it become a consumer electronic product? Phrased in this fashion, we can better appreciate the way in which consumer electronics are a category of good, a 'brown good' such as TV5, hi-fis, etc. Experience of other such brown goods conditions the consumers' and retailers' expectations of what computers marketed as consumer electronics should be like.

By the late 1970s microcomputers were just starting to become more established in work settings such as the office. As we shall see, this did not make them an obvious candidate for the home electronics niche. Even when a variety of companies designed the new micro to fit the consumer electronics category, the result did not get a totally smooth ride. Elements of the product's identity were in tension with each other, and this was a tension the companies had to manage.

Although the home version developed only in the 1980s, some of its seeds were sown in the earlier history of the microcomputer, especially its use by hobbyists. That history can help reveal the origins of the contrast between the home version and the microcomputers designed for the workplace. Thus our starting point will be the early 1970s. By reviewing the development of those first machines, we can better see everything that goes into a computer product. From this we can draw the contrasts with its later transformations.

COMPUTER AND CHIP FUTURES

Like many technologies, the idea of a small computer had a number of antecedents. In 1942 Anastoff, an American university professor, built a prototype machine about the size of a large desk. Although it was never fully completed and had fewer capabilities than later machines, both its originator and computer historians consider this device to be a computer. Many of its design principles were taken up in the large-scale machine, the mainframe, which became the archetype of the computer.

Certainly the existence of machines for personal use and hobby designs can be traced back to the 1960s and earlier. This era saw the development of a smaller form of computer mainly for laboratory analysis and industrial control: the minicomputer. Although this machine would fill the room of a house and eventually cost $20,000, some enthusiasts were willing to pay that amount - or construct their own. What marks a more recent history is the development of the micro-chip, or microprocessor, the main technical innovation which made possible the microcomputers we now have.

By the late 1960s the semiconductor industries had moved on from the days when military contracts and the space programme underwrote virtually the entire initial development of chip technology. By this time the chip suppliers had started to look towards future markets in a range of products, an early example of which was the calculator. As demand for chips increased, some manufacturers anticipated an imminent engineering bottleneck. The requests for new chips, each designed afresh for a particular purpose, would soon outpace the semiconductors' capacities. One solution might be a more general-purpose chip which could meet the wide-ranging specifications of manufacturer clients.

General-purpose chip

The microprocessor chip was developed by an American semiconductor firm, Intel, in 1970. Since the company's origin in the late 1 960s one of its founders had talked about the possibility of making just such a flexible chip. He saw it as a component that could be adapted, or programmed, for a specific purpose at the point of manufacture of a dedicated device (e.g. calculator, clock).

The opportunity to implement these ideas came when Japanese calculator manufacturer asked Intel to develop a set of chips for a new line of programmable calculators. Instead of following their customer's design brief, the semiconductor company came up with a more general-purpose

chip, the microprocessor. This chip was based on the principle that ii could parallel the working of the central processor in a computer. Initially the Japanese company had the exclusive right to the chip, but from 1971 Intel negotiated the option to sell this microprocessor chip to other clients.

At first the new microprocessor was far from an obvious success. The next few years saw internal resistance, especially from the marketing staff. Potential customers were also wary. The microchip designers were kept busy, via seminars, attempting to persuade possible clients of the value of the new chip. These designers emphasized the structural similarity of microprocessors to the larger mainframes; they announced their invention as a microprogrammable computer on a chip'. Yet, from Intel's viewpoint, this advertising ploy created misconceptions. The chip was often compared too closely to contemporary computers. The comparison was shown in customers' enquiries about how to repair it and how to keep it busy. One commentator even expressed a doubt about putting important files on a machine that could fall through a crack in the floor.

Such questions missed the point, as far as Intel were concerned. The computer analogy was proving to be a distraction which had to be overcome. Fundamentally their vision was not of a future with products promoted as 'microcomputers ; rather it was a future of microchips as embedded parts of other products. They envisaged most early sales going to calculators and minicomputers. Later roles would lie in providing 'intelligence' - that is, programmable facilities - in a wide range of goods. The potential revolution of microprocessor technology, like other chip technology, lay in its pervasiveness.

We can capture that same set of ambiguities, the small computer versus component, in the debates still going on a few years later in Britain. One contemporary journalist recalls:

> *[in 1974] I was taking up a job on a paper called Electronics Weekly. . .1 was their computer correspondent and it was a matter for serious dispute on the paper as to whether, if a microcomputer press conference was announced, the components editor should go or the computing editor should go. I felt that it was interesting and exciting. I declared, therefore, that these things were computers, and therefore they came under the jurisdiction of the computer correspondent. . . which was a point of view that didn't find a lot of acceptance. It was held at the time that microchips were simply components, they would be sold just as components were sold - through big distributors. . . and it was held that although superficially they resembled computers, they were in fact nothing like computers. The reason they were held to be nothing like computers was never explained. It was just 'known' they were nowhere near as powerful as computers.*

Intel's conception was shared by the other semiconductor firms; they saw the microchip as general component, not the core of an actual computer. The overall role of these companies as component suppliers led them to locate the microprocessor in such terms: indeed, the device had been designed partly to overcome a component supply problem. In comparison, the producers of those existing computers - the mainframe and minicomputer manufacturers - were not limited by this view. The microcomputer may have been conceivable, but for different reasons such a device

was still not an obvious progression from their main interests.

'Office of the future'

Xerox had earlier set up the Palo Alto Research Centre (PARC), partly as a showpiece to explore technological frontiers. PARC had no commitment to develop commercial products, although its ideas, and staff, were later to influence developments in the microcomputer industry. The research centre was, however, responsible for one innovation taken up by Xerox. This was he Alto workstation. Developed between 1972 and 1974, this machine, the size of a large desk, was referred to as 'the office of the future'. It even utilized the new microprocessor technology and the designers, looking back, claimed it as the first personal computer. Others have rejected these claims; such critics point out that the Alto sold at the price of a minicomputer and was taken up in only limited numbers (about 2,000) by institutions with large administrations.

At least the Alto represented a possible route into smaller machines, while Xerox could have been the large corporation to develop micros. In fact a few years later Xerox act~ally moved on to smaller-scale and cheaper versions. But by then its initiative had been eclipsed, overtaken by developments from another quarter.

It was Digital Equipment Corporation (DEC), one of the big minicomputer firms, which went furthest down the road to producing a small machine. The manager of their educational sales, David Ahl, had organized a team to develop a micro in 1973. DEC had previously sold some of their existing range of minis to the education sector and so hoped purchases might increase if the firm could produce a cheaper computer. They might even attract some private sales. DEC itself, as a large computer firm, was geared more to the capital goods sector, or at least to institutional clients rather than individual consumers. Ahl took steps to overcome this inertia. He started negotiations for possible subcontracting to hobbyist kit firms and even for production and retail distribution of an up-market home computer. A year after starting the project the team produced actual prototypes. These models were about the size of a television. They were literally such scaled-down versions of the company's minis that they did not even use microprocessors. The plan was to sell these for $5,000 each.

It soon became apparent that the marketing staff were very doubtful about the future of such a product. The majority opinion in top management was that it would not have a use even in an educational, administrative or business capacity, let alone for a consumer market. The basis of this evaluation was the feeling that the computer time-sharing services offered by existing mainframe and minicomputer companies could better supply to institutions all the functions offered by such small machines.

The semiconductors had worked with a vision of the way the chip revolution would unfold - bringing 'intelligence' to more and more commodities. In contrast, the computer companies had their own model of the way their technology would develop. The computer revolution envisaged from the 1960s and early 1 970s was going to be brought about by larger machines in conjunction with telecommunications systems. Even the revolution in the home, involving new entertainment and information services as well as access to computer power, was going to be made available

from larger machines via phone or cable. In this future, who would want a separate private computer that would offer less? It is indicative of the power of these scenarios within the computer industry that even at this stage DEC dropped its microcomputer project.

Thus, by the 1970s big corporations were aware that a small computer could be constructed at relatively low costs of research and development, especially with the help of the new microprocessor innovation. What blocked such a line of development was the general vision within which these high-technology companies operated. This was shaped by the wider dominant perspective of the computer and chip revolutions. What a number of more enthusiastic writers later called the 'micro revolution' had to compete, as a vision, against these other possible futures. Within the paradigms of the time, the microcomputer had no obvious progression from the industry's existing concerns.

THE HOBBYIST MACHINE

In the mid-1970s, electronics enthusiasts recognized the formal similarity of microprocessors to the workings of mainframe computers. These hobbyists wanted a small computer for its own sake. Such an appeal had been difficult to appreciate from the frameworks of the semiconductors and computer companies. In the pursuit of their interest, early hobbyists created a form of the micro which reflected their own values and was the machine they wanted to 'consume'.

Since the first appearance of the microprocessor, it had been taken up by some hobbyists. They remained an isolated few, not an organized network. Access to these chips was limited in the early days. The sales administration of semiconductor firms was geared to a capital goods market which was organized around bulk sales to approved customers with accounts .,Therefore microprocessors were most readily available to those hobbyists working in locations such as companies selling electronics parts, in firms using these chips or institutions such as schools and colleges.

Other hobbyists who could get their hands on microchips were those actually working within electronics and minicomputer firms capable of making small computers. This meant people like Ahl, at DEC**, p**eople such as Steven Jobs and Stephan Wosniak, later founders of the microcomputer firm Apple, started out at Atari and Hewlett-Packard, respectively. These characters are well known from hobbyist histories, but other lesser-known figures were also voices within the larger corporations.

Such hobbyists enthusiastically encouraged their employers to develop microcomputers. As individuals they sometimes worked on designs in their own time, sometimes in company time. Occasionally firms took up an employee's design, as in the case of Tandy's TRS-80 micro. At other times larger companies were willing to help the start-up ventures of ex-employees. Thus micros did not come simply from grassroots users. Some early hobbyists did not constitute such a distinct group from larger firms. Hobby machines and company products were mutually facilitated by that kind of connection.

'For their own entertainment'

Intermediary firms making microchips available to individual buyers helped create an actual hobby movement. By 1975 some of the American electronics magazines were carrying non-commercial hobbyist designs. The policy of these media soon developed into a further initiative: that of actively seeking out and encouraging designs for a small commercial computer. In response to this, and the promised publicity of a cover story, the company MITS took a chance. This tiny firm, which had previously made calculator kits, built and sold by mail order the first machine proclaiming itself to be a micro: the 'Altair'. That step was to be the start of a cottage industry, the start of a microcomputer market.

That these developments marked some turning-point was by no means immediately clear to all industry observers. Even MITS was unsure whether their product would sell, despite this climate of expectation being created by the American magazines. Meanwhile in the UK, that expectation was weaker still. The computer journalist cited earlier recalled the view from Britain:

> *About the time that MITS launched their first machine the editor happened to be in America. He came back with a press cutting from a magazine and he was very amused and entertained. He said, 'These crazy Americans, what will they do next? They seem to think that people are going to buy computers for their own entertainment!' He then said, 'What's really strange is that Americans, being crazy some of them are! Of course, they have too much money.'*

This editor and others soon had to take the matter more seriously; Demand for the machine turned out to be considerable. The level of interest surprised everyone, and this surprise in itself became part of the reason why contemporary and even later accounts could describe this machine as the start of a 'micro revolution'. As we have seen, that dramatic demonstration of enthusiasm was so sudden only because that product tapped into a potential interest that had already been expressed by some.

The next few years saw the consolidation of the hobby micro in the US. A whole range of small companies and retailers started up to cater for this market. Magazines, fairs and new clubs organized this enthusiasm and helped structure a movement. These companies, journalists and organizers Were often hobbyists themselves, acting in what felt like a pioneer spirit.

British hobbyists

The UK equivalent arose a few years later. A layer of firms, some start-up ones like their American equivalents, bought microprocessors and other components in bulk and then sold them in smaller quantities to other companies and hobbyists. This was to remain an important source of microprocessors through to the late 1970s, since the US products remained expensive for British hobbyists. The launch of the Nascom in 1977 represented the equivalent of Altair. Like its American counterpart, this computer tapped a submerged interest in micros among the adult male electronics enthusiasts who read *Wireless World, Electronics Weekly,* etc. By 1978 British micro

magazines such as *Personal Computer World* had been founded. Over the next few years hobbyist clubs sprang up around the country.

What was the motivation behind this hobbyist movement? For its participants it was the computer as such that was interesting; any practical applications were secondary. They wanted to explore the technology, how it worked. This involved tinkering, the fun of experimenting, of learning, of problem solving. Put simply by one British hobbyist:

> *There was, I think, just a feeling that computers were interesting things and could do clever tricks. And I was never going to get time on the mainframe of a university and so I should build my own. That was a fairly common motivation.*

Of course building your own computer or customizing a commercial one was possible only because of the nature of micro technology, the nature of the innovation. Once the chips that constituted the building blocks were accessible, the relative 'makeability' of the micro allowed a hobbyist involvement. Amateur devices are not so easy to construct where the technologies require precision engineering, or where necessary knowledge is the closely guarded secret of corporations. The core of the micro basically consists of logic arrangements, while most of the computing principles had already been worked out in the previous decades. More than, say, the video, the micro could be the type of technological development embraced by hardware enthusiasts of the sort who previously would have built their own wireless sets, radio-controlled boats, etc.

Even if the micro could fit into a hobbyist niche, it did so while carrying a considerable weight of symbolic meaning. The computer is, after all, the icon of the modern age. Unlike some other hobbies, this interest in microcomputers could not simply be limited to a personal pursuit. There was a serious side to this machine which can be seen in the memories of a British hobbyist at that time:

> *We used to get together and talk about the potential of these machines, more, I think, in order to protect ourselves from ridicule. People would say, 'Why are you playing around with these toys?' We would say, 'No, we're not playing, this is serious. Just think of all the things you could do.' And then the arguments would come out as to why these things couldn't be done. But what we were really trying to do was to justify our interest by saying, 'Well, this is a serious subject for consideration and not just somebody mucking around with an intellectual toy.' At the same time we were genuinely aware of the fact, and would say to each other, that there must be, there had always been, a demand for a cheaper computer than had already been built.*

Whereas some types of hobbyist (such as CB radio operators) do not really feel the need to justify their pleasures by rationalization, microcomputer enthusiasts found themselves in a context that created pressure to do so. Computers were supposed to shape everyone's future in so many of the scenarios painted by public speakers and writers. These expectations conveyed the feeling that they ought to be more than a toy. We should expect something extra, something really useful, from anything identifying itself with this revolutionary technology. And that

feeling, expressed here by the hobbyists, was probably also implicit in some of the ridicule they feared.

Convivial technology

In late 1980s Britain it is the current imagery of information technology that would colour those expectations. In late 1970s America the future discussed by hobbyists had some slightly different strands. For one thing researchers at Xerox's Palo Alto centre developed more than technology. They also contributed ideas to the intellectual climate of the hobbyist movement around notions of 'personal information needs' and 'friendly' computers.

Some saw themselves as 'countercultural engineers'. A movement within hobbyists, these enthusiasts had the ideal of developing the micro as a 'convivial technology'. They had been influenced by the contemporary counterculture groups and fears of big corporations. There arose a related critique of the organization of mainframe computer power and its uses. One publicized outcome of their efforts to bring 'computer power to the people' was the Community Memory Project. This could be seen as an alternative, yet communal, form of computing. A large centralized machine allowed information exchange for anyone who wanted to take part via terminals.

These same hobbyists also had an interest in the new micros. The small computers represented a form of decentralization of computer power, a means to bring computer power under personal control. Hence it was more of an individualized form of computing, although it still arose from a similar political viewpoint. Ironically, the micros then seen as 'alternative technologies' have more recently been seen by many as symbols of 'high tech'.

Do-it-yourself micros

As convivial technologies, micros were theoretically supposed to be designed towards 'user-friendliness' and accessibility. In practice, the design of even these idealists bore the imprint of the hobbyist context. Although machines changed shape from the original Altair, many kept some of the same fundamental features as the MITS device.

The sheer appearance of such machines reflected the primary interest in function. They consisted of a metal box (often literally 'the black box') with toggle switches, blinking lights, and wires coming out of all sides. The lack of aesthetic considerations reflected both the do-it-yourself form of short-run production and the values of the producers. Even though they were developing a marketable product, the producers were mainly designing the machine they wanted to have - that is, continuing the customary practice of hobbyists producing for hobbyists.

To use these computers required fairly sophisticated knowledge. With little software available in the early years, and indeed with not enough memory to run it on the first machines, the hobbyists had to program the machine to get it to do anything. Repairing the micros when they broke down -by all accounts fairly frequently - was another challenge. Various early surveys seemed surprised to find that a large proportion of these enthusiasts were very skilled already. For example, Kaplan

quotes a 1976 American survey which found that two-thirds of hobbyists were programmers, technicians or engineers and three-quarters used computers at work. The special knowledge needed, in the absence of much documentation, was a major impetus for the less skilled to seek the benefits of club participation.

As is common with hobbyist products, there was only nominal marketing: the products' arrival was, literally, announced. There did not need to be any discussion of use: that, of course; was the prerogative of the hobbyist. Finally the whole attitude towards the products was visible in the images by which these small companies presented themselves. Their very names indicated the fun and humorous side of the industry: Loving Grace Cybernetics, Kentucky Fried Computers and Intergalactic Digital Research (before it became plain Digital Research, now a major software firm). This easygoing atmosphere of a technical subculture was soon to be replaced by a wholly different regime. Under the new rules, micros were going to be a far more serious business.

THEOFFICECOMPUTER

Alongside the hobby computer another paradigm of the micro was being constructed. This new micro had some strikingly different design principles, was intended for different use and had a strongly contrasting image. In fact we could well consider it a different product. What might be seen as just a progression really had a new underlying conception of the computer's role and the user's relation to that technology. This new model has come to be typified by the office computer, although its forms varied widely.

Once machines were actually available and selling to hobbyists, some small companies quickly saw that a possible business market might exist for small computers. The firm Imsai targeted small business users in the US as early as 1975. Its intention was to sell packages of software and hardware to meet individual client requirements, much as larger computer firms did. In line with this aim, the unit which constituted the micro was expanded to include disc-drives and the operating system which controlled them. For the first time a more proactive marketing was employed, using the technique of telephone sales. Yet at this early stage the reality of the machine still fell considerably short of the grand plan.

In many respects elements of the hobby machines still lingered on. The Imsai micro was to remain unreliable, its instructions were written by engineers for engineers, there was initially no software and its appearance was still described as like a 'pile of electronic test equipment'. (The Imsai micro was the one used in the film *War Games* - appropriately enough, given its do-it-yourself appearance.) Imsai nevertheless represented the start of a new trajectory. Soon others were to follow who, for example, started to concern themselves with aesthetics and to rearrange the units - for example, putting the monitor, keyboard, microprocessor circuitry all in one unit.

New computer aesthetic

The launch of the Apple II in 1977, and with it the Apple company, marked for many the new face of micros. This machine in particular represented the transformation to what was soon to be

named the 'personal computer'-even though it was taken up principally in office work. IBM were finally to legitimize this type of product, and the very term 'personal computer', when it entered the market in 1981. However, Apple first brought micros to the notice of a wider public: it put the microcomputer on the map.

In appearance the Apple microcomputer was a sustained attempt to realize the notion of ‘user-friendliness'. The square metal box was replaced by a low, wide design encased in plastic. It was designed to run silently in order to avoid apprehension about whirring machines. On the whole there was an attempt to de-emphasize the micro as technology, such as by having no sharp edges and no screws jutting out; there were to be no shapes that in any way connoted 'science fiction'-type gadgets. The Apple II's departure from previous computers led some industrial design circles to refer to this style as constructing a 'new computer aesthetic'.

Perhaps the key central difference was that these micros were geared to running software packages. In the years following Imsai the industry witnessed the rise of separate software houses in a symbiotic relation to the hardware companies. Although some catered for hobbyists, some saw promise in the developing business market. By 1977 a word processor for micros called 'Electric Pencil' was available, though this software was developed by hobbyists not specifically for business purposes. Databases and spreadsheets like 'Visicalc' appeared shortly afterwards. In fact Apple's own success has been partly attributed to the support of a network of software firms supplying its machine, with a major role played by the 'Visicalc' program alone.

In terms of the overall package, the more generally readable documentation reflected the perception of the user as being a non-expert. Within a short time, support for the user was in effect bundled with the machine in the new retail structure which arose. This supplied advice and back-up services similar to the suppliers of larger computers. Most importantly, a new era of marketing involved much more active promotion, with the overt emphasis on the micro as a tool, not a toy. Implicitly, though, this marketing sold micro-computers as other office equipment had been sold: partly on the basis of its modern image.

These personal computers offered internal design features which were also attractive to hobbyists. A machine such as the Apple could, in the US context, be sold as either business

machine, hobbyist machine or, later, home computer. Its price, in relation to American incomes, meant that the Apple II could to some extent break down product boundaries and cater for both markets. The subsequent arrival of much higher-priced machines created some division between home and business micros, even in the US. Yet the end result was still that hobbyist computers and what became called home computers somewhat resembled this new product.

THE HOME COMPUTER

For many potential and actual manufacturers there remained the issue of whether they could expand beyond the hobbyist, office and emerging educational markets. Articles in the late 1970s discussed the possibility of home computers. Would the interest in computers inevitably be restricted to relatively few? Did the micro, or could it, have the right qualities to become a consumer electronic? What changes would have to be made to the current hobbyist version to make it acceptable as a domestic item?

Optimists thought that eventually the home micro could be a pervasive technology like the calculator. More pessimistic commentators had doubts. They regarded hobbyists as the only real home buyers and so could talk of the home market being already saturated by 1980. The evidence of market research was difficult to assess. By the end of 1977 the Apple II had been joined by the TSR-80 machine from the retail chain Tandy and the PET computer from Commodore, a corporation previously known for its calculators. These three machines dominated the American market. They continued to sell well for the next few years, including to private customers. But they were uncertain whether they were still really mopping up hobbyist interest, which could soon dry up.

For those who thought there might be a wider latent audience, the question was about the new basis on which a micro could be sold. In principle the computer was a universal machine - you could do so many things on it. While each type of micro could share the same underlying principles of operation, they could be designed and marketed in very diverse ways. The debate was about the best way to develop and market a computer for the domestic context.

At that time the predominant view was that the micro should be mainly a machine for running software. That certainly fitted in with the personal computer used in paid work. But should the hardware companies stress the specific type of software used in business - the word processing, the spreadsheets, the databases? Would potential consumers be immediately enthusiastic about running their households and finances as a rationalized organization might do? That type of transfer between the office setting and the domestic context had worked with some products, the typewriter being an outstanding example. Over the next few years that route was certainly taken up by some software houses who produced such packages as personal accounting programs marketed as personal productivity software'.

Eventually many of those companies emphasized the micro as an educational machine. On the one hand this had a wide-ranging meaning: education for all the family. The new term 'edutainment' soon started to appear in the vocabulary of marketers. This captured the idea that home education was also fun and part of leisure activities. The other meaning of education was

geared specifically to children. This strategy appealed to parents to think of their children's future, based on the premise that somehow computer skills were the route to future jobs and prosperity. A few years later, the introduction of micros into the education systems of many Western countries was used by manufacturers to support their marketing claims.

However, this strategy was not simply an advertising ploy. Hardware companies commissioned and encouraged a range of educational software for their machines to run. In the USA, Apple was particularly keen to develop this feature. And the educational pitch was stressed by the American semiconducter giant, Texas Instruments. TI was unique in aiming solely for this new market, and not a hobbyist one or business one as well; its educational machine was thought to capitalize on TI'S previous successes - the 'Speak and Spell' devices and their follow-ups. Lastly Atari, the arcade and video games world leader, produced some 'home' machines, albeit with a few reservations about the future of this product. Without doing much promotion for this new micro, they did commission some software to support its educational identity.

If we now turn from the American to the British context, we find an important difference which was a legacy from the hobbyist days. Here the contrast between the two types of machine - hobby and personal computers - was far more acute. The high price of disc-drive computers like the Apple, over the £1,000 mark, limited them to the business, education and scientific fields. In these contexts, personal computers were also used with monitors and printers. Many companies such as Atari, as well as third parties in the UK, did offer these peripherals for a core machine. But relatively few were taken up for home use. In fact it was only by the mid-1980s that falling costs enabled Amstrad to offer a whole system at a price which proved more acceptable for a home computer market.

Consequently, when producers for the British market started to think about wider sales, they had to devise cheaper machines. Options such as the business software route were not really possible for a mass machine in this country. Hence, during the period of the UK 'boom', the type of home micro available was only the core part of its American and office computer counterparts: the keyboard, the microprocessor and memory chips. The essential peripherals of the British computer had to be improvised and repeatedly reassembled from other domestic artefacts: the TV and the cassette recorder. Many people thought them to be a bit makeshift, not proper computers after all. This contrast with the personal computer - the definer of the 'real' micro, in appearance, convenience and capabilities - was continually to threaten its home versions with the status of a toy, regardless of which firm made them.

THE SINCLAIR MICRO: THE SELF-REFERENTIAL COMPUTER

Many people have viewed Sinclair's early machines, the ZX80 and ZX81, as marking the start of home computing in Britain. Sinclair was the earliest computer manufacturer in Britain to advertise home micros in the national press. Through this he helped create a mass market for the home micro as a consumer durable. His machines were the first to begin to attract a wider audience without any previous interest in computing or electronics. The number of ZX80s bought was soon greater than the previous combined sales of all micros in Britain. That very success of the zx80 and zx81 first attracted the attention of the management journals and led to a

range of articles about Sinclair as a model entrepreneur.

Some commentators have also criticized these products as helping to spoil the British market. They have described these early Sinclair products in particular as setting low standards of computing in Britain by virtue of their being such basic machines. The critics argue that the limited capabilities of the first ZX micros misled potentially interested consumers about what computers could do. Yet the appeal of these Sinclair machines was ultimately not that they provided uses and benefits. The appeal was substantially the same as the hobbyist one. You bought the machine for itself, to explore it, rather than for what it could do. The commentators who wanted to see computers used more practically thought that Sinclair was playing unfairly upon a form of computer mystique in adopting this approach. Certainly these Sinclair products led the wider public to puzzle over what these machines were supposed to do, what their role was to be.

It is not unusual to buy machines for reasons other than purely to obtain their functions. Consumer electronics can be part of personal style, personal furniture. And part of the attraction of a range of 'brown goods' like hi-fis and photography equipment can lie in the fact that people play around with them as gadgets. High-street shops like Currys and Dixons have themselves been referred to as 'adult toy shops'.

Even the calculator, which may seem to be very much a utilitarian tool, had other layers of meaning. A version was designed by engineers at Texas Instruments mainly with the intention of demonstrating that there could be a place for chips in consumer goods. The calculator was a symbol of the chip, a vehicle to demonstrate the new semiconductor technology. Later models added value by styling and by providing the ever-increasing number of functions that could be performed. These machines had their fun dimension too. For example, people often bought versions which had far more facilities than they would ever use. Nevertheless some potential applications for these calculators were at least clear. What is unusual about the Sinclair home computers is their virtual lack of any practical uses or benefits, apart from being self-referential and symbolizing the new computer revolution.

Sinclair tinkerers

To understand why Sinclair chose such a product, we need to appreciate a number of points both about the firm and about the British context. Sinclair previously had sold hobbyist products and consumer electronics. Aware of the appeal of the novel product, he had taken this same route between the two types of product before. Sinclair Radionics, the original Sinclair firm, had initially sold calculators as kits to hobbyists before aiming for a wider market. Calculators themselves, which in so many respects had foreshadowed computers, had thus been a cross-over product. As regards the British market, the view within the firm was expressed by one of the Sinclair marketing staff:

> *In Britain there was a segment of the market, the hobbyist group, which is larger proportionally, I think, than in any other country in the world. And for a product such as the zx80 you can get a kick start, because they would buy in considerable numbers. So you*

actually get awareness out of a larger market as a result of that much more quickly than can be achieved say in some other European countries.

This perception that the British hobbyist market can constitute a useful stepping-stone to a mass market would have to be judged with some qualification. For example, half the sales of these actual Sinclair machines were abroad, a large proportion of which went to the US. Nevertheless, the quotation above expressed a widespread view, often articulated as the idea of Britain as a 'nation of tinkerers'. When we first achieved that important statistic of the greatest number of home computers per capita, many attributed this earlier popularity in Britain to a hobbyist tradition.

When Sinclair was still operating Sinclair Radionics he had originally entered the computer field by supplying this hobbyist market with what was really a device to learn about microprocessors, the MK14. Sinclair, although not enthusiastic about micros, did see them as a possible way to get funds for his main interest, miniature televisions, and so developed plans for an improved machine. Those efforts might have come to fruition in the late 1970s but for financial difficulties, a veto by the National Enterprise Board and the demise of his first company. Those designs were sold off.

Once Sinclair had set up again as Sinclair Research, he hoped to find a sales base among the existing hobbyist market. His new machine, the ZX80, would win this on the grounds of cheapness. In addition, if the appropriate transformations were made, including the active marketing of the product, the interest of a wider audience could be captured. As the marketing staff indicated, these were not just two distinct publics being addressed. Those hobbyists were to play an important role in marketing. They constituted an important group of 'opinion-forming end-users' who gave a visibility to the product beyond advertising. Later they were to be used as a leading edge in another way, as the Sinclair public relations apparatus drew attention to the uses that hobbyists discovered. In other words, theirs was a form of labour, freely given in the pursuit of personal interest, but used by the company. That association with hobbyist strands affected the product's image and possibly limited its appeal for some potential consumers.

White box

The zx80 was a product designed down to a price point. The question was: what machine could be brought below a threshold price of £100 and still be called a computer? As with so many other product development strategies this was later portrayed by some as an obvious move waiting to be seen. Yet it was by no means obvious at the time, even to some of the other British hobbyist firms, whose policy instead ran in the direction of adding more functions. Hence a contemporary view within the British market saw the ZX80 as inferior technology or, put more mildly, a very basic machine. Although it was certainly basic in a technical sense, Sinclair's strategy relied upon a widespread interest in the mystique of such a machine, regardless of what it could do.

The internal design of this first cross-over product from hobbyist to consumer electronic reflected the fact that this was a machine to explore. Despite advertisements proclaiming the machine's ability to control processes, its actual construction lent itself mainly to learning to program. The

ZX80 had too little memory for running any pre-packaged programs and Sinclair was one of the few key manufacturers who did not at the outset develop or encourage much supporting software. It was only later - with the release of add-on memory for the ZX8l and then the introduction of Spectrum - that third parties could write programs for his machines.

In appearance theZX80 was smaller than previous hobby machines and enclosed in white injection-moulded plastic. Its sweeping streamlined shape and speed lines gave it a modernistic style, while its small size, in Sinclair's own eyes, added a certain elegance. At the same time there is a sense in which this design still referred back to the archetypal 'black box'. It literally would have been this if the particular manufacturing process had not forced Sinclair to abandon his favoured company colours. The enclosed shape was without monitor, while the membrane keyboard abandoned the look of a typewriter. The form revealed no function at all. What is more, that appearance, including its very smallness and lightness, distanced the machine from the image of the personal computer.

Everyman's computer

Since the design of the Sinclair machine had distanced the product entirely from the office model, the chief role for advertising was to persuade the public that this was still, in essence, a computer. The advertising copy started:

> *My objective with the ZX80 is to produce a computer for everyman. It has only one-tenth the number of parts of existing comparable computers yet the price is within the range of everyone.*
>
> *The ZX80 weighs just 12 ounces, yet it has all the capability of machines many times its size and price. Programmed in BASIC, it can do anything from playing chess to running a power station.*

As we can see, the main thrust was the announcement of a new *consumer* product. There

followed, after several more paragraphs of reassurance, the technical specifications more familiar from the hobby-oriented advertisements. This listing of features, albeit in what was seen by the company as the style of 'fast-moving consumer electronics', still serves the same purpose as in the hobby context. Like the imposing pictures of isolated computers that have been for so many years the dominant style of advertising, they draw attention to the machine in the abstract, not the machine in any context of use.

These advertisements constituted a new departure in that they appeared in the Sunday magazine supplements of the up-market national press. Sinclair was actively marketing his product in a way British hobbyist manufacturers had not previously done.

While the ZX80 started to pick up a wider audience, the bulk of sales were still seen by the company as going to hobbyists. The ZX81, produced in 1981, was a second attempt to broaden the market, fundamentally located within the same conception, the same policy. According to a member of the Sinclair marketing staff: *'By then we were into educating a larger market with the ZX81. You might call it the semi-computer-literate laymen, who at least were aware of developments going on and were aware that they ought to take a look at it.*'

However, the 'laymen' that Sinclair originally implied were now more precisely identified as older children and teenagers, still mainly males. These were seen to be the driving force in sales. This was to be the main target group of most British producers for the next few years. This differed from the American pattern, where dearer machines were aimed at (male) heads of households, possibly for the family. In the UK, at £50, the ZX8l could be a somewhat up-market present for children. From today's standpoint we might assume that the teenage computer market arose from an interest in games, yet it had its origins within a very different type of machine.

The actual innovations in this new ZX81 machine made it more reliable, smaller and gave it more memory, at a reduced cost. These were technological advances. The zx8l became even more of a black box, as the micro reverted to the Sinclair house colour. Its form still revealed no function, although unsympathetic competitors were later to recommend a role as door-stop. In terms of marketing, new public relations strategies were employed, such as giving away the machines in competitions and arranging reviews across a wide media base. But the establishment of a retail outlet was really the most significant change enhancing the process by which the machines became a consumer electronic.

W.H. Smith, the bookselling chain, had been looking to achieve a more modern image for some time. One route was to introduce consumer electronics into their range: first audio and photographic equipment and later calculators. Even though the US machines were too expensive an item to sell, Smiths had still used them to attract attention within its experimental computer corners in the late 1970s. By the 1980s they were looking for a cheap enough machine that had a computer identity; to this end, they were the ones to approach Sinclair. The ZX81 was to be positively promoted. In the face of some reservations by branch staff, this tactic proved successful from Smiths' and Sinclair's view. The retail industry had made its contribution to the making of this home micro.

A final challenge to other conceptions of the home micro was provided by the very prices of the machines themselves. Such low prices allowed Sinclair’s micros to be seen as a different type of commodity from previous microcomputers. Potential buyers could try out this product and see what a computer was like, even if they might not continue to use it. I hat was entirely consistent with Sinclair's intention. However, that also meant that the use of these micros was potentially short lived. Such products allowed a commodity sold as a computer to be for the first time an 'impulse buy' and in effect a 'disposable' item. It was against this aspect in particular that criticisms of Sinclair's machines arose. A disposable computer was a world away from the micro as potentially part of the infrastructure of daily lives, as a resource or tool with a more permanent place in the home.

Such disposability had another potential meaning for manufacturers, though. Hardware companies represented their later machines as being on an up-grade path from what became seen as 'starter' computers such as Sinclair'. This same thinking was later embodied in the idea of each consumer progressing through ranges of machines from the same company. The computer, it was hoped, could become a commodity like the hi-fl. It might, after all, find a way to stabilize as a consumer electronic.

THE COMMODORE MICRO: THE SOFTWARE PLAYER

In contrast to the Sinclair micro it was Commodore who initially did most to develop the alternative conception: the machine to play software. Perhaps 'play' seems an odd word to use. It can have connotations of passivity that seem inappropriate for an interactive system where the user has to be constantly directing the software. Yet there is a parallel between this conception and certain other consumer electronics, such as hi-fl Systems, video and audio cassette recorders. These have all been referred to as delivery systems. Paradoxically, perhaps, these parallels have been acknowledged more in reverse, in that video, records and cassettes have increasingly adopted the generic name of 'software'. All such delivery Systems share similar production structures and practices. There has developed a related hardware-software division across these industries and a common way in which software is marketed, especially for entertainment. Within this software player framework we are really talking about the micro as a medium, as well as a tool.

Commodore itself is a US-based multinational. Although it has considerable computer sales in America, the company always concentrated mainly on the European market. This had been true for its earlier and bigger machine, the PET. It was also true for its (relatively) cheap home machine, of interest here, the Vic20. While design took place in the USA and Japan, the British and other subsidiaries operated with some autonomy as regards how to market the product. For example, in Germany the PET had been initially sold as an industrial tool. In Britain it was quickly turned to business and education markets.

The British arm of Commodore had a specific corporate identity. They saw themselves primarily as marketers, while viewing Sinclair as more of a technologist. As we have seen, that distinction is misleading, in that Sinclair Research clearly had marketing considerations and staff to develop them. The perception really marks the difference in how the two companies were going to make a

consumer electronic. Commodore was not going to make use of the hobbyist sales base and hobbyist appeals. They had great doubts about the overall marketing success of (what they saw as) an 'intellectual' sales pitch. This still meant promoting programming somewhat; all manufacturers at that time did so, given the contemporary public discussion of the future demand for computing skills. The difference was going to be Commodore's stronger emphasis that their micro had to provide practical benefits.

Commodore's Vic20 design itself shared the same pattern as the Sinclair machines: engineering down to a marketable price point. The difference was that the Vic's baseline had to be the ability to run software, and it had to look more like the office-style personal computer. The compromise was that, like the ZX series, Commodore's machine used existing domestic electronics as peripherals: a TV as an improvised monitor, a cassette player to replace a disc drive. The Commodore micro had slightly more memory than Sinclair's machine, with the option of considerable expansion, and it had coloured display. On the other hand its appearance, with typewriter keyboard, did at least resemble part of the office machine.

Nation of gadget lovers

Right from the start, there had been considerable doubts within the firm's management and amongst its engineers about the Vic's economic viability. This was a recurring worry for all producers of the home computer. Was it so different from the personal computer paradigm that it would be seen as a toy? If so, would it sell at all? The marketers and advertisers in the UK were fairly confident that the micros could be presented and taken up as an item of consumer electronic. The accounts manager at Commodore's advertising agency clarified why:

> *The technology business in the UK changes about every two years. There's a new thing that comes on stream. Like it was video recorders, then it was colour TV5 with stereo. It's now compact discs. Home computers fitted into that at one stage.*
>
> *LH: Is that partly what helped sell them, the establishment of that pattern?*
>
> *Yes. The British culture, technological culture, is far more advanced than Germany or France or anywhere like that. This is the market that the Japanese go for first because we're waiting for these things to come. We take them very readily.*

Again, such views should be qualified. For example, video was introduced in the USA first on the grounds that it was a more important market.

Nonetheless the argument does capture an accepted wisdom found elsewhere in the industry. This is the argument that both producers and the public are mutually geared to certain categories of new technologies: if you fit a product into that general identity, there is a fair chance of market success. Britain as a 'nation of tinkerers' has a different formulation as a nation of gadget lovers'.
In fact, when these advertising staff looked back on the development of the market, they felt that this is exactly what happened with the home computer for a while:

Micros were very much a 'must have' for Christmas 1983. The video recorder market had peaked by Christmas 1983, so there weren't many buying decisions being made like 'Do I have a video or do I have a home computer?' Anyone who had wanted a video had probably hired it; not many people bought them. So they'd got this, and they'd got the colour TV.

Shifting the boxes

If we now look at the approach that Commodore took, we find that firstly these marketers had had very similar plans to Sinclair's about high-street retailing and mass media advertising. The difference in advertising lay in even greater avoidance of technical jargon, while specifically listing benefits and describing contexts of use rather than focusing attention on the technical qualities of the machine.

Like Sinclair Research, the Commodore team sought to make the transformations needed in order to attain the perceived qualities of a consumer electronic. As one manifestation of these efforts, soon after the initial launch they moved to selling packages which included the Vic, beginners' software and tape recorder. These innovations were not just an attempt to attract the end-user. As the marketing manager for the Vic explained:

You have to keep it as simple as possible. That's why we actually developed certain software like the 'Introduction to BASIC' and those kinds of things. And that's why we quickly put it into a set, because [retailers) want to sell a box, they're box shifters. I had to make it as simple as possible for the users and the retailers.

Innovations in relation to distribution often go unnoticed. Here we see how the product configuration for the benefit of 'brown goods' and the multiple retailers was felt to be important. The commodity was being put into a form where it could be sold without the back-up support that had come to be associated with specialist outlets. The boundaries of the product had recently included services, deemed necessary owing to the intrinsic complexity of computers. The starter packs were part of the process of redefining those boundaries and the nature of the machine.

At first sight this conception of the software player, and all these attempts to implement it, would seem to avoid some of the criticisms of 'uselessness' levelled at the Sinclair machines. In principle Commodore's type of machine seemed to offer the potential of packaged uses that could be named, which could be bought as commodities and which were easily accessible. In spite of this, within a few years such computers were in the same boat as the self-referential computer. The doubts about real usefulness were all to be raised once again, especially with the rise of games-playing. But the roots of that development can be traced back to the longer history of the video games industry. This had a significant bearing on the creation of a consumer space for the micro.

THE VIDEOGAMES MACHINE

In some respects video games machines provided a model for computers as delivery systems. In their heyday of the late 1970s and early 1980s, these games machines set a number of precedents

such that we might almost consider them to be another lineage of the current home micro. A brief resume of the history of this other industry will help us to appreciate those innovations.

Video games had originated in two forms. One line of development was the arcade games. The other was that of video games played on a domestic machine. This was devised in the late 1960s as an extension of TV or an alternative use for it. In later years that was exactly the image used to promote the video games machines - that they were an 'active' use of television. As we shall see, this theme was later resurrected by the computer firms.

During the early 1970s the games technology consisted of combinations of chips on which there were fixed programs. So you bought a machine which had, say, three games on it. The next major development, first in the arcade machine and then in the domestic one, was to replace these chips by a microprocessor which could then be re-programmed. This innovation was in principle just the type of dedicated application of the microprocessor that had been envisaged by the semiconductor companies; it now created a flexible division between hardware and cartridge-based software. The games could be sold separately to run on the hardware - the key feature of the 'software player' paradigm. Such software could even be made by a separate branch of the industry. Just such a sector of video games cartridge manufacturers did arise, mainly around Atari's programmable games machine, called the 'Video Computer System'.

The larger computers and the personal micro had established the idea of a 'software-running' machine in a work context. Most likely it is video games which did most to pave the way for the computer as software player in the home. Games made the software-hardware distinction a familiar form for potential users. They created a set of retail and distribution arrangements into which computers could comfortably fit. And these products announced a form of computerized commodity which could be likened to the products of the record and video (tape) industries. Thus video games may be seen to constitute a model for computer products. Yet that is not the same as saying that computer games would be the most likely packages for the micros; the package was problematic.

We can see this if we look at what had been seen by some analysts as the firm that might lead the micro revolution: Atari. This company, the foremost video games manufacturer, actively distinguished its home micros from its main-stay product. While many within the company thought that the future might lie in some progression to home computers, they faced a particular short-term dilemma. Atari's own dedicated games machine was extremely profitable at that time. There was concern that its sales would be reduced if they and other companies came out with a cheap home computer selling on a games basis. As a result Atari devoted few resources to home computers during the early years of the 1980s. Even then the games giant used strategies - like differential pricing and marketing its computer products as educational machines - to maintain a separate identity from its video games machine. At this point Atari were not going to create a mass computer market.

For microcomputer manufacturers in general, it was by no means obvious that their own machines should be promoted to any great degree as games-playing equipment. Mapy were considering an educational identity as the best way to position the home computer; this would

provide a degree of respectability, an air of seriousness about the machine. In particular, a games machine' identity might hinder the chances of sales to the education sector.

At the same time the firms considered the 'fun' aspect important; ultimately that aspect was important in selling the machine as a consumer electronic at all. Many within the industry, including staff at Commodore, thought that leisure/ entertainment uses might eventually be the most significant line of development. The aim was always to find a balance between the fun aspects and serious ones. Sinclair had suggested the fun of familiarization and programming. Meanwhile he maintained an element of seriousness by relying on popular feelings about the necessity of learning computer skills.

However, too great a stress on games might upset the balance of the serious-fun equation. That was a risk that Commodore decided to run.

COMMODORE AND GAMES-PLAYING

In the late 1970s Commodore had bought a semiconductor firm, called AIOS Technology, which produced not only computer microprocessors but chips for video games. The Vic chip, as well as the sound and graphics chips for the subsequent Commodore 64, were originally intended for games. So Commodore's ties with the video games industry were sufficiently separate for it to have no machine that would suffer if its home computer were to compete with the existing video games machines. Furthermore, it had the expertise and technology to make the quality of its games-playing a selling point. With video games booming in the early 1980s the option to take a slice of that market looked just too attractive a proposition to miss. It became an acknowledged part of general policy to compete directly with the video games industry. Commodore's US advertisements even ran: 'Why buy a video games machine when you can buy a computer?'

'Not for playing games'

Commodore's UK strategy was more subtle. The British subsidiary had organized some initial market research. The marketing manager explained how he had interpreted and acted on the research findings in the light of his marketing perspective:

> *I then wrote down a list of the answers I would get, all right, from the research. On the one side I wrote down that we would launch it as being an educational aid, suitable for low-end business applications, for learning about programming computers and also . . . as an entertainment medium. This was very much fourth. I said that is the way we are going to launch it, and that is the way the research findings say we should have it. That is what everyone will say. That is what adults would say, that they're interested for the children. However what we should do privately and quietly is develop, like mad, all the games. Because this is what they will actually be using this for. There are two things. There is one which is called the 'justification for purchase' and the other which is the 'real reason for purchase'. The point is that it is very, very difficult for researchers to get at the real reason.*

Consumer motives may be a little more complex than this simplistic dichotomy between 'real

reasons' and 'justifications' implies. Nevertheless, from this marketing analysis the problems with overtly promoting a games image were particularly clear to him:

> *The [video] games market was booming. But the point is, unfortunately, there was a lot of bad publicity about games-playing in those days: 'kids were becoming addicted to them', etc. 'It wasn't good for you.' So obviously to launch a computer on that basis was the wrong one. That is not how to position it.*

He commented on the actual advert the agency came up with:

> *'What do you expect to gain by sitting in front of a television all day?' There was a picture of all these television screens and you had: 'You can do this. . . and you can do this and this and that. . . and by the way' at the end 'we've got chess and those kind of things' and right at the end it 5 'Space Invaders'. It was very much a throwaway, the last one. But I'll tell you what, the reason it was the last one was deliberate, because the last one is the one that people look at last. They look at it and say 'Ah!' They may not go through all the rest.*

At the same time there was intended to be a clear message:

> *'He's not playing games, he's learning the language of the future.' So we were deliberately trying to say, 'Look. This is <u>not</u> for playing games'.*

Elusive 'universal machine'

Commodore UK was therefore operating on two levels. It had accepted games as having a major role in selling micros. Yet publicly it strove to maintain the notion of the 'universal machine'. Advertising attempted to keep the two aspects in balance. It suggested that any use of the computer was in some sense active and therefore constructive, educational.

Even so, the hidden market strategy of supporting games did not find unmitigated favour with some advisers. The advertising agency acted in many ways as an extra marketing arm. And it was very much aware of the ambiguities that were to become an increasing worry in the industry. The accounts manager at the agency recalled:

> *We said that to [sell it as a games machine] would cheapen this product. It will automatically mean that it will die sooner or later because it will be faddy. This could end up just like the video games that we had taken on three years earlier. You've got to start to broaden its usage.*

Within a few years these advertisers would be arguing for the expansion of the software operation to maintain the other genres, such as educational packages, that were becoming increasingly neglected by the software writing houses. The company would soon be investigating other 'entertainment' forms to counteract the prevalent 'games machine' image. One such venture was their later promotion of music and art packages.

Of course Commodore was by no means the sole or even the main cause of the rise of games-playing. The effect of their marketing strategy needs to be put into perspective. Hobbyists themselves had always found games acceptable-although only amongst other uses. Hence companies like Acorn, who followed some of the same lines as Sinclair in the early days, always produced games for hobbyist users via their software operation.

A major influence on the production side occurred a few years later when big publishing, record and video companies entered the software field and made it into an industry organized on the same model as their other interests. This meant that software houses now produced games as routinely and systematically as these other 'cultural industries', as opposed to the relatively haphazard offerings of some of the earlier, part-time software operations. Meanwhile, active marketing of 'the latest' product guaranteed sufficient chart hits for profitability. This structure operated in conjunction with the emerging new type of computer magazines geared to leisure and entertainment, which gave far more support to games developments. The new regime had the effect of systematically promoting the games form. Such an arrangement often relegated other software genres, by default, to the fringes of the industry.

Lastly, the development of any product is not totally at the control of its producers. In the case of home micros, Lie consumers certainly had some role to play. Games packages were soon the software genre most actively taken up by home users. The arcades and video games machines had made this games use familiar. In particular, the currency of games in male school culture helped these machines to become successful.

Merely a better games machine?

As this sketch shows, the identity of Commodore's micro as a consumer electronic was continually fraught with problems. By deriving sales from implicit identification with games machines, Commodore also took on future problems. The games product's life cycle had an uncertainty that, it was hoped, a computer product would avoid. The industry realized that games did not help the computer to extend its appeal beyond certain types of user: mainly male and young. And this genre, perhaps more than other entertainment forms, was that much harder to portray as constructive. Games could very easily be seen as frivolous, just a distraction.
Today the games base of home computers still helps to sell them. But it has also contributed to directing the home micro into certain paths of development. The degree to which the home micro became an entertainment machine jarred with the intentions for it to become something more: a computer. While the dedicated games machine had a clear role, computers such as the Commodore both benefited and suffered from an ambiguity about whether it was a better games machine - and merely so.

THE MAKING OF A CONSUMER ELECTRONIC

Although this essay's historical sketch stops short of subsequent developments such as the BBC and government initiatives, we can use the Sinclair and Commodore examples to see central elements of the home computer's development.

We can understand the main forms of the micro as the intersection of their producers' conceptions and the features they thought attractive to different potential consumers as expressed in pricing, packaging and advertising. For example, the conception of the self-referential micro was first to be found in hobbyist machines. In the UK, this notion carried over into Sinclair's home machines. Meanwhile office computers set the model of a microcomputer for running software. In the British context, the different 'software player' conception promoted by Commodore had to be tempered by the price slot that was acceptable. Thus the player concept had limited application, as it lacked the option of running business-type packages. At another level, a range of product features were transformed in order to turn micros from hobbyist to business commodities and later to consumer electronics.

Thus the development of the micro was no simple evolutionary or incremental matter. The various machines were by no means the same product filtering through to diverse markets. These machines may all be microcomputers generically, sharing similar basic principles of operation, but they have fundamentally different product characteristics.

Their consumer appeal has been far broader than the question of what the devices can do, of any narrowly conceived uses. With the self-referential hobby machine, we could talk about 'use' only in the wider sense of the place it had in someone's life. There might even be a hidden history of the rise of micros in work contexts where a degree of pleasure enters into playing with the latest technology. Whether the emphasis was on the self-referential machine or software player conception, the home computer shared one aspect with the earlier hobbyist version: this domestic machine distanced itself from the image of the functional mainframes by emphasizing the idea of fun in using the micro. This was crucial for giving the product a place within the category of consumer electronic.

Balanced against this pleasure dimension of the home micro, the open-ended promise of computers generally required any product of that name to be seen as more than just a gimmick or a gadget. After all, they were supposed to enhance lifestyles and the very social order. As the micro was changed into a home electronic, it remained important to retain that image. Many in the micro industry have seen the importance of maintaining the connotation of seriousness, if only to provide a consumer justification for acquiring the machine. That attempt to maintain legitimacy is manifest in casting games in a constructive light.

One approach to providing serious uses suggested particular applications such as various forms of home filing system or personal finance management. The other involved a broader promise, an educational emphasis, given salience by a context where some form of 'computer literacy' was widely portrayed as an important investment for the future.

Some commentators now feel that the 'real' home computer market no longer exists. This may seem paradoxical when contrasted to the sales success of these machines. Such claims mean that, while micros like the new Amstrads may find customers in a particular social niche, the truly mass machine has been relegated to a games or hobbyist market. That is, the product called the 'home computer' may seem to be alive and well but its identity has allowed it to drift into a narrow path of development. After all, the earliest vision of the 'micro revolution' foresaw the

computer as part of the daily routine of the lives of a wide public. For some observers, the possibility of such a future has diminished; thus the computer's wider potential is being wasted.

Although that much-heralded 'micro revolution' involved dubiously optimistic forecasts, this essay is not intended directly to challenge them. Rather, it shows how those popular visions were one element in the marketing of home computers. What we have seen is the production process of a new home electronic: no single 'micro' but a diversity of products designed and marketed for different consumers, their appeal never reducible to a simple serious use

This paper is based on my current PhD research on the development of the home computer. All quotations are taken from interviews conducted for that research.

Many thanks to Ben Keen and members of the *SaC* Editorial Board for useful comments and criticisms.

REFERENCES

Adamson, I. and Kennedy, R. (1986) *Sinclair and the 'Sunrise' Technology: The Deconstruction of a Myth.* Harmondsworth: Penguin.

Athanasiou, T. (1985) 'High-tech alternativism: the case of the Community Memory Project', in Radical Science Collective, *Making Waves: The Politics of Communication.* London: Free Association Books.

Augarten, S. (1981) *Bit by Bit: An Illustrated History of Computers.* London: Allen & Unwin.

Freiberger, P. and Swaine, M. (1984)Fire in *the Valley: The Making of the Personal Computer. B*erkeley, CA: Osborne/McGraw-Hill.

Jones, T. (1983) 'The grand old man', *Psychology Today*, 21(3): 504.

Kaplan, A. (1977) 'Home computers versus hobby computers', *Datamation*, 23(7): 72-5.

Larsen, J. and Rogers, E. (1985) *Silicon Valley Fever: Growth of High Technology Culture.* London: Unwin Paperbacks.

Levy, S. (1 984*) Hackers: Heroes of the Revolution.* Garden City, NJ: Doubleday.

Reid, T. (1985) *Micro-Chip: The Story of a Revolution and the Men Who Made It.* London: Pan.

Shurkin, J. (1984) *Engines of the Mind: A History of the Computer.* New York: Norton.

Tomczyk, M. (1984) *The Home Computer Wars: An Insider's Account of Commodore and Jack Tramiel.* Greensboro: Compute! Publications.

Turkle, S. (1984) *The Second Self: Computers and the Human Spirit.* London: Granada.