UNIVERSITY OF LONDON

THE ROOTS AND EARLY HISTORY OF THE BRITISH HOME COMPUTER MARKET: ORIGINS OF THE MASCULINE MICRO

by

LESLIE G. HADDON

A thesis submitted at the University of London in fulfilment of the requirements for the degree of Doctor of Philosophy.

Management School
Imperial College

November 1988

ABSTRACT

The first concern of this thesis is to account for the emergence and popularity of the home computer in Britain. The roots of the home micro are traced back to both early hobbyist machines in the UK and USA and through the various lineages of interactive games. The main focus, drawing on interviews with producers, then turns to the British context from 1980 to 1983. After showing how the micro was fitted into the product category of 'consumer electronic', the thesis examines the various contending conceptions of the home computer's role. Particular attention is given to the rise of games-playing as the dominant application, although it is argued that the current games-machine identity of the home micro remains problematic and open to change.

Some commentators have suggested that the micro is a masculine technology. The second aim of the thesis is to investigate why home computers were more popular with a male audience. This question of how products are shaped in gendered terms is addressed drawing evidence from secondary statistical data, and interviews with both producers and micro users.

In analysing the history of the home micro, this thesis draws upon discussions concerning how artefacts are socially constructed through a circuit of cultural production. An additional theoretical input is provided by literature which utilises notions of technological paradigms. The third aim of this thesis is to show how these frameworks and tools of analysis may be elaborated, refined and applied to the field of consumer electronics. By so doing, it is possible to derive further research questions.

CONTENTS

Methodological Appendices

Statistical Appendices

LIST OF STATISTICAL TABLES

CHAPTER 1: INTRODUCTION

OUTLINE OF THE THESIS RESEARCH

Origins of the Project

When the first proposal for this thesis was formulated in 1983, home computers had reached what subsequently proved to be a peak rate of sales growth and of media coverage in the UK. The earliest hobby machines had originated in the US in the mid-1970s, and had been sold as mass market consumer electronics since the early 1980s. However, it was in the British market that micros attracted the most enthusiasm. The UK had higher sales per capita than any other country.

Within just a few years, home computers had apparently come from nowhere to consolidate a substantial place in consumer electronics shop displays and in the newspaper Sunday supplements. By 1983, combined sales of the vast number of home computer magazine titles even surpassed those of women's magazines (1). Meanwhile, the BBC and Department of Trade and Industry threw their weight behind a bandwagon of public interest, through the Computer Literacy Campaign and funding micros in schools respectively (2). Micros, together with computer special effects more generally, were even starting to find a place in advertising and film imagery (3).

This sudden appearance and interest in the home computer seemed to be a phenomenon worthy of further investigation. Once sensitised to this potential, I soon discovered that home computers were also a regular topic of conversation or reference amongst a range of social groups: whether this involved discussing the merits of machines, talking about plans to write software, or referring to the way in which their children were always using the new machine. Thus, some

form of popularity was being expressed in terms other than those of sales figures, and registering at other levels besides public representations.

Key Questions

This thesis emerged as an attempt to chart the early history of the domestic micro and to explain the interest which it evoked. Although it has been possible to refine these goals and to locate them within issues derived from more theoretical debates, two central questions were initially posed which have remained guiding themes ever since:

(a) How did the home microcomputer emerge as a product? This question entails asking about the micro's roots, both at an international level and as concerns the British context.

(b) Why did the home computer become popular in the UK? To answer this, I explore the nature of that popularity, including the issue of which groups showed interest in this product.

The Scope of the Historical Account

A History of Interactive Games

Following preliminary enquiries, I decided that any account of popularity should take more than a history of computer products into account. Other commodities appeared to have played an important role - especially interactive games products. By 1983, the domestic micro was predominantly used for playing computer games (4), a feature which even at that time prompted some concern as to whether the machine was being 'mis-used'.

Electronic games machines, which generically can be referred to as 'video games' machines, had existed prior to the home computer. One version of video games was the the coin-operated device which was to be found in pubs and arcades - earning it the name 'arcade machine'. The other form of video game was the product which was sold as a consumer electronic for home use - sometimes called the 'TV games' machine. To understand the rise of games-playing on the micro, it was necessary to appreciate the development of these related products. In the early 1980s, many games started to cross from a video games format to a computer games one. Apart from this link between the two commodities at the level of production, I decided to investigate how the experience of video games influenced the way in which micros were later received by various social groups.

As with the home computer, there had been little sustained research on and documentation of the origins and evolution of video games, apart from some journalistic outlines. Apart from contributing to my analysis of the domestic micro's origin, the sub-project of charting the history of games seemed to have some merit in its own right, in the light of current discussions of interactive media (5).

Post-1983 developments

Apart from the coverage of games, the other main factor which influenced the scope of the historical account related to changes within the home computer market itself. At the outset, the industry was widely regarded as experiencing a 'boom' and, with some exceptions, commercial commentators were optimistic (6). Soon after the thesis research commenced, various financial crisis (amongst other factors) led to the new perception that the 'bubble had burst'.

Yet, a contrary evaluation can be discerned. The consumer electronics firm Amstrad launched its PCW word-processor and its IBM compatible PC micro in 1985 and 1986 respectively. As opposed to

those who talked about the demise of the home micro, the low-cost Amstrad products were seen by some circles as generating a renewed interest in home computers: one which was not based on games, and one which might well bring about the real micro revolution in people's lives.

While there was some challenge in trying to assess these two competing viewpoints, another consideration justified extending the analysis beyond the 1983 time frame which had originally been intended. An assessment of the post-'83 home computer market would have some bearing on any evaluation of the whole microcomputing phenomenon. For example, if the 'burst bubble' scenario was adopted, than one could view the thesis as dealing with some kind of historical fluke, a product that had its brief, dramatic moment and then disappeared into obscurity. Alternatively, if the Amstrad products were seen as leading the way to a renaissance in home computing, then while the early history may have been somewhat of a false start, it was nevertheless played in important role as part of a longer term trajectory.

Thus, an analysis of the closer contemporary scene would cast light on the nature and relevance of the earlier history. Conversely, appreciating the earlier development of the micro and the genealogy of current products might well have some bearing on our evaluation of present day trends. With this in mind, the major part of the account deals with the development of the micro and of games up until approximately the end of 1983. Then, a separate historical chapter covers subsequent developments up until the present time of writing.

Frameworks and Tools of Analysis

Cultural studies provided the broadest overview from within which to approach this history of the micro. A first step in deriving some

wider theoretical framework was to conceptualise the object of my study as being the production and consumption of the home computer as a cultural form - (this term will be discussed presently). Posed in these terms, Johnson's paper discussing the object of cultural studies research offered a starting point for asking about the elements which might constitute this particular cultural form (7). His description of a circuit of cultural production could also serve to draw attention to and theoretically locate the different types of cultural studies (and other) analyses which could be brought to bear on the micro as cultural object.

Other bodies of writing which had to be given some consideration were the economics, sociology and history of 'technological' innovation. These disciplines have specifically given some attention to the design and production of artefacts with features which were similar to those possessed by the micro - eg containing electronic components. On the one hand, engagement with these bodies of literature was never a central goal of the thesis, although certain implications are drawn about some of their approaches and assumptions. We have already noted that the project originated not from some theoretical discussion of technology, but from a curiosity about the appearance of the micro product and its subsequent popularity. Furthermore, when I introduce critical debates relating to the micro, these are based in areas which are more familiar and salient for me than are some of the existing writings on innovation.

On the other hand, by discussing these theories of technological innovation, we can derive a springboard for choosing some of the features which the historical account should possess. Although there has been fairly little research specifically on consumer electronics, as we shall see presently, some of the questions posed and some of the conceptions utilised in previous historical case studies can provide a basis for formulating useful tools of analysis.

Lastly, a further sub-theme of this thesis is to develop both the framework and tools for examining so-called (domestic) 'information

technology' products. This task commences here in the introduction where I show the shortcomings of applying available intellectual resources to the particular subject area of home micros. From this process, it is possible to elaborate those theoretical frameworks and tools which the thesis will employ. Then, in the conclusion the analytical apparatus is again reconsidered and refined in the light of the home computer history.

Home Computer Issues

The final part of this preliminary outline deals with the issues and debates in relation to which the home computer has been cited. A range of critical arguments referring to the micro have lent significance to the home computer, structuring the way in which the artefact may be viewed. For example, some writers have cited the micro as an example of a commodity which facilitates the privatisation of everyday life. The home computer, from this stance, is yet another good enticing us to home-centred 'leisure', and thus isolating households from more communal practices (8). Meanwhile, other commentators have feared the 'compulsive' nature of computers (including electronic games), which may enhance our experience of being adjuncts to machines (9).

To confront such critical claims would have the merit of giving more salience to the history. A problem with this strategy is that there are too many possible issues with which to engage. Each assertion would need initial exposition, argument and the marshalling of evidence - which constitutes enough work for several theses. Therefore, where points are raised in the main narrative which have implications for critical comments such as those noted above, there is only space to address these issues as side references or as footnotes.

However, there is an issue which is clearly pertinent to the original questions posed about the home computer. Given that the thesis is concerned with the nature of the popularity of the domestic micro, one question which I have found striking was that of why more 'interest' appears to have been shown in this artefact by males (10). This gender issue is the final sub-theme of the thesis.

Partial answers to this question are implied within various feminist discussions concerning both 'technology' and gender and the nature of computer games texts. These feminist critiques require some explication in the introduction in order to appreciate the significance of the gendered nature of popularity. Unfortunately, there is once again a problem of containing the range of issues which the thesis can reasonably be expected to cover. As we shall see, some lines of analysis are prioritised in the main narrative and given more evidential backing. Other concerns have to remain more peripheral, where I simply supply a few observations and suggestions concerning further avenues of investigation.

Plan of the Introduction

1) The preliminary outline has already covered the reasons shaping the project's focus on the roots and popularity of the home computer and of interactive games. In the next chapter on methodology, I discuss more details concerning how this research was conducted.

2) The following two sections of this chapter expand upon the theoretical frameworks and tools of analysis which are utilised in this project. First, there is a description of Johnson's 'circuit of cultural production', followed by an examination of the possible implications of this framework for my analysis of the home computer product. Some elaboration of the circuit is required as this very generalised overview of cultural production is applied to a particular sphere of everyday life.

The second section examines certain key themes in the literature on technological innovation. I indicate how we might conceive of 'demand-pull' and 'technology-push' approaches in the light of the cultural studies circuit, and then discuss the notion of 'technological paradigms'. We can then explore links between the merits of this latter approach and some of the overarching conceptualisations which historians have applied in particular studies of innovation. The outcome of this discussion is a tentative analytical tool which I refer to as an 'artefact conception'.

3) Finally, we proceed to a discussion of gender and the home micro. This initially involves noting those commentaries which have pointed to the micro as a 'masculine' artefact - although such views have to be considered with some reservations. Next, I briefly review some of the other gender issues which could be examined before elaborating the relevance of the particular set of questions posed in this thesis. Concerns about female 'access' to new technologies have lent significance to the question of why there should be greater male usage or interest. Yet, this way of structuring issues around gender and technology has received considerable criticism from other feminist quarters.

In the latter part of the section, I proceed to consider those analyses which characterise the notion of 'technology' as itself constituting a representation. This will be one key theme in the main historical account. Hence, some of the main questions concerning the theme of representations are formulated at this point in the project. The other central theme relates to computer games as texts. I outline some of the writings on this topic and, once again, derive the focal questions which will structure the main historical narrative.

4) The introduction ends with an overview of the thesis which specifies the ground covered by each subsequent chapter.

THE CIRCUIT OF CULTURAL PRODUCTION

In the paper 'What is Cultural Studies Anyway?', Johnson sets out to characterise the nature of cultural studies. At one level, he discusses methodological points concerning the different types of cultural studies research. These will be elaborated further in the next chapter. Of more direct relevance in this chapter is his emphasis on the qualities of the objects of cultural studies. Key elements of Johnson's diagrammatic representation of the circuit of production, circulation and consumption of cultural objects are given below (11):

Texts

Production Readings

Lived Cultures

The cultural objects which can be analysed in relation to this circuit are wide ranging. The include, for example, various media products, social movements, public rituals - and even consumer durables (12). Johnson briefly illustrates how a cultural object might be analysed in relation to this circuit with his example of the Mini Metro car (13):

'I choose the Mini-Metro because it was a pretty standard later twentieth-century capitalist commodity that happened to carry a particularly rich accumulation of meaning. The Metro was the car that was going to save the British car industry, by beating rivals from the market and solving Leyland's acute problems of industrial relations. It came to signify solutions to internal and external national threats. The advertising campaigns around its launching

were remarkable. In one television advert, a band of Mini-Metros pursued a gang of foreign imports up to (and apparently over) the White Cliffs of Dover, whence they fled in what looked remarkably like a landing craft. This was Dunkirk in reverse with the Metro as nationalist hero. Certainly there are some forms - nationalist epic, popular memory of World War II, internal/external treat - that I would want to abstract for further, formal analysis. But this raises interesting questions too about what constitutes the 'text' (or raw material for such abstractions) in these cases. Would it be enough to analyse the design of the Metro itself as Barthes once analysed the lines of the Citroen? How could we exclude the adverts and garage showroom displays? Shouldn't we include, indeed, the Metro's place in discourses upon national economic recovery and moral renaissance?'

Johnson's discussion highlights the way in which the Metro as a cultural object consists of far more than just a physical artefact: in particular, the approaches of cultural studies are sensitive to the symbolic meanings of such commodities - or more specifically, these objects can also be read as texts.

In fact, it might be more appropriate to consider the Metro cultural object as being constituted by an ensemble of interrelated texts. Apart from aspects of the physical car itself - as noted in the comment about its design - Johnson mentions the representations of the Metro in adverts and through the displays in the showroom. He also points further afield to the pronouncements of other agencies such as Government spokespeople. While Johnson is concerned in this passage to suggest how all these representations can be subjected to textual analysis, he addresses elsewhere the issue of how we can also turn our attention to the earlier moment in the circuit: to the processes by which these texts are produced (14). Continuing the above passage, Johnson proceeds to the question of how these texts are read by various social groups, as opposed to the range of possible interpretations of these texts which professional analysts could derive.

'Supposing that we answered these questions affirmatively ... there would still be some unposed questions. What was made of the Metro phenomenon, more privately, by particular groups of consumers and readers? It would be unwise to infer this from public representations. For one thing, we would expect great diversity of response. Leyland workers, for example, were likely to view the car differently from those who only bought it. Beyond this, the Metro (and its transformed meanings) found some kind of lodgement in the ways of life and subjectivities of those groups for which it had salience. It became a way of getting to work or picking the kids up from school. But it may also have helped produce, for example, orientations towards working life, connecting industrial 'peace' with national prosperity.'

Here, Johnson is emphasising how 'consumers' or 'audiences' are not passive in their interpretation of texts or in their use of artefacts (15), but produce meaning for themselves. The lived culture experienced by different people is structured by the social relations of gender, age, race etc but also by other influences within their milieux. In the example above, working for BL would be one factor which might well shape the way in which employees read these texts. Meanwhile, Johnson's last point illustrates the way in which this cultural production is indeed a circuit. He gives the example of how readings can then enter into and become part of lived culture, reinforcing or changing orientations. We might, in addition, broaden his point away from the emphasis on 'texts' by suggesting how artefacts entering the home can be used in such a way as to promote new patterns of social relations, or perpetuate existing ones.

Finally, the circuit is complete when lived culture provides some of the new 'raw' material for further production (16). Although this theme is not developed in the quotation which has been selected here, Johnson later argues how producers are also engaged in the process of 'reading' cultural practices - through such means as market research - and of drawing on elements from these experiences when constructing further texts.

Products and Production

When conceptualised within this framework, cultural objects entail far more than the 'products' referred to in the economics and technology literatures. In the latter writings, which we shall be discussing presently, a 'technological' product is usually considered to be merely a physical object, a 'black box', or a gadget. In contrast, we could derive from cultural studies or related fields (17) a broader definition of what constitutes a product and of who count as being producers.

In fact, both marketeers and many journalists already acknowledge the fact that there is more to products than physical artefacts. Trade slogans such as 'Advertising is the Product Too' exemplify this viewpoint (18). From such a stance, marketing, PR and advertising are not simply processes which are somehow 'tacked on' after the 'real' product - the black box - has been developed. Instead, the practices of these agencies both within and outside the firm form an integral part of production.

We have already noted that the car-as-a-physical-object can be scrutinised as a text at the level industrial design (19). What is neglected in the Johnson account is the way in which features of the Metro's very operation, the way it functions and its facilities, are also elements of the car-as-text. In other words, we should not lose sight of some of the traditional design concerns within the technology literature, such as questions concerning which features are prioritised in technical development.

Once we have adopted a broad conception of products and producers, a corollary is that 'innovation' consists of more than those improvements which are introduced by R&D staff. There can also be innovation in terms of the other dimensions listed above. For example, when considering the development of the home computer I ask what innovations were entailed when the early hobby microcomputer

became a consumer electronic. As we shall see, these innovations involved changes to the product across the board: in functions, in appearance, in the channels through which the product was marketed, in the adverts and in the very image of hardware companies themselves.

A further issue which is not specifically tackled within the Johnson example is the question of how other agencies, even within the automobile 'industry', may have produced texts relating to the Metro. For example, car magazine publishers would presumably have been a source of representations of British Leyland's new automobile. It is also conceivable that the firms producing accessories mobilised their own images in advertisements. In the case of the domestic micro, the corresponding agencies would be the home computer press, software publishers and firms making computer peripherals. Thus, we could conceptualise the home computing 'industry' as consisting of a set of producers with interlocking and symbiotic products, all of whose output could be taken into account when analysing the micro as cultural object.

Lastly, Johnson indicates how representations of the Metro originated from agencies outside the car industry. There are clear parallels in the case of the microcomputer. The State, especially in the form of the Departments of Education and of Industry, appears to have played a clear role in underwriting the popularity of the computer through its pronouncements and through its funding of and support for micros in schools. The BBC gave a high profile to this product through its Computer Literacy Campaign. Lastly, a whole range of 'futurological' books and articles appeared in the early 1980s. These portrayed the micro within a vision of the forthcoming high tech home. There would thus seem to be a wide range of texts to which we could devote research in any study of the home computers.

The role of consumers

One of the themes which the main historical account develops is the role which more optimistic commentators, such as 'post-industrialists', had attributed to new information technologies. At this point in the thesis, we can observe that there is a certain technological determinism behind their view of the 'impact' of these commodities on society, and on everyday life. More critical analysts have shown concern about products such as the micro being the latest goods being foistered on us by a capitalist and patriarchal society. The specifically feminist concerns will be discussed later in the introduction. Meanwhile, some Marxist writings have pointed to the rosy, ideological nature of the future which is portrayed in images of high tech, while at the same time expressing the already noted fears that computers may constrain our creativity and narrow our line of thinking (20).

What these writings share is a focus on the possible influence - at diverse levels and in different forms - of artefacts such as home computers, as products to be used and as texts. Such questions are justified. How can products help to shape experience? How can they effect practices and social relations? Or how might texts operate ideologically - what are the 'preferred readings' which the audience is offered? How might these texts construct us as users, or as consumers (21)?

However, what Johnson's work and other debates within cultural studies point to is the way in which we also need to be attentive to the degree of autonomy of readers and of users (22). People make meanings, they do not passively receive them. This aspect can be easily overlooked when - as above - the dominant concern stresses the forces which shape consciousness and structure the options open to us.

The active role of 'consumers' has been emphasised especially in studies of lived culture. Early analyses of subculture drew attention to the way in which mainly male youths appropriated elements of mass culture, and utilised commercial products in unexpected ways, transforming these commodities and images so that they fitted into the youths' own repertoire of style (23). More recently, analysts have started to trace cultural forms across the different moments of the circuit. In terms of following a literary genre, analysis of the 'romance' theme within magazines which are aimed at young girls and women was complemented by studies of the meaning of romance within the everyday lives of these teenagers (24). Meanwhile, in terms of news media, a textual analysis of a 'Nationwide' programme was followed up by a study of how these texts were diversely interpreted by different audiences (25). Both these lines of analysis demonstrate how we need to take into account the constructive work of audiences.

Yet, this does not mean that we should look only for some sign that audiences reject the readings offered by texts or else utilise products in novel ways. Even where company strategies <u>seem</u> to 'succeed' - where people either buy products, use them in the ways intended, or reiterate the representations being offered - we still have to appreciate that this is so because those products or texts somehow fit into the on-going activities, relations or orientations of these social groups. So when we address the question of the popularity of computers, it is legitimate to go beyond asking about the tactics of producers and investigate the set of understandings, experiences and practices of those who have shown interest in this artefact.

The home computer as a cultural object

The above discussion draws attention to potential approaches through which we can study the home computer as a cultural object: principally through introducing a broad definition of products and producers and through stressing the importance of consumption as well as of production. Unfortunately, it is not practicable to conduct such a wide-ranging analysis within the scope of one project, and certainly not within the constraints of Phd resources. Mapping the field has served to locate the particular project choosen and to show its limits within the range of possible strategies. In this final part of the section, I indicate the priorities of this historical account.

The initial question concerning the popularity of home computers entails at least some consideration of consumption. With that proviso, it should be noted that my research will be mainly a production based study. Not only are production initiatives important in any appreciation of popularity, but this production focus is clearly most salient for addressing my other initial question concerning how the home computer originated.

Furthermore, the producers who receive central interest are those within the microcomputer 'industry'. While some attention has to be given to the role of the State and of the BBC, due to the significant interventions of these bodies, the main emphasis is on the commercial sector which initially established the micro as a consumer electronic. While the hardware firms may have instituted many of the earliest and core innovations, initial research suggested that the software and the magazine industry have played an important part in the ways in which the home computer was experienced. This justified the inclusion of these particular producers in the analysis.

Clearly, Johnson's paper provides only very wide-ranging generalisations - albeit backed up with examples - concerning how

the research of cultural objects may be conceptualised. His piece is not intended to be a blueprint for examining 'information technologies'. It is true that his paper offers a good deal of methodological guidance. Yet, once we start to apply the overview of a circuit of production to the question of understanding the emergence of a specific product such as the micro, it becomes necessary to introduce even more considerations and complexity. Through reflection on the historical account in the conclusion, I develop these research questions, approaches and conceptualisations still further.

THEORIES AND HISTORIES OF TECHNOLOGICAL INNOVATION

There is relatively little work, even within the innovation literature, concerning new domestic products. This arises from two trends (26). First, analysts in this field have paid more attention to capital goods than to consumer ones. Second, there has been an emphasis on incremental improvements to existing products and services - especially concerning how to cut costs of production and delivery - rather than on the development of new products. Many commentators thus talk of process innovation, thus indicating innovations in the process of production, rather than of product innovation.

Two main approaches which underlie various economic theories of product development are 'demand-pull' and 'technology-push' based analyses (27). While it is not intended to examine all the criticisms levelled at these approaches, we can note some of the key problems with their main assumptions.

Demand-Pull analyses

The demand-pull theories reflect the main themes of neoclassical economics in that they stress how changing patterns of consumer expenditure act as a signalling mechanism to entrepreneurs. The latter somehow perceive how consumption patterns indicate potential demand for new goods and attempt to supply appropriate products. This set of assumptions concerning the way in which innovation takes place is echoed outside academia by the marketing press in the form of advice rather than analysis. Many of these journals urge producers to discover the potential preferences of consumers, and to be attendant to the wants and needs of their customers as the formula for success.

Even critics within the innovation literature point out that it is by no means clear how firms arrive at a perception that there is potential demand for new products. In addition, while some versions of this demand-based analysis note that as companies perceive potential demand they actively direct which products should be researched and developed, more usually this form of analysis portrays such initiatives as being more automatic and merely reactive to the demand of the sovereign consumer (28).

To translate this point into the terms of the circuit of cultural production, this neoclassical economics approach characterises producer readings of one narrow aspect of 'lived relations' (spending patterns) as a relatively straightforward and unproblematic interpretative process. Instead, we would want to ask both how these producers may be more creative in arriving at those readings and also what factors, including the history of past products, may somehow structure interpretations of potential demand.

Technology-Push Analyses

In contrast to demand-pull approaches, technology-push analysis posits science and technology as having an autonomous dynamic which throws up potential products through its own logics of research. Firms then market these technologies as products, sometimes having to take a little more initiative in terms of finding applications for devices at first which seem to have only a vague potential for consumer use. A possible example which would be pertinent to the concerns of this thesis would be the way in which the military and then space research initially promoted the development of basic chip technology. Technology-push analysts would then point to the role of later entrepreneurs who developed the domestic products which applied these technologies.

As we shall see, many accounts of the micro have heralded this product as an example of technology-push: of a technology developed by hobbyists which firms then tried to convert into a useful consumer product. However, critics of technology-push have suggested that technology does not usually develop in such a vacuum from wider economic considerations. We would want to ask how technical staff produce readings of existing consumption which anticipate potential products. In addition, commercial R&D departments often do not have such a free hand to conduct research, so we would need to consider the degree and forms of direction given by other sections of firms.

Technological Paradigms

Within the innovation literature, one influential attempt to theorise the factors which structure technical development is the notion of 'technological paradigms'. The originator of this concept, Dosi, describes his endeavour as being an application of the idea of

paradigms which Kuhn initially formulated in relation to the philosophy of Science. Dosi comments (29):

'..a technological paradigm (or research programme) embodies strong prescriptions on the directions of technical change to pursue and those to neglect...The efforts and technological imagination of engineers and of the organisations they are in are focussed in rather precise directions while they are "blind" with respect to other technological possibilities...At the same time, technological paradigms also define some idea of "progress".'

Dosi admits that his analysis constitutes only a partial application of Kuhnian frameworks, and that the definition of a technological paradigm is even looser than that of a scientific one (30). As Keen notes, Dosi is generally uncritical in his application of Kuhn's work, not addressing some of the problems raised in debates about the original formulation of scientific paradigms - for example, concerning the difficulties which arise in drawing distinctions between normal and revolutionary science. Nor does Dosi attempt, in any sustained way, to explore how new paradigms emerge, how some come to dominate others, or how paradigms relate to interests which might be invested in them (31).

Yet, Dosi's approach contains a core element which may be worth further consideration. He addresses the issue of whether frameworks emerge - influenced by economic 'demand' amongst other factors - which structure the paths of research, procedures and the technical problems for which solutions are sought. To illustrate his argument, his own case study of the semiconductor industry points to the rise of paradigms which steered technical innovation in the directions of miniturisation, of improved speed, of reliability and of decreasing the production costs of chips (32).

A key point of Dosi's analysis is that paradigms can develop their own inertia. In the case of semiconductors, while military and space agency requirements shaped initial trajectories of innovation, the

paradigm in which chips were developed continued with a momentum of its own even when marketing circumstances had changed (33). Although Dosi appears to be centrally concerned with the activities of technical staff, he recognises that paradigms shape the decisions in other departments of firms besides that of R&D. This would fit in with the wider view of what constitutes a product which is being employed in this thesis. I would also want to ask about the broad frameworks which may structure other aspects of product development besides the technical shaping of artefacts.

Historical Studies

Some historical studies have generated a notion related to Dosi's theme, in which broad visions of a trajectory of innovation have shaped product development. Although the characterisations employed in these accounts are not elaborated into a theory of innovation in quite the same way as Dosi's work, these case studies provide possible guidelines for approaching a history of the micro.

Several historians have noted that the telephone was originally conceived within a 'telegraphy' model of sending messages or information from one point to another (34). This contrasts with the now dominant 'telephony' conception, whose principle feature is instant two-way communication. Specifically, the telephone was developed as a musical or harmonic form of telegraph. However, within that overarching vision of telephone's telegraphic function there were doubts about the usefulness of this experiment, since the phone left no permanent written output.

The history of the telephone is also of interest because this artefact was later taken up within a 'broadcasting' framework. There were experiments in which the 'pleasure telephone' was used to 'pipe' music and news to public places, especially for paying audiences.

The broadcasting conception shaped the form of technical innovation for some time, prioritising efforts to perfect one-way transmission.

Another example of the different general conceptions which can lie behind newly emerging technological forms is provided by the history of radio. As with the telephone, this service was developed initially within a telegraphy model for maintaining contact with shipping. Within a short time, amateur enthusiasts adopted the radio for establishing point-to-point communication in what might be seen as a more telephonic model. This 'ham' tradition still exists. Only after the basic technology had existed for a few years was radio developed by large corporations as a predominantly broadcasting medium (35).

Artefact conceptions

There are dangers in overusing the word 'paradigm' so that it encompasses diverse bodies of theory. To avoid these pitfalls, this thesis will refer to the above overarching frameworks of the historical examples as being 'artefact conceptions'. The difference in emphasis between these accounts and Dosi's work lies in the fact that broad concepts such as 'telegraphy' captured the functional roles through which producers conceived the technologies which they were developing. Historians have also paid more attention to other aspects of the products besides technical development, and to contending artefact conceptions. What these accounts share with Dosi's approach is that they describe how general frameworks can shape the paths of technical research and innovation.

A last example of how some notion of artefact conceptions has been employed is provided by Ben Keen's analysis of the history of video technologies (36). Keen describes how the technology for recording pictures was initially used within broadcasting companies to facilitate the control of their output. However, a number of different and competing conceptions soon arose concerning how such a

product might sell as a consumer good. One set of policies were framed within a vision of the video as a medium for distributing various types of what we now call 'software'. The key, but not the only, line of technological development within this artefact conception was that which was based on the video disc.

Meanwhile, other companies were successful in initially establishing video within a 'time-shifting' conception. Here, video tape technology gave consumers control over the way in which they viewed television broadcasting output. Lastly, there was a third conception whereby VCR technology could be used in conjunction with cameras to promote video as a 'home movie' medium. In all cases, Keen provides examples of how the general framework influenced the R&D programmes of the firms involved.

The decision to refer to artefact conceptions in the study of the home computer was not taken prior to empirical investigations, but arose during the course of research. This notion provided a useful way to characterise the patterns of development which emerged. Inevitably, artefact conceptions remains loosely defined, and at this point the term has mainly been evoked through the illustrations given above. Being principally an historical narrative, the thesis will not attempt develop any rigorous theory around this notion. However, we will return to reflect on this concept in the conclusion, as part of more general process of drawing out possible guidelines for the future research.

THE MASCULINE MICRO

A sub-theme of the thesis concerned the question of why the home computer appears to have attracted more 'interest' among males than females. Given that the emphasis in the project is on an analysis of production, we can formulate the issue in terms of asking which qualities of the home product have encouraged or facilitated this

greater popularity among men and boys. In fact, a number of writers have already implied that we should look to the home computer as a text and examine its conditions of production. Cockburn notes that: 'When a computer arrives in school boys and girls are quick to detect its latent masculinity' (37). Zimmerman describes these machines as being 'built by male engineers in their own image' (38). Thus, we might characterise part of this project as being an investigation of the nature and origins of the 'masculine micro' (39).

Observations such as those cited above can, however, be overstated. In the case of home computers, it is true that hardware production and games programming employ a mainly male workforce. But once we adopt a wider view of production - taking into account design, marketing, advertising, etc. - we start to find some of the women who are involved in this industry. Indeed, the home computer magazines, which cater for a male audience, employ a considerable number of women journalists, even if they still constitute a minority of all staff (40).

Conversely, if we consider other products which are aimed principally at female audiences - such as cosmetics, foods, and kitchen appliances - we find that there are many men employed not only in all aspects of production, but specifically in product conceptualisation. These observations demonstrate the general point that we cannot from the outset draw conclusions concerning why products are of a certain form simply from noting a few features of the production process. While there may prove to be understandable connections between the form of products or texts and the processes by which these are produced, these links need to be investigated and not asserted too prematurely.

A second reservation about sweeping statements arises from any initial overview of the way in which home computers are used. Indeed, most statistics consistently have shown more usage by males. These data justify pursuing the initial question about the masculine micro. Yet, there have always been a significant number of women and

girls who use these machines (41). We can juxtapose here an observation which emerged in the course of this research that amongst producers and in everyday conversations about micros, there is often an assumption that virtually all interest is male. This supposition, which even appears to creep into the writings of the more critical commentators noted above, is simply not justified. Hence, the assumption about the degree of greater male use requires some investigation in its own right. Why is this male interest more 'visible'?

Of course, the everyday term 'interest' is theoretically loose and itself needs to be elaborated. 'Interest' is utilised in this introduction as an umbrella term which can refer to a range of relationships which people can have to the home computer product. On the quantitative side, we can start to relate this idea of 'interest' to measures of usage, to the preferences which people express, to their readership of magazines relating to micros or to participation in events organised around this product. Beyond that, we need a far more qualitative analysis of the experience of micros - and perhaps the different gender experience of these machines - which cannot easily be revealed by such statistical data.

Other Gender Issues

It should be made clear that the question of difference in popularity of micros between males and females is by no means the only gender issue in relation to which we can analyse home computers. For example, one could ask about the implications of micros in the home for domestic practices and social relations. The literature on the history of domestic technologies has pursued exactly this theme, examining how the design and marketing of new products have helped to construct housework as an activity and to structure the experience of women within nuclear families (42).

When we turn to current developments around unpaid labour, several writers have explored the range of activities, such as women's 'consumption work', which can be effected by technological change (43). Zimmerman specifically extends this theme to consumer electronics, arguing that these products have at least as much potential to worsen women's domestic experience as to improve it. As an illustration, she points out the new information management chores may well expand the housewife's role in a way which could counter any potential savings in her travel time (44).

Other gender issues could be explored by conducting a more textual analysis of publications relating to the field of micros. For example, the specialist home computer magazines would appear to provide a potentially rich field for investigating how representations of 'masculinity' and 'femininity' relate to those of 'technology'. While representations of early micros in the computing press are briefly discussed in this theses, this area is not as developed as it could be (45). Specifically, advertisements for the home micro have been frequently cited as being a source of somewhat stereotypical representations of gender relations (46). Although these particular texts remain peripheral to the main thrust of my analysis, the adverts receive some attention in the later chapters. The point I wish to make here is that analysis of this dimension of home computing could be developed as a project in its own right.

The above examples show that the decision to focus on possible differences between male and female interest is only one emphasis within a nexus of potential and interconnected questions which could be asked about micros and gender. Such an emphasis is clearly an elaboration of the concern with the popularity of home computers which initially helped to prompt this whole research programme. In effect, the thesis examines one aspect of the nature of that popularity. But in addition, this theme of differential gender usage and interest has been given further relevance by virtue of being defined as an 'issue', especially within educational circles. In the

next section, I critically examine the way in which gender and micro has become such a 'policy concern'.

Gender and 'Access' to New Technologies

Many of the home computer ads have played on the fear of being 'left behind' in the march of progress towards some post-industrial society in which new information technologies are of central importance (47). In particular, some commentators have expressed the concern that it may specifically be girls and women who are bypassed by this computing revolution. At one level, this concern is framed by the wider issue of there being fewer girls who study science and technology in general. Thus, writers in journals such as 'New Scientist' fear that girls will be under-represented in the field of computer programming (48).

Taking a broader view, others have argued that girls should learn computing skills because these will somehow become significant within a whole range of newly emerging labour markets, as well as into other walks of life (49). When this fear about being 'left behind' has been expressed in class terms, we find the characterisation of a growing dichotomy between information 'haves' and 'have nots' (50). This same line of argument appears to be implicit in pleas for parents to invest in home computers for the future of their daughters as well as of their sons (51).

What these formulations of the concern about women and girls share is an underlying conceptualisation of the problem: it is one of 'access' to the new technology. Within this consensus, the barriers to access which are discussed remain diverse. Some writers stress the unfamiliarity of technology for many women, some refer to gender stereotyping, while others emphasise the appropriation of these technologies by males. Often, several factors are cited to form almost a list of explanations concerning differential gender usage of

micros. The educational version of the problem of access presents such arguments at their clearest when discussing how school policies can give girls more opportunities in the classroom (52). But, the same points are also voiced in relation to the educational benefits of computers in the home. Indeed, this question of access has had some bearing on the issues which have become defined as research problems. For example, the Centre for Mass Communications Research addressed this differential interest as an issue in its study of the everyday use of new technologies (53).

The problem of access can first be challenged on its own terms: the question of 'skill' acquisition (54). The home computing experience which has the clearest link to a labour market skill is that of programming - although even here some educationalists claim that programming micros in BASIC at home and school does not develop good practices for later employment (55). This point aside, the limited number of jobs where staff engage in some form of programming does not really justify the degree of concern which we find about children in general lacking programming skills for the future.

Once the argument shifts so that a more general 'computer literacy' is important for emerging labour markets, the 'skills' required in the future can become so vague that it is difficult to make any simple judgement about what contribution the home micro actually makes. What is it about using micros which is going to help us at work? Or, to turn the argument the other way around, there may be a variety of experiences in the home which in some way provide a basic familiarity with new technology processes that are later encountered in the workplace. In which case, why should using the home computer be singled out as being particularly special? For example, if word-processing becomes one of the most common uses of new technology in paid work, then is the experience of using typewriters the most useful skill which can be developed in the home? Or if the ability to pre-plan sequences of operations will be important at work, then a host of programmable goods from calculators to microwave ovens can provide familiarity with this 'skill'.

More significantly, this very goal of 'access' to experience of new technologies has been criticised by a range of analysts who point to the ideological nature of representations of the post-industrial society and of notions of continuous 'progress' (56). Feminist writers, in particular, have rendered problematic the way in which males embrace technology and technical change. Instead of accepting the problem as being one of access, some commentators have questioned whether women should also 'leap onto the technological bandwagon' (57).

Without necessarily evoking essentialist definitions of gender, feminist writers have argued that the current experience of women can make them more down-to-earth and sensitive to aspects of social relations, whereas men's romantic relationship with technology can lead to a blindness to some social issues. Cockburn refers to this theme when discussing the place of technology as part of a male orientation to 'transcendence' (58):

'*(Transcendence) means escape from the earth-bound and the repetitive, climbing above the everyday. (For example) it means putting men on the moon before feeding and housing the world's poor...*'

Here the glamour of space technology is given as an example of an appeal which distorts male priorities. A sentiment of 'immaturity' in male fantasy relations to technology is also captured by the connotations of the slogan 'toys for the boys', which is evoked especially in the context of discussing masculinity and nuclear weapons.

At the level of domestic social relations, these critics have also noted how male involvement with technology can serve as a means to escape from the mundanities and difficulties of everyday existence. Noting de Beauvoir's comments that "women...wallow in immanence" Cockburn remarks (59):

'There is a Dr Frankenstein in every work-obsessed engineer...entranced in his masculine project he knows no greater dread than being stuck in the kitchen sink up to his elbows in immanence.'

Meanwhile, picking up on the feminist analysis of the female hidden labour behind male intellectual endeavours, Cockburn points out how that escape from the 'hum-drum' leaves women performing in various capacities the tasks that underwrite male pleasures. She comments on the women who appear fleetingly in the Kidder account of a minicomputer designers, "Soul of a New Machine" (60):

'There are the wives at home, carrying the world on their shoulders to free their men for the great project.'

Added to these themes are further lines of arguments that relations to technology can form a basis for male identity and bonds between males which support a patriarchal society (61). Thus, instead of women being 'left behind', we can start to see how techno-masculinity may itself be a central cause for concern.

To acknowledge these criticisms does not mean that we should be totally dismissive of arguments about women and 'access' to technology. Indeed, writers such as Cockburn still maintain this concern. However, the above points imply that neither should we uncritically embrace the suppositions lying behind various policy orientated debates concerning gender and micros. In this thesis, the feminist criticisms of males and technology will provide a backdrop as I investigate the popularity of home computers.

'Technology' as a representation

Several writers on the theme of gender and technology have questioned whether there is any definitive basis for designating an artefact as being 'technological'. Instead, these analysts draw attention to the use of this term as a label. Here, Linn draws the contrast (62):

'Why, for example are the chemical processes, stainless steel tools and electrical gadgetry of hairdressing not often seen as technology, when television repair is associated with technology? And yet, relative to the routinized procedures of TV repair men, hairdressers need to exercise more decision-making and problem-solving in their work. Consider two workers in factory: one operating an industrial sewing machine, one an industrial sanding machine. Only the latter is seen to be working in a technical area. (Thus) men's work is often defined as technical, (and) technical work is often seen as men's work.'

Such examples serve to illustrate how definitions of what counts as 'technological' are often linked to masculinity. In this particular article, Linn then proceeds to give examples of how these definitional processes operated within the Technology Network in which she was active. For example, Linn notes how a printing project which was run by a female member of staff was not seen as being technological work even by some of the 'progressive' VIPs who were visiting. In addition, she outlines some of the processes by which particular equipment came to be designated as being 'technical' and thus in the realm of male staff (63).

Even when some artefact has been represented as being a 'technology', there are still further questions concerning the exact imagery which is employed - for example, what type of technology is being represented? On this theme, Game and Pringle outline some observations from their studies of various workplaces. Strictly

speaking, these analysts are discussing how the activity of 'work' is represented, but some of the dichotomies which they note could equally well be rephrased to characterise the way in which workers represent 'technology' (64):

'..the sexual division of labour operates on...a series of polarities which are broadly equated with masculinity and femininity. The most obvious distinction is between skilled and unskilled work. The other main ones are: heavy/light, dangerous/less dangerous, dirty/clean, interesting/boring, mobile/immobile. The first of these pairs is held to be appropriate for men, or men are assumed to be better at it.'

These authors then point to the flexibility with which these categories can be used when representing technology. For example, in their study of the 'whitegoods' industry, certain machines were initially considered to be male technologies since using them was considered to be 'heavy', 'dangerous' and 'dirty' work. Automated machines were then introduced, so that it would have been feasible to now judge that work as 'light' and 'clean': that is to say, as potentially feminine. Instead, the male workers stressed the skill polarity, emphasising how the 'high tech' nature of machines required male, technical expertise (65). Cockburn raises a similar point concerning the flexibility with which technological work can be represented in her study of engineers (66):

'...men use one of these pairs of complementary values - hard/soft - to explain and legitimate their exclusion of women from technological work and careers... At one moment, in order to fortify their identification with physical engineering, men dismiss the intellectual world as 'soft'. At the next moment, however, they need to appropriate sedentary, intellectual engineering for masculinity too. Ideological (sic) complementary values such as hard/soft must therefore always be seen as provisional. The values called into play...will vary from time to time and from one situation to another.'

Although much of these discussions occur in relation to a context of paid labour, other analysts have started to apply some of these themes to consumer products. For example, Bereano et al draw on Gershuny's time budget study to examine how men and women differ in terms of the domestic labour in which they engage. These authors note (67):

'*In most cases the more nominally "high tech" a device is, the more male dominated is its use. So, motorbikes are more male orientated than pedal bikes; stereos more than mono record players; automatic washing machines more than twin tubs.*'

Admittedly, we cannot see the processes of definition within the household; these analysts are to a degree speculating about such technological representations. But, we can see from this and the other examples a line of analysis which might usefully be followed up in relation to home micros. What technological identities have been assigned to these computer artefacts, by whom and under what conditions?

Apart from such definitional processes, we also need to ask whether certain producer representations of the home micro as technology have been particularly attractive to males. The complementary question is whether some representations have been seen not only less positively, but indeed negatively by women. Here, we must be careful to avoid simply reinforcing the crude stereotypes of women as anti-technological. In fact, many of the feminist studies cited above try to challenge this stereotype by choosing the more positive examples of women who have some interest in 'technology' but whose experience is rendered problematic by virtue of being in what is widely perceived as a male domain. On the other hand, it is important to remain sensitive to the background debate, especially in educational circles, which argues that fewer females than males are enthusiastic about artefacts which are represented as technologies (68).

Women and Technology: Issues for Home Computers

In the light of these discussions of the issues of 'access' and of representations of technology, the thesis occasionally pauses in its narrative to attempt to address a number of gender related issues:

a) First, I will explore representations of the home computer as a technology. Such an exercise includes being sensitive to the possibility of more nuanced technological identities, beyond the simple dichotomous classifications mentioned above. Given the flexibility of technological definition which were noted in some of the case studies cited, the thesis also considers how identities change over time, and how some come to dominate others. This involves charting the ways in which different agencies may offer contending technological identities for a family of computer products. Lastly, I try to ascertain how these changing and contending representations link up with the other analytical tool - artefact conceptions - which was introduced earlier in this chapter.

b) A second focus of this thesis is the question of which social groups are addressed by and embrace particular technological identities of the home micro. Up until now, I have usually referred to males and females in a general sense. In fact, a number of feminists take issue with the use of these blanket gender terms or 'stereotypes' (69). One possible implication is that we could be more specific about gender categories. This might include providing some detail of the different social locations of the males and females whom we discuss - (for example, avoiding the assumption that all females are the archetypal married women with young children).

However, it should be pointed out that achieving any degree of specificity is difficult in a thesis such as this one. There are some clues from the available statistics, but the limited stress on consumption in this project does not allow me to pinpoint in any great detail the 'types' of male and females with an interest in

micros. Where possible, the history tries to ascertain which groups - for the most part meaning which males - played a more significant role in the appearance and rise to popularity of the home computer.

c) The third line of analysis moves away from the question of representations of the home computer as technology. Earlier, we noted how several analysts had examined the actual experiences of women who are interested or involved in technology and how the approach of such writers challenges too simplistic a view of women as being 'anti-technological'. Indeed, some feminists suggest we should consider possible female 'pleasures' in technology - a term which connotes an even more enthusiastic relationship than is implied by mere 'interest' (70). In keeping with this approach, the thesis investigates those factors which structure the ability of different males and females to develop interest in and active use of these microcomputer products.

Computer Games and Gender

While the above technology debates provide some framework for investigating the origins of the 'masculine micro', to date the most frequent form of explanation of this differential gender interest has originated from a completely different source: that of discussions of gender and media. Journalistic, and to an extent academic, commentators have repeatedly dwelt upon the male orientation of the narratives, genres, forms of action, and other such features of computer games (71).

In fact, these criticisms of games pre-date the home computer manifestation of an interactive games medium, and can be traced back to the rise of arcade games and of domestic video games machines. Since the thesis covers the history of these products, it is fairly easy simultaneously to follow the emerging feminist critique of various electronic game forms.

Even a very preliminary examination of the statistical evidence available indicates that there are differences in the extent to which males and females play computer games. This fact requires explanation. However, those same data suggest that the issue might be more complex than some of the critics of male orientated games imply. While more males play these games, game playing is also the main use of the computer by females. With this initial reservation in mind, the following issues will be examined in the course of this thesis.

a) First, there is an outline of the history of concern about the nature of electronic games, providing some detail of the various strands of criticism. This account locates the various analyses in relation to the development of interactive games in general and computer games in particular.

b) In contrast to the commentaries which provide example lists of games texts in order to demonstrate some form of gender 'bias', a second goal in this section of the project is to chart the changes in games texts and discuss why such developments occurred against the background of newly emerging conditions of production. In this respect, the most significant development is the founding of a production structure which resembled that for other media such as records - that is to say, when games became another of the so-called 'cultural industries' (72).

c) Lastly, the thesis will attempt to reconsider the various claims about the effects of games texts on the interest of males and females. This questioning of the significance of games as texts parallels my suggestion that we should go beyond discussing the influence of representations of micros as technology. This is not to say that the points raised by textual analyses of games should be ignored. We need also to examine the context in which games media are used. To refer back to the circuit of cultural production outlined above, we need to explore lived relations. In fact, this approach of examining the context of use, and concurrently

investigating the readings of texts which people adopt, is now starting to occur elsewhere in the study of media after many years of emphasis on textual forms of analysis (73).

THE STRUCTURE OF THE THESIS

In the light of the issues raised in the preceding sections, the thesis is structured as follows:

Chapter 2 deals with methodological issues. After an initial general discussion, there is an review of the secondary sources used and of the producer interviews which were conducted in the project. This is followed by a description of the observations undertaken and of the interviews conducted with computer users.

Part 1: Origins and Popularity of the Earliest Home Computers

The next three chapters deal with the origins of the micro and with the early years of the home computer, during which the machine's hobbyist connotations were strongest. While there is some comment on consumption throughout this part of the project, the first two chapters deal mainly with hardware production, while the third considers the nature of popularity in this period.

Chapter 3 examines the roots of the micro as traced through the computing and microelectronics industries. The main trajectories within these fields are outlined, including the visions which producers had concerning how future products and services would develop. Within this broad context, I examine the origin and significance of the microprocessor chip, of precursors to the micro and of the first hobby computer. The early hobbyist 'movement' in

the US is then charted, before proceeding to the question of how its UK counterpart emerged.

Chapter 4 covers the appearance of a specifically 'home' computer. After considering the development of the business micro, I examine the options and policies of US hardware companies concerning the promotion of the micro as a consumer electronic. Then, the focus shifts to the UK, exploring the strategies of the firms Sinclair Research, Acorn (in relation to the BBC initiative) and Commodore.

Chapter 5 begins to address the question of popularity. The chapter commences with the role of electronics and computing magazines in helping to construct the technological identity of the hobbyist computer product. This leads to a discussion of the nature of the micro's 'technological' appeal both to pre-existing male hobbyists and to wider male audiences. Then, I consider the literature which discusses gender and 'leisure'. This material provides a context for examining the greater ease with which males could take up hobby computing as an activity. Lastly, there is an examination of the nature of computer clubs in order to account for the virtual absence of women from these public venues.

Part 2: Interactive Games and Later Home Computers

In this part of the thesis, I trace the roots of the micro through the lineage of interactive games. Once again, the first two chapters cover mainly production considerations, while the third explores the nature of 'interest' in the micro as games machine.

Chapter 6 outlines the history of electronic games from mainframes and minis, through arcades to home video games. This includes

looking at both company strategies and the development of the industry as a whole; charting the changing nature of games as text; and piecing together what little data exist concerning the playing of video games.

Chapter 7 describes the way in which the home micro itself became a games machine. I commence with the stance of US companies towards games-playing, and the response of these firms to the increasing popularity of this activity. Next, we see the views and aspirations of British hardware companies as regards the possible games market. This is followed by a outline of the emergence and restructuring of the UK software industry, and of magazines which supported and promoted games.

Chapter 8 begins with a discussion of the available quantitative data concerning both computer usage and other measures of 'interest' in these machines. These measures justify focussing on youth as key users of home micros, especially for playing games. I then explore the nature of interest both in and out of schools and particularly in school and other computing clubs. From this qualitative material, it is possible to discuss the differences in the way boy and girl users experience micros.

Part 3: Discussions

Now that the main historical section is complete, this part of the thesis provides several layers of conclusion, each addressing the different sub-themes of the project. First, I relate the history up until 1983 to later developments, showing how themes which appeared early in micro's evolution have shaped and still find echos in current debates. This is followed by a chapter devoted specifically to the issue of gender. Finally, we have a chapter which summarises the history before turning to concentrate mainly on the research apparatus utilised in the thesis.

Chapter 9 covers production developments in the period from 1983 until the present time of writing. I chart the 'crisis' in production, changes in the industry structure and developments within the games field. The chapter also discusses the on-going way in which producers see games as problematic and notes the attempts to find alternative identities for the micro to that of games machine. This includes outlining the emergence of the Amstrad 'home-business' machines, and noting potential uses of the home computer in relation to telecommunications and home control.

Chapter 10 returns to the issue of the masculine micro. The first part of the chapter summarises key points relating to gender, both from the history of the hobby machine and from that of the games machine. Then, I turn to the policies which companies have adopted concerning the issue of gender, focussing on adverts and on games as texts.

Chapter 11 summarises the key points concerning the general history of the micro and then proceeds to review and revise the frameworks and tools of analysis, drawing on examples from the main narrative.

Because of the complex structure of the thesis, covering several historical lines and switching between production and consumption, chronologies of relevant events are provided at the start of a number of chapters. Appendices supply details of method and discuss consumption statistics .

CHAPTER 2: RESEARCH OUTLINE AND METHODOLOGY

In this chapter, I commence with a theoretical overview of methodology which builds on Johnson observations concerning the circuit of cultural production. That outline is followed by sections which detail the particular methodological issues and strategies which are involved in different parts of the project. The sections include a discussion of written sources generally, of statistical data, of interviews with producers and of the interviews with and observation of users.

RESEARCHING THE CIRCUIT OF CULTURAL PRODUCTION

Johnson argues that the existence of several broad clusters of approaches to research within cultural studies might partly originate from the nature of the different moments in cultural production. Thus 'theoretical divisions may arise from different standpoints or viewpoints in relation to cultural process themselves. The regularities of cultural process themselves create or sustain different points of view, different preoccupations' (1). In other words, the concerns and the methods of different research approaches such as 'production studies' and 'textual studies' may be structured by their very object of attention. Johnson recognises that this is 'a kind of realist hypothesis', but suggests that such an assumption might go some way to explaining the nature of 'theoretical and disciplinary fragmentations' (2).

While Johnson's observation's provide a general overview of the nature of analytical divisions within cultural studies research, his classification is not one into which all studies can easily be made to fit. For example, commentaries on technology and gender such as that

of Zimmerman do not slot neatly into his picture. Arguably, Zimmerman often employs what we might call a form of textual analysis to the extent that she draws attention to features of different machines. But she also slips back and forth to makes points about both production and lived culture (3). Nevertheless, this reservation aside, the typology of research which Johnson outlines has broadly framed the design of this project.

The central theme of Johnson's papers is the partiality of analyses which focus on one moment of the circuit in a way which is blind to what research on other moments has to offer. For example, he points to the way in which semiologically based textual studies can produce accounts which both lose sight of the key production processes which structured texts and which do not do justice to the degree of autonomy readers can bring to texts. Johnson emphasises that such partial accounts are 'quite evidently inadequate, even "ideological", as an account of the whole' (4), and throughout the papers he tries to show some of the further shortcomings arising from these research divisions within cultural studies.

Yet, Johnson is not suggesting that every piece of research should examine all the moments in the circuit equally. He recognises a number of constraints, including the limits of available research resources. Instead, Johnson argues that while accounts may be partial due to prioritising one moment in research, there should be a sensitivity to the others. This would include rethinking each in the light of knowledge of the rest of the circuit.

One of the examples which Johnson gives to illustrate this point is that once the conditions of production are known, it may be possible to look for the results of production processes in texts. As an example, he suggests that we need histories of televisual forms in relation to histories of TV production (5). While this thesis only makes a limited range of observations concerning texts, there is an attempt to carry out just this type of analysis at certain points. For instance, I will be examining the way in which industrial design of

micros (as texts) was revised in the light of changing production concepts. We will also see how magazine content changed under different production conditions, and how adverts reflected the different (gender) policies of producers. A final theme, already noted in the introduction, is that of how games texts changed with the restructuring of the games industry.

However, I felt that it was necessary to carry out at least some research into consumption in this particular project. The first key question about the origin of the home computer can clearly be addressed by some form of production history, although even here we have to appreciate some points about the consumption of games to understand producer decisions.

The other key question concerned the popularity of the home computer - or more particularly, it concerned differential gender interest. On the one hand, it is legitimate to pose questions about production in relation to this issue, asking why certain product features were developed which may have enabled or encouraged more male attention. But, to ask about popularity without investigating consumption at all would appear to be a very speculative strategy, and definitely one which might be considered 'inadequate as an account of the whole'. Johnson stresses this inability to fully predict one moment of the circuit from the analysis of another, and I would certainly hesitate before inferring the conditions of consumption from any production or textual analysis. Thus, while I utilise a range of secondary sources to discuss consumption, the thesis also grounds it arguments in a limited amount of original research on lived culture.

Production

The introductory chapter already noted some of the products and producers which are examined in this thesis. To recap, the main focus of the study is the commercial sector which initially established the

micro as a consumer electronic. The following sections of the methods chapter spell out the implications for temporal and geographical parameters of the project. I then provide more detail concerning the specific questions being asked about production, and particularly about gender.

Roots of the Home Computer

The 'roots' of the home computer chosen in this history are a set of cultural objects which at a physical level were constructed from microelectronic technology. These include other chip-controlled electronics, earlier micros, and video game machines. The nature of these previous products and the forms of consumption which had developed in relation to them, were very salient in structuring the options and perceptions of producers.
One corollary of investigating such roots is that a greater international dimension is added to this study.

The fact that some multinationals operated in the British market, meant that even an account of the more recent home micros could not be totally restricted to decisions which were made in this country. When I add a history of earlier products, most of which appeared first in the US, the result is a tension between accounting for what is and is not specific to the British context. A further consequence of broadening the thesis is that the study has to rely to some extent on secondary data. While I can refer to hobbyists interviewed and texts produced in Britain, as well as to interviews with producers who worked in the US, neither the funds nor time were available to conduct investigations abroad. However, I felt that it was important to be sensitive to the role of those earlier products, and decided that even very preliminary and derived historical sketches would be of value.

The British Home Computer Market

The main concern of the thesis is the history of the British market for home micros, and here more primary data are available. Despite some difficulties which will be discussed presently, producers in this country were simply far more accessible than those abroad.

While the late 1970s hobbyist computer market receives some coverage, the launch of the Sinclair ZX80 in 1980 proved to be an appropriate starting point for discussing the 'home' computer. Meanwhile, the end of 1983 is taken to mark the end of the main history. Not only was Christmas 1983 widely perceived as the point when the 'boom' in micros started to falter, but an initial historical survey suggested that initiatives taken in the first years of the decade largely structured the path by which subsequent products were developed.

Production Questions

One of the limitations of production accounts which Johnson notes is that of 'economism' (6). By this he means the material circumstances of the firms concerned while they operate within a capitalist structure. The market's economic constraints on firms are clearly an important factor and will be considered in the thesis when we examine matters such as disposable income and cost structures. But Johnson argues that cultural production - the specific concern of cultural studies - also includes mobilising an 'existing stock of cultural elements drawn from the reservoirs of lived culture or from the already public fields of discourse'(7). In other words, other 'raw materials' enter into production and structure producer options and practices besides more narrowly conceived economic ones (8).

The introductory chapter has already discussed artefact conceptions, where some wider vision of the nature of products shapes the path of

their further development. Other cultural elements that we can consider in analysing production include such matters as producers' reference to previous product histories, design styles, producer theories of product diffusion, assumptions about the future role of technology in society and producers' views concerning the nature of family life.

In the latter part of my interviews,I inevitably posed questions which addressed themes such as awareness of gender issues and related policies. The answers which were given by staff merit discussion as a separate theme in one of the concluding chapters. But, while such comments can be illuminating, this tactic of posing direct questions about gender was never the main line of enquiry. Instead, more open-end questions about the overall conceptions of the home micro held by producers provided the key route into the issue of the masculine micro. In the case of hardware, these questions touched upon the anticipated role of the machine, the context of use and the type of user. It is partly from this material that I develop arguments as to whether these artefacts are somehow more geared to males.

Consumption

Consumption data relating to precursors to the home computer are somewhat limited. These consist of mainly secondary quantitative and qualititative material concerning electronic games and hobby computers, which sometimes derive from reorganising previous research. For example, the only way to locate figures for the use of arcade games is to bring together a range of small case studies.

Since the consumption of home computers constituted only a minor part of the overall project, there was always the danger that to cover too wide a range of both users and non-users would spread research resources very thinly. Thus, a compromise emerged in the course of research whereby I targeted groups whom I thought would be more

strategic to my arguments. In particular, I focussed on younger users who were shown by statistics to be the main consumers of games, and within these I concentrated more on boys. This was because it seemed important to establish the nature and dimensions of 'interest' amongst young males - certain aspects of which, from initial investigations, appeared to be less developed among girls. This point will be elaborated in one of the later chapters.

As a consequence, coverage of older users was even more limited. In part, background knowledges built up through general conversations within my own social circles and through responses evoked when asked about my project inevitably enter into my characterisations of consumption. In addition, I made an effort to find at least a few women who showed some particular interest in micros, in the hope that their experiences might cast some light on the nature of gender differences. Those attending hobbyist clubs formed another target group, since, as in the case of games, it seemed important to identify the exact nature of 'interest' amongst this group. All this material was then used in conjunction with analyses derived from previous research on leisure, and tentative conclusions were then matched up against the work on other concurrent studies investigating the use of home computers (9).

These user interviews and observations were not intended to test central, pre-formulated hypotheses in anything like a strong positivist fashion. Instead, there was always an iterative process by which empirical data were used both to construct certain aspects of a theoretical overview and to evaluate others. The consumption research was an integral part of the very process by which arguments were formulated. Later, details from this material could be used to exemplify how the general themes which I discuss could be made manifest in people's life.

WRITTEN SOURCES

A considerable amount of this historical account is derived from various types of written sources. In this section of the chapter, I intend first to generally clarify the nature and status of these sources in relation to the questions asked in the thesis.

Second, I indicate in more detail the extent to which different parts of the thesis rely on different types of written evidence. It would have been feasible to evaluate each source during the course of the narrative, in the same way that ethnomethodologists within sociology constantly dissect and unpack their judgements in meticulous detail. While such effort deserves some admiration for the way in which it sensitises readers to be reflective about the text presented to them, there is also some merit to avoiding such disruption of the narrative. Thus, I raise all the main questions about evidence at this point and rely on the reader to bear these in mind when reading the later chapters.

Methodological Appendix 1 contains an outline of the strategies which were employed to obtain much of this material - especially trade and related press reports, contemporary popular press coverage and academic commentaries. There, I deconstruct the process by which certain types of evidence was assembled. Methodological Appendix 2 lists the main journals examined when employing this search procedure.

The Nature of Written Sources

One way of approaching questions of the status of written sources is via the distinction between documentary and reported evidence. The former term refers to material produced as part of decision making processes, while the latter refers to accounts of those processes, perhaps communicated to other people, which are not part of that

decision-making processes themselves. In fact, even proponents of this distinction acknowledge that the difference is often not so clear-cut in practice, and they suggest a sliding scale between the two types of evidence (10). I would want to problematise this simple duality further, although it can be useful to take the distinction as a starting point for discussion.

Documentary Evidence and Press Reports

Documentary evidence has been described as including such sources as the minutes of meetings or reports of such minutes, background papers and reports, or communications such as directives and memoranda (11). Being so close to the process and practices of decision making, such sources have been highly valued: even if we still need to be aware that any written summaries remain interpretations of the actual interactions and negotiations between people. Only very occasionally are such sources used in this thesis. Examples would include reference to the consultative papers within the BBC concerning the Computer Literacy Campaign and the discussion documents of the Nedo Task Group which relate to Interactive Home Services. It might well have been feasible to seek out more further evidence concerning the initiatives of the Departments of Trade and Industry and of Education, but the effort did not seem justified given the role which these developments played in my account.

Discussions of historical method have noted that the role played by documentary evidence has depended on the subject matter of the particular type of history being researched. In the case of the British home computer industry, there were often no such written traces of small companies' policies and practices. While it is true that in other industries, major companies have maintained their own commercial archives, (12) I doubt whether even the biggest American producers would have been large enough and had a sufficient bureaucratic structure to have kept very detailed records (13). In

any case, my project and funding was primarily restricted to the UK and so I was not in a position to consider investigating this avenue.

The first type of reported evidence stems from media such as the microcomputer and electronic leisure trade press, and from the industry commentators in other newspaper and magazines. In these cases, we have to bear in mind the questions which are being asked of these sources. As accounts of company policy or of the motives and interests of bodies such as BBC, these reports can sometimes be faulted. It became clear in the course of this research that British journalists, acting on patchy information, have sometimes surmised incorrectly. More often they had committed acts of omission, where further details about company actions from my interviews cast the orientation of firms in a different light. These details include accounts of product developments which never materialised as marketable commodities, or internal discussions which never entered the public eye. Certainly, some interviewees were keen to 'set the record straight' as regards the press and other historical accounts (14). My general policy was to construct a tentative history from such secondary sources and then use this as a basis for interviews with the producers concerned.

At a second level, the specialist press reported events such as product launches and carried public announcements of company decisions and policy. The media concerned still made occasional mistakes in what might seem to be a more straightforward exercise, but this was far less problematic and such details could often be cross checked.

A third aspect of this press reportage involves us viewing these media as itself constituting an integral part of the 'industry' which is to be examined. The hobbyist press were the public face of what has been called a hobbyist 'movement'. Similarly, the home computer trade press was a public side of the industry, as was stressed in the introduction. Where the thesis highlights industry wide discussions of concerns and problems, and draws attention to the prophecies and commentaries concerning the way in which markets should and were

developing, then this press coverage can provide useful insights. Not only were the views of producers reported in this forum, but such debates were read by other producers, and later re-reported in interviews (15). Such themes as emerged in this press may well have structured widespread perceptions and have themselves influenced further product developments.

Memoirs and Previous Historical Accounts

The other main forms of reported evidence cited in these thesis are the retrospective memoirs of those working in the industry and histories constructed by third parties based on mainly on interview material. I had to rely on these more in the case of American developments.

The memoirs can certainly throw some light on motivations and convey some of the experience of events. These insider accounts, as with my producer interviews, can also highlight forms of product development which were later abandoned. But as with oral histories, the perspective of the author still involves a degree of construction and filtering which reflect their particular location in production, their personal involvement and the effect of hindsight (16). For instance, Tomczyk presents us with a particularly partisan picture of the importance and exemplary nature of the microcomputer firm Commodore (17). And although Carlton tries to write a broader history of the US software industry, incorporating interviews with other producers, his work still very much reflects an enthusiasm from his own involvement as co-founder of one of the early and larger games software houses (18).

Third party histories are also framed by the perspective of the authors concerned and their attempt to construct a coherent narrative - a point which is also true of this thesis. While these authors can at least claim a detachment which is greater than in the case of

memoirs, they select and interpret interview material. In fact, as regards the few company histories available in this field, the perspective of the author concerned is often not very different from that of the key protagonists whom they are describing. The history of the Apple computer company by Moritz occasionally mentions differences of viewpoint within the firm, but is in general fairly positive (19). Meanwhile, Dale's history of Sinclair Research clearly lacks any developed critical perspective (20). Even one company employee referred to this particular account as a 'whitewash job' (21), and this slant is certainly shown up when we contrast Dale's work with the more critical history of Sinclair from Adamson and Kennedy (22).

In the more wide ranging histories of the hobby computing 'movement' and of the micro industry, I attempted to make some allowances for the organising principles which structured these accounts and framed interviews. For example, Levy's key theme is the rise (and fall) of the spirit of Hackerism, undercurrents of which he sees continuing from the first MIT minicomputers, through microcomputer hobbyists to games software writers (23). And, the main motif of Freiberger and Swaine is that of a grassroots technological revolution from below (24). Nevertheless, evaluation can still be rendered difficult to the extent that these texts do not by any means reveal all their processes of construction, and so my main strategy remains that of cross checking between texts and following up references in search of further comment.

Although I will discuss this in more detail below, the thesis relies on these histories, memoirs and trade and related press commentaries most heavily in discussions of the roots of the home micro, early American hobbyism, and the origins of electronic games. In the case of the British experience, such written sources supplement my interviews, although I again had to rely more heavily on reported material where American parent organisations developed product ideas outside of this country. These are the aspects of the thesis where I would have welcomed the chance to verify my sources further, especially

concerning the early development of games. Nonetheless, I still consider that the resulting history is worthwhile (25).

The Media and Moral Panics

The final aspects of press reportage which I wish to consider are those cases where newspapers, consumer magazines and academic writings show concern about a phenomenon. The introduction indicated that this thesis intended to document comments about the gender identity of games and home computers. In addition, I briefly chart the range of mild moral panics about electronic games playing in general (26). Written sources do not simply reflect that concern but help to construct it. I do not attempt to trace back various fears to primary definers - those groups in small American towns and social scientists who were key figures in generating worries about games (27). Nor does the thesis focus on many aspects of wider political and cultural context within which these concerns were structured (28). But at least by noting the developments within the media we can take a first step in tracing these concerns and outlining the elements from which they are constituted.

The Secondary Material Base of Different Chapters

a) Early Chip and Computer Histories

The history of computers has only arisen recently as a sub-discipline within computing departments. Most academic accounts of computer development covering the '50's and '60's period where written in the 1980s. The same applies to histories of chip technology, which also dated from the late 1970s. And many of the more popular works which deal with both chip and computer development appeared during the

course of this Phd project (29). Since all these histories are relatively recent, the participants in innovations were interviewed only a few years ago after their involvement.

Neither interviewees nor authors (over 90% of whom are male) concerned themselves with gender issues directly. However, this material can still help to inform an overview of producers' conceptions of products and of the anticipated paths in which commodities would develop. To help judge whether an author's perspective from the 1980s also existed in the 1970s, the contemporary periodical references cited in the books were also checked. While such articles have their own conditions of production, they provide some idea of public debates at the time (30).

One chip product did seem to be increasingly strategic: the calculator. There are sufficient references to put together some picture of its development, but a study devoted to this artefact would have been welcome. There seemed to be a fair amount on the history of the micro-processor, which I checked against both contemporary writing and against the articles written by its developers. While there is some conflict over detail, this is not enough to affect the role which these accounts play in my argument.

There is no shortage of literature forecasting the impact of computers on society, as can be seen from some of the references cited in later chapters. In particular, there is a whole series of books by one author, Martin, which draw on his previous planning work for IBM (31). Arguably, his views regarding possible future developments were at least considered within the industry, rather than representing merely wishful thinking. It should be noted that my characterisation of the chip and computer revolutions as being two separate visions is a particular reading of this literature, and even then it is a simplification. If the history of I.T. discourses had been the central project of my thesis, then a range of strands in these visions would have required untangling. For the purposes of this particular thesis, the main division referred to here seems appropriate.

Lastly, we have the early initiatives of certain individual companies which could have led to a very different history of the micro. The detail is not absolutely crucial to the central argument, but where possible - as in the of the company DEC - I confirmed the accounts by more than one source.

b) American Hobbyist Products

It is in the nature of this hobbyist period that production and consumption histories are not always divorcable. Hence, the principle of discussing these two 'moments' separately breaks down to some extent. Two main sources were used to build up a picture of the early American hobbyist products. The Freiberger and Swaine book was written by reporters who covered developments at the time in the first microcomputer press (32). The other key text by Levy was based on numerous interviews with early hobbyist producers in the 1980s (33). Both books appeared at the same time and do not refer to each other. These sources were compared to and supplemented by a range of shorter accounts and company histories, by contemporary features in general consumer and business magazines and, to a limited extent, by examination of the American computer press itself.

c) Discussions of how Home Computers might develop.

Since this is quite an important sub-section in my thesis I would have liked a little more material on this. However, given the private nature of company planning, to follow up this theme would have required interviewing relevant companies in the US. Instead, this section had to rely on material from the microcomputer press, contemporary company profiles in business magazines, statements from company representatives, and the advice of consultants. These sources at least capture the public debates within the industry.

d) The Origins of Early Computer and Video Games

Descriptions of the origins of games on computers drew on the same key authors as the American hobbyist accounts. I also cross-checked these against 1970s accounts in popular journals.

The arcade game history came partly from the celebratory accounts of enthusiasts. Perhaps from more reliable sources, the original games such as 'Pong' were often discussed within outlines which charted the development of chip products. The founder of Atari, Bushnall, has given his version of events in various texts. *Screen Digest*, which has a good reputation for its meticulous coverage of media developments, also had some information on both the arcade and the home video games machine.

The relationship between the arcade video games and pinball has been discussed in various commentaries. This led me to also investigate pinball's own history. Introductions to those social science studies of game-players which arose from various concerns about the arcade's corrupting nature also provided accounts of the changes in the nature of that venue.

The history of the home video games machine was built up partly from technical journals, one of which carried the account of the original designer. Trade magazines which dealt with consumer electronics carried a good deal about the products and about companies entering this field, including the views of industry spokespeople concerning how the video game field might develop. Sub-sections of consumer electronics periodicals also carried the latest developments and sometimes case studies of particular products.

e) The History of British Home Computer Products

Although interviews formed the main sources for these chapters, written sources enabled me to build an initial, general framework. As we shall see presently, the interviews against which the magazine information can be compared have themselves to be examined with a critical eye. However, from the comparison it is possible to gain some appreciation of how production of the computer press involved a good deal of speculation, rumour, and information supplied by companies which were representing themselves in a certain light. As noted previously, two books on Sinclair appeared while I was working on the project.

f) 'Consumption' Histories

Both the original 'hackers' who developed the first computer games and the early American hobbyists have been documented because of their perceived role as the originators of a computer revolution. In addition, these particular enthusiasts had a newsworthiness, (or to invent an equivalent term, a 'bookworthiness') since they were groups which writers could characterise in subcultural terms, or as a 'movement'.

Arcades also received some attention from reporters, whose imagination appears to have been captured by the relatively sudden, widespread and hi-tech phenomenon of electronic game-playing. Meanwhile, worries about the implications of the activity attracted social science researchers, especially psychologists.

What Hackers, hobbyists and arcade game-players share in common is that their activities were relatively public events, where there was a common set of interests and knowledges about which people could be questioned (34). In the case of arcades, the activities could easily

be observed. However some of the settings outside the home which are of interest in this project have received less or no attention. One particular absence is that of studies which examine the experience in school outside lessons, reflecting the lack of research generally on many aspects of the underlife of schools (35). Yet, industry commentators have for some time pointed to the existence of computer related activities in school, such as swapping games in the playground.

The one work which covers both video games and home computers in terms of their meaning for users is that of Turkle (36). She employs a range of case studies and anecdotal observations in support of her argument concerning the experience of computer and microelectronic artefacts. Turkle started her US based research in the late 1970s and so occasionally she provides some glimpses of users' experiences at that time. However, although she refers to subcultural analysis, the bulk of her work is based in psychology and stresses the isolated experience of users. Accordingly, Turkle often removes her subjects from the very contexts important in my project, such as peer relations.

Until recently, there have been few qualitative studies of the meaning and role of consumer electronics in the home. Several current research programmes in Britain have now started to address this issue. These projects have specifically included the home computer within their remit. The Centre for Mass Communications Research conducted a longitudinal study between 1983 and 1987, periodically interviewing a panel of people who live in the East Midlands about their use of and reasons for buying various equipment: chiefly videos, home computers and teletext.

A year after my research commenced, David Skinner started a Phd at Brunel specifically involving interviews with families about their home computers. This study focusses on the use of machines, reasons for buying in relation to family members' views about the future, notions of the machines' utility and accounts of the home computer's history. Lastly, another project has recently commenced at the Centre for

Research into Innovation, Culture and Technology at Brunel. This project is ethnographically orientated, examining the experience of home computers and other screen-related domestic electronics through fieldwork in people's homes.

My own research has involved collaboration with these and other relevant studies (37). We have compared notes and, especially concerning David Skinner's project, exchanged the various reports which we have produced. Given that my thesis has such limited material on consumption, these sources have been of considerable value in the process of assessing some of the arguments developed in my project.

STATISTICAL SOURCES AND DATA

Statistical data are necessary to chart a development such as the national popularity of home computers. Thus, sensitivity to various phenomenological criticisms of such positivistic data, does not lead me to reject the latter. General figures on consumption help to convey the magnitude and growth of interest, as well as describe its forms. Such information also enables me to evaluate hypotheses such as the 'burst bubble' claim noted in the introduction. Various sales figures also put into context the home micro by indicating the significance of this market in comparison with other products. Lastly, these data act as one guide to the relative importance of the producers interviewed in the course of this study.

In particular, statistical details of consumption patterns are vital for evaluating the questions posed about gender - although these are always supplemented and enhanced by my more qualitative investigations. We have already seen in the introduction how quantitative data can help to formulate the research problem. The figures initially demonstrated gender differences, while simultaneously suggesting that these are less than some commentators have implied. In subsequent chapters, more detailed statistics from a variety of

sources allow us to investigate further the gap between male and female interest.

Sources of quantitative data include publicly available sales and sample based figures from market research and official statistics held in libraries. Other strategies for assembling quantitative data entailed approaching those companies who had bought or commissioned research reports; those authorities who produce their own statistics such as the BBC; and approaching various academic analysts who had generated relevant figures - such as the Centre for Mass Communications Research. The outcome of the search has been that this thesis contains more quantitative details on home computers and electronic games than have previously been brought together in the UK (38).

While the above points draw attention to the rationale for using and sources of statistical data, there remains the issue of interpreting these figures. As regards sales based data, the statistical appendices attempt to explain the variation between estimates by considering how such figures are constructed and whether, despite problems, these data are sufficiently useful for my purposes (39). However, some sales figures are those which simply have been re-reported from the trade and other press, without citing source and conditions of production - for example, concerning US figures on video sales. Without further background knowledge concerning their construction, these statistics are always suspect. Normally, while the quantitative data may enhance the general picture of historical development, the exactitude of estimates is never vital to my main arguments.

As regards survey based data, I try to utilise the secondary quantitative data in conjunction with my own primary data where possible. At several points, I evoke hypotheses of a phenomenological nature concerning the processes which might shape the construction of consumption statistics. Insights from my interview and observational research can then be employed to evaluate the usefulness of such figures.

In order to trace the consumption of home computers and games in more detail, I used the various indices listing market research firms to locate a range of companies in the US and UK which had conducted or commissioned relevant research (40). I then contacted these firms, asking if they would consider allowing me access to a limited amount of older data relating to gender and covering the years until 1983. Such information would probably have been out-of-data in commercial terms by this time, although there was obviously some labour involved in sorting out this material for me. While most companies did not reply, this strategy was successful in enlisting the support of one British market research firm: Carrick James Market Research. As long as I supplied the labour of searching through their files and taking photocopies, the firm allowed me to have whatever outdated material I wanted.

This particular company specialised in conducting regular surveys which examined the possessions, wants and activities of children and teenagers. The firm had therefore produced a range of statistics which were relevant to gender, dating from an earlier period than most published research. I introduced some elements of secondary analysis of these figures in terms of reorganising certain data. Perhaps more importantly, this is the first time that any interpretation has been given to these figures, since the company itself has never provided commentary on its tables.

Most statistics are not to be found in the main chapters of this thesis. Part of of the rationale behind the common practice of sprinkling various tables throughout reports seems to be to provide the veneer of a more scholarly appearance, via citing 'hard' data. Often, this disrupts the narrative, literally breaking up the flow of argument or of the account by occupying space with tables. In this thesis, the potential for disruption is even more pronounced, given my policy of qualifying and discussing the statistics. Therefore, most figures and tables have been relegated to footnotes, where they may support a point which is being discussed in the main chapter. Where I

have felt that there needed to be a more detailed discussion of the statistics, the tables appear in separate statistical appendices.

PRODUCER INTERVIEWS

General issues

My initial research position was as someone outside the industry, without informants and co-researchers in this field. For this reason, it took some time to construct an historical overview of production developments, on the basis of which to choose appropriate interviewees. For example, it was only late in my second year that I discovered the third trade magazine. If that overview had been attainable more quickly, some of the interview choices would have been slightly different (41).

The market for hard- and software was influenced by the fact that cost of entry into these fields was a relatively low. Compared to some other consumer electronics, it is in the nature of home micros that they neither required very expensive R&D facilities nor evoked high capital costs in production. Software, especially in the British context, was in the form of cheap and readily available cassette technology. This enabled the creation of a cottage industry structure. The computer magazine field was also very fast-changing. in part reflecting trends within the magazine industry more generally. The broad move to very narrowly targeted, specialist magazines in the 1980s created fierce competition both for readers and for advertising revenue, leading to a degree of instability of titles.

As a consequence of these market structures, it was difficult to track down most of the earlier, small hard- and software firms. The vast majority had gone out of business and could not be traced. Even in surviving firms, the high rate of change of personnel meant that it

was difficult to locate some of interviewees whom I would have preferred to meet (See Methodological Appendix 5 of which staff were interviewed and reasons for failure to achieve further interviews. Various magazines assisted my search, but their staff had themselves been in the industry for only a short time. This type of industry structure meant that those people who had been involved in the field for some time had often taken part in more than one capacity. (See Methodological Appendix 3 for details of the background of the producers who were interviewed). Hence it was sometimes possible to ask interviewees about several of their roles.

One route by which I located some ex-staff was through repeatedly phoning firms who would ask around, over a period of weeks, to see if anyone knew of the person whom I was seeking. Some staff were found by discovering a network of personal contacts. Some were hit upon by chance. Of course, given these difficulties it could be argued charting the early industry at this point in time for my Phd would be easier than trying to track done these staff at an even later period (42).

Partly from the nature of this industry, it also proved difficult to find some form of sponsorship for my research, in terms of persuading organisations to recognise the value of the study and use their influence to give the project weight in the eyes of producers (43). Until very recently, it has proved impossible even to set up a trade organisation which could regulate relationships between different interests in the field. My approach was therefore very low key, stressing the academic value of the research and relying on goodwill. In fact, many interviewees welcomed the idea of a British history. On the whole, most firms whom I approached were willing to supply interviewees. However, meetings sometimes took place under conditions where there were constraints on interview time.

The Time Scale of Producer Interviews

Hardware, software and magazine interviews were conducted in broadly separate blocks of time, although there were exceptions. There was usually a pause between interviews in order to write out the previous, fairly full, transcript. Points raised could then feed into questions in the next session. Towards the end of the research, I had to arrange some further interviews to fill in gaps and to check the overview which was emerging.

The first set of interviews, held mainly in the first year, were with magazine staff. This choice was shaped by several considerations. One was sheer opportunity, when I made a contact at a computer show. In addition, looking at magazines also provided some continuity from my MA project. The second batch of interviews were with software firms and took place in the early and middle part of second year. At that stage, it appeared that hardware firms had been the most significant force in the very early years, and so these interviews were delayed to allow more preparation time. Supporting this decision was the fact that I was able to meet a number of software interviewees at the 'Personal Computer World' show - the most important annual event in the industry. In the case of the hardware staff most contacts had to be developed through letters and phone calls. The majority of these interviews took place at the end of second and beginning of the third year.

Hardware companies:

Of these three sectors, hardware developments were the most fully documented by secondary sources, although there were a number of disagreements concerning dates and explanations of companies' actions. For the purposes of this study, hardware manufacturers were divided into 'major' and 'minor' producers. Major firms certainly referred to

the giant, mainly US based, companies which operated in international markets. But it also included Sinclair and Acorn who, although very small by comparison, had been prominent in the British market. Minor companies referred to the range of small, mostly British based companies which appeared and then disappeared in roughly the 1982-1984 period. Given that so few major producers were involved, it did not seem appropriate to conceal the identity of firms. Instead, the particular staff interviewed remained anonymous and are referred to only in their general capacity. The exception is Clive Sinclair, whose identity would have been difficult to conceal!

In the early years of the British industry, a few companies held between them the biggest share of the market. Therefore many people's experience of micros was of machines from these firms. Sinclair and Commodore were arguably the most significant hardware companies in the early history of the home computer in Britain, while Acorn and then Atari were the next most important companies for my purposes. Hence, I concentrated on these four firms. One advantage of this strategy is that these manufacturers were still operating at the time of the research, whereas other companies were now defunct or had pulled out of the home market. Other major firms with whose staff interviews were conducted included Texas Instruments, Tandy, and Amstrad.

Within the key major firms, interviews were sought from the fields of marketing, advertising, and R&D/Production. In the case of those firms operating in international markets, the R&D and initial product idea originated in the companies' home base, and so personnel involved in these roles could not be contacted. Apart from that one problem, interviews were arranged with the types of personnel who had been targeted.

The heterogeneous nature of minor companies meant that any attempt to derive a theoretical sample was problematic. In fact, there were sufficient practical difficulties involved in locating any ex-staff given the time limits of the project that I decided to settle for

interviewees who could more easily be traced. To evaluate whether these differed from less accessible staff, I compared firms on the basis of secondary data.

Software Companies

The very first independent software 'companies' arose in the early 1980s, mainly as one-person, one-product affairs. Most of these quickly disappeared. Such producers sold by mail order through the new types of computer press which was then emerging. Games software was only one type among many. In late '82 and the start of '83, bigger firms entered and restructured the form and procedures of the industry, especially through retailing software. For my project, it was obviously important to have examples of both types of firm. Since the defunct ones were difficult to trace, interviews were conducted with with those older firms which had survived and still operate (44). In the case of these earlier firms, I saw a mixture of programming and marketing staff - although the roles were combined in some cases. The later firms consisted solely of marketing staff.

Apart from some distinction between early and later firms, other typologies were more difficult to formulate. Software companies could not be simply classified by the software genre which they produced (see Methodological Appendix 6). The earlier firms, in particular, dabbled in a number of different types of product market. At the outset, I tried to employ a criterion of firm size, in terms of the number of products and sales turnover (the actual number of staff of even the biggest firms being very small), but this did not appear to add anything to my analysis.

Magazines

Within a few years of the home computer's appearance, there were thought to be at any one point in time over a hundred magazines devoted to this field. Indices of the press, such as the standard advertisers' guide to media, only included a handful of these journals and even then many titles cited were out of print because of fast change within the industry. Hence, it was only possible to chart the development of certain broad type of magazine, while noting details concerning some of the older, more established computer press.

This publishing market was dominated in the early '80s by two companies: EMAP and Argus, an IPC subsidiary. Apart from these two firms, there were at the time of the research only a handful of companies with several magazines each. The two bigger publishing houses appear to have had slightly different regimes. For example, I was told by EMAP staff that loyalty within EMAP was organised around magazine titles, whereas in Argus this was geared to the company. Also, EMAP was seen as a young enterprise, compared to the more established IPC subsidiary. I decided to develop material concerning just one of these firms - EMAP - since I could more easily approach different types of magazine originating from the same company once contact had been established. However, as some EMAP staff had previously been involved with other, earlier magazines, I was able to construct a broader picture of the initial market.

EMAP and Argus were not themselves the main innovators in the early period. The publishing houses often bought up existing titles, a large proportion of of which came from one person whom I interviewed: IS(2). He was able to cast light on overall policy. Apart from that interview, I saw mostly editors, but also some advertising staff, and one reporter. To illustrate the fast turnover in this field, one editor whom I interviewed had been recommended as a relative 'veteran' because he had covered home computing developments for three years. (For details of magazine interviews, see Methodological Appendix 7).

Finally, there were the three trade journals. *Microscope*, the earliest of the trade press, had shifted its focus to cover the business and up-market machines which were no longer seen as being 'home computers'. One of my interviewees had been a freelance writer for this publication in its earlier days. Another magazine, *Leisure Electronics Trader*, went out of business during my project. I managed to see the editor of the newest trade journal: *Computer Trade Weekly*.

Other producer roles

Within the theoretical framework which has been adopted by this thesis, staff in retail and distribution roles would also constitute producers, in that their practices contribute to shaping the possible meanings of artefacts. However, after some attempts to make contact with firms in these sectors, it appeared that the project would be overstretched if it were to also encompass these production dimension. I initially tried to contact one of the largest distributors, but staff passed me around the company's departments with little success. The staff of another distributor seemed particularly unhelpful when approached. I finally managed to talk to some staff who had been involved in retailing while interviewing these people about their other roles in the industry (See Methodological Appendix 7).

Finally, I felt it was useful to have at least some material on telecommunications. This area was one possible application for the home micro which was not developed to any great extent in the early years, despite the fact that some of those in the industry thought that it had potential. Since other interviewees volunteered a number of comments concerning why this usage had not developed, staff at British Telecom were also approached to provide their view of events.

The Nature of the Interviews

During interviews, I usually presented the project as being one which was examining the development of the home computer market, thus introducing the study as a general history and not one which had gender issues as a sub-theme. The bulk of the interviews was taken up with questions concerning company and product development, and anticipated users and uses. Towards the end of the session, I would usually mention that questions of gender formed a significant part of my study before asking further questions about policy and perceptions. There were exceptions to this general approach. In some cases I mentioned my particular interest in gender if it seemed that it might help me to gain access to the firm. For example, Acorn had at one point addressed the issue of gender and micros in one of their documents.

Despite some difficulties with arranging interviews, it was nevertheless surprising just how many of the people who were approached were willing to give me some time simply because they had been asked. These producers merely wanted to be assured that I had a genuine academic project. I had been wary that the staff concerned might have asked me to comment on my user interviews and hence provide them with the equivalent of market research, but only in one case, right at the start of my work, was I ever asked about any 'findings' (45). Several interviewees asked to see the finished Phd. Those who had been involved in the industry for some time liked the chance to talk about the past, sometimes partly to 'set the record straight'. A number of interviewees also asked whether this work might be published, arguing that there was a need for such a history.

There was a degree of presenting a company, or the interviewees' role within a company, in a good light (46). But in general, this was counterbalanced by as much, if not more, criticism of their company and of others, together with admission of mistakes and discussion of the problems which they had faced. Only occasionally did the session

become one where company policy was being promoted as if conducting a presentation to journalists.

I had very little control over the setting of the interview. Respondents, fitted me into their routines, and virtually always suggested the venue. The situation which I preferred was one where comments were least structured by the specific details of my question. Hence, my ideal was for fairly informal sessions where interviewees could initially elaborate without prompting, and perhaps repeat points in different ways, so that their characterisations and views concerning important developments could be more easily identified. Moreover, that type of conversation provided more breathing spaces for me to reflect upon and return to the themes raised by the interviewee. Under these conditions, I could occasionally interrupt the interviewee's narrative and raise questions derived from my own theoretical framework.

The vast majority of interviews conformed to this preferred format to varying extents. However, a few interviewees waited for questions and gave brief answers, sometimes reproducing a company line on various issues. These circumstances increased the sense of pressure which I experienced from the feeling of being evaluated as interviewer. The 'right' questions appeared to be ones which were concise, phrased in the terms usually discussed in the industry and somewhat 'journalistic' in nature.

Gender in the Research Process

One question particularly pertinent for a study which examines gender issues concerns the bearing which my own sex had on interviews with mostly male producers. Strictly speaking, this is not simply a question of what influence does 'gender' have, but how do the particular role, age, status etc of myself and of the interviewees structure our masculine identities and the interaction between us

(47). While it is important to pose such a question, answering it is difficult, and at best only some broad generalisations are possible.

It is doubtful whether being a male interviewing mostly male interviewees made much difference to actual access to firms. Once I had located my contacts, they mostly agreed to be interviewed and this appeared to differ little from the experience of contemporary female researchers who were approaching producers in other industries. Where companies refused interviews, I felt it was for a reason other than my own sex.

While some interviews were more businesslike, there were a number of occasions where the 'stories' told by interviewees struck me as being very much like the type of content and style of conversation which we might equally well have had in an informal social setting. So, there is question of whether such occasions constituted a more general form of 'boys talk'. Another facet of this relationship was the sense of 'you know what I mean' which interviewees sometimes conveyed in discussion. Examples of this would be when staff talked about the fact that male users were anticipated, or that it was natural that boys would be interested, or when commenting on the interests of women. Possibly, these comments might still have been raised in conversation with female interviewees, but there remains the question of whether some of the 'chattiness' and relaxation in informal settings was occasionally structured by our loose camaraderie as males (48).

USER INTERVIEWS AND OBSERVATIONS

As outlined earlier in this chapter, the very restricted research resources available for studying consumption meant that the groups which were targeted had to be strategic in various senses. These limitations also meant that some of the methodological canons concerning the selection of groups and individuals had to be slightly relaxed. The generalisability of the group processes which I observed

and of interviewees' experiences had to be judged mainly through reference to other concurrent studies and in the light of any relevant statistical data.

The first general decision was to concentrate my efforts on locating actual users of home computers. Other routes were considered. Some of the earliest pilot interviews in the thesis were conducted with mothers whose children used computers. There was also the possibility of organising family studies, interviewing different family members in order to get a view of how the micro slotted into the social relationships of the home (49). However, since such an option required me to locate and set up interviews with at least a number of families, it would have been too demanding for a minor, albeit significant, sub-project. Instead, I had to settle for trying to appreciate aspects of the familial context through the eyes of actual users. Talking to and observing these users provided a way of exploring several issues: the nature of interest, any factors which underwrote or structured that interest and any barriers users might have faced as regards developing that interest.

A second general decision was to divide my attention between interviewing individuals and paying attention to group processes. Even though much concern had been expressed about the 'isolated' experience of home computing or of game-playing (50), there were several theoretical bases which justified a focus on the 'collective' dimension of this activity. One base was the subculture literature, although the criticisms of this also had to be borne in mind (51). In addition, within feminist literature there is reference both to the significance of relationships between men and to the collective male practices which may exclude women from certain spheres of activity (52).

I examined the collective side of computing through two types of club study. The first of these was of a hobby computing club which met in the evening and which was open to the general public. This study, checked against some other clubs, both provided material concerning

the nature of hobby clubs and experiences within them and facilitated the construction of the history of clubs more generally. The other study was of a club in a boys' school. While only a minority of users actually go to clubs, I hoped to see in such accessible public spaces some of the processes that might well occur elsewhere - for example, in the classroom (53). At another level, the clubs were also places to establish contact with and interview individuals about their personal experience of home computing (54).

A second source of interviewees was not originally intended as such. From the first producer interviews it soon became clear that a number of staff had also been early users themselves. Therefore, I adopted a policy of preparing a secondary line of questions that about the nature of their own involvement with computing, as well as about the firms for which they worked.

The clubs and producer interviews provided a totally male sample. To obtain a smaller sample of female interviewees, a different tactic had to be employed, since it soon became obvious that girls and women were largely absent from the public spaces of computing such as clubs and fairs and from forums such as magazines. Thus, women users were found mainly through chance contacts and informal networks, while girl users were contacted via a computing teacher at a local girls school.

The Computer Club Study

The computer club chosen was the nearest one to my accommodation in North London. I had acquired a list of London clubs from an umbrella organisation, the ALCC (Association of London Computer Clubs). At that stage, I had little knowledge of the differences between clubs, and so with no other guiding basis for choice, I decided to join my most local club. At least that allowed me to attend more easily. Just before the period of my research I had bought two computers myself. One, the Amstrad PCW 8256, was acquired mainly to word-process my

thesis. The other machine, the Sinclair Spectrum Plus, was bought principally to allow me to review software and experiment with programming. It seemed important to have some experience of these machines and 'involvement' in computing myself. Bringing the problems and questions arising from my own use of those machines to a local club threw up some insights into the experience of novice club members. My role was very much one of a participant, as well as of an observer.

The fact that the club had to perform a range of functions has to be borne in mind. In addition to the points mentioned so far, club members also provided a good deal of background information which facilitated other aspects of my project. For example, several issues which were discussed in the club directed me to further questions concerning company policy, which were later investigated through written sources and interviews. Because these visits functioned as a means of introducing me to the experience of home computing, I had, especially in the early period, a high profile as a researcher. That is not totally unusual in participant observation, since there are a number of different styles which have been adopted, depending on circumstances (55). (For further details of my involvement with the club see Methodological Appendix 8)

Comparison with Other Clubs

While the experience of the North London club provided some insights, I considered it to be important to have some idea of how the life of this club related to that of others. Since there was little movement of members between clubs, it was difficult to develop a comparison from the 'old hands' at my own club. In the past, this club had been one of the most active and prominent ones, and was thus likely to be atypical in a number of respects. There was no time to visit all the London clubs, and so I contacted and interviewed long-standing members of two other clubs shown on the ACCL handout in order to construct a

broader picture of how club life had developed. This tactic also provided some clues about the exceptionality of the processes within my own case study.

One of the clubs contacted was based in South London. It had recently ceased to exist as a club, although some of its members continued to meet informally. The other club was in East London. My contact there had also been on the committee of the ACCL and so knew a little about some of the other clubs around London. In both cases, I also asked about the interests and involvement of my interviewees as well as about the clubs of which they were a part.

The School Club Study

Some of the studies and articles discussing computing in schools and in training programmes had argued that in mixed classes enthusiastic boys had appropriated micros and squeezed out any girls (56). This would be consistent with arguments and evidence drawn from other walks of life about male behaviour in public 'spaces' (57). However, other sources suggested that this might only be one of a complex of factors. In her school study, Shotten found that it was also been difficult to attract girls to the single-sex clubs which had been set aside for their exclusive use (58). The same point was made in some of the pilot interviews which I had conducted with teachers at schools different from that of my eventual case study (59). Nevertheless, in choosing a school club, one option would have been to look at a mixed sex school to least to try to see if this exclusion process was at work.

A different consideration eventually shaped my choice of school club. At the time of the project, I had moved back Hackney, the East London borough in which I had grown up. I had always kept in touch with staff at my old school, and there were a number of advantages in examining the computing club which met there. First, there was

convenience of closeness and easy access through my contacts. In addition, I had completed a computing A-level at this school in the '70s, at the time when the movement to introduce computing onto the educational curriculum first started. Therefore, I knew not only about the general historical and social context of the area and of the school, but also I was aware of how computing had developed in that context (60). Secondary Schools are single-sex in Hackney and so that choice committed me to examining a boys-only club (61).

I was a little wary of being too formally introduced to the club since the literature on interviewing points to ways in which formality can work as a barrier (62). Hence, I always tried to mention that I had been at the school years ago and to discuss the experience of using my own micros. Despite these efforts, I was still seen as being 'like a teacher' and it was very hard to start up conversations as 'one of the boys'. Whereas they would talk a little more with each other and 'muck about' occasionally, I was always treated formally and answers to questions tended to be very brief. Therefore, a considerable amount of time was spent in a more observational role, occasionally asking questions. Since conversing was so difficult, there was no easy entry into arranging a longer interview. I simply had to ask the boys if they were willing to spend some time talking about their interest (usually in a nearby room). Those approached always cooperated.

I built up a good relation with the very articulate 6th former, QW, who was regarded as being in charge. He proved to be of considerable assistance in helping to clarify the nature of interest in the school. Since he had been involved in computing for a number of years, QW also constituted a very strategic case study in his own right. Hence I conducted several interviews with him (63). (For further details of the school club study - see Methodological Appendix 9)

Interviews with Users

Interviews with Male Users

The interviews with members of the school club have already been mentioned, although it should be added that on the whole the boys were a little more forthcoming when we were alone than in the club setting. It felt very much as though they were willing to talk to someone as a 'friendly teacher', of whatever sex, as opposed to an 'old boy'. Many appeared to be quite pleased to discuss their interest, to give their opinions and to explain what they had achieved. (For details of the school club contacts and other interviews with male youth, see Methodological Appendix 10).

Interviews with males from the computer clubs entailed questions about their own involvement with the micros, as well as about the club history. Apart from those members who were 'formally' interviewed, informal discussion during club time over a number of visits allowed me to build up a picture of the involvement of other club members. (For interviews with other males, including club members, see Methodological Appendix 11).

I also had less structured and general contact with males who have an interest in, or have tried out, some form of home computing. Arguably, these contacts should not really be separated off as something that was not part of the research. In effect, I was 'on duty' as a researcher all the time, since the issue always interested me. Furthermore, I was often a participant, discussing my own computer experiences with other male users. These frequent discussions formed a backdrop to my analyses, even if contacts could not be systematically documented and recorded.

Interviews with Female Users

There were some possible missed opportunities as regards meeting female users. For example, one of the magazines whose staff I interviewed (and which had a 95% male readership) had asked some of its female readers to write in. This brought some response, and perhaps the magazine would have been willing to act as an intermediary in arranging interviews. However, those who wrote in were scattered around the country. While it was justifable to travel to see producers, it seemed less so in the case of users, given the function of this sub-study in the thesis. In another case, two of the software firms which I visited had women freelancers who had written games. At the time, the criteria for choosing producer interviews were such that I did not prioritise getting in touch with these women. Towards the end of the project, I could no longer find the time to follow up these possible contacts.

Amongst the producers whom I interviewed, only four were women. These were in marketing, advertising and reporting capacities. While I appreciated their comments on gender and interest, they were not themselves home computer users in any sense. In two cases, time pressure restricted discussion of their personal (non-)involvement.

In practice, the main source of women interviewees arose from a combination of chance contacts, and my personal social networks. I met some women with a computing interest at social events (such as parties), at times when I had not intended to conduct interviews. However, since female interviewees were scarce, I made even more of an effort on these occasions to ask about the nature and origins of their interest. With the interviewees' knowledge that such details might feed into my project, I made notes on those meetings shortly afterwards.

Friends, and friends of friends, provided some further contacts. Only sometimes was it possible to make recordings - for example, it was

not appropriate on the occasion when I had been invited to dinner with some users! These women knew of my work and had been asked if they would mind helping me out by answering some of my questions. There were very obliging. (For details of female users interviewed, See Methodological Appendix 11)

To locate younger female users, I approached the headmistress of a local girls school which was near to my own school. She agreed to help and passed on my requests to the female teacher who was in charge of computing. Since there was no club in this school, this teacher asked girls attending some of her classes whether they used computers at home and whether they would be willing to speak to me about this. Obviously, it is difficult to comment on representativeness of such a sample, given that I had so little control over who was interviewed when using such an approach. All interviews were conducted during the same day, in groups of two or three girls, since this was convenient for the staff concerned.

In these circumstances, the initial introduction was clearly a little more formal than in the case of the boys, and this may well have been a more significant factor structuring the interview than my relationship as an older male interviewing girls. The fact that interviews were conducted with groups helped to relax the atmosphere, as the girls sometimes talked amongst themselves, laughing at some of the stories each other told - for example, concerning relationships with brothers. However, some of the girls were a little more reticent. Inevitably, material arising from such interviews was limited, but it proved to be worthwhile and illuminated certain key points which will be discussed in a later chapter (For details of the interviews with girls, see Methodological Appendix 10).

PART ONE:

ORIGINS AND POPULARITY

OF THE EARLIEST

HOME COMPUTERS

SELECTIVE CHRONOLOGY: EARLY HISTORY OF THE MICRO

Microcomputer Industry	Related Developments
1971	
	Intel's 4004 - first micrprocessor released for general sale
1972	
	People's Computer Company founded
1973	
DEC plan a small computer	Community Memory Project
1974	
Xerox releases Alto DEC project abandoned	
1975	
MIT's 'Altair launched' - publicised in a *Popular Electronics* article First meeting of 'Homebrew' Club & a number of other societies First computers retailed and the first 'Byte' shop First microcomputer magazine *Byte* Various hard- & software companies founded	
1976	
First 'Imsai' computers World Altair Computer Conference. Processor Technology's 'Sol' computer Various hard- & software companies founded	
1977	
Apple computer start and launch of 'Apple II' Launch of 'Commodore PET' First West Coast Computer Faire Tandy's TSR-80	

UK - 'Nascom 1' launched
UK - Science of Cambridge
launch 'MK14'

1978

UK - Specialist computer retail
shops appear
UK - *Personal Computer World* and
Practical Computing magazines
founded
UK - Arrival of Commodore PET
Apple II, TSR 80 etc
UK - Variety of kits and single
board systems start to
become available
UK - Acorn Founded

1979

UK - 'Acorn System 75' launched

CHAPTER 3: PRECURSORS AND EARLY HOBBYIST MACHINES

This first historical chapter examines the origins of the microcomputer in terms of certain conditions of production both in the computing and semiconductor industries and among hobbyists.

Computer and Semiconductor Producers

Computer and chip developments are clearly technological pre-cursors to the micro in the sense that the technical knowledges from these spheres of activity allowed a small commercial computer to become feasible. But, these two lineages are important at other levels as well. I have already drawn attention to Johnson's argument that we should examine specifically cultural elements of production as well as more narrowly defined economic conditions (1). Both computers and chips were clearly symbolic goods, being glamorous icons of a high-tech, modern age. For some time we have experienced a considerable amount of prophesying about the revolutions which these technologies will introduce into our everyday lives. When the microcomputer appeared, some of these older visions and meanings were adapted to this new product (2).

While some futurologists referred to new technological products and services as evidence in their arguments about societal trends, I would argue that there was another process at work whereby these visions were themselves significant in shaping the paths of development in the computer and semiconductor industries. The first section of this chapter outlines some of the key 'paradigms' which appear to have existed among these producers and addresses the question of why these industries produced the technical building blocks for a microcomputer, yet chose not to develop one.

Arguably, if other visions of technological trajectories had framed the concerns of these particular producers, then we may well have seen the emergence of a very different microcomputer artefact. We can start to appreciate this from the more recent example of the Amstrad PCW 8256 machine. This 'micro' was developed and marketed principally as a word-processor, and thus a replacement for a typewriter. We can only speculate what might have happened if a device called a 'home computer' had initially been developed and marketed solely as such a cross-over product from the office. The industry might have followed a very different path of development, and the micro might have enjoyed a completely different history of consumption.

Early Hobbyists

The next section in this chapter starts by examining the way in which the microcomputer was developed through the interests of hobbyists in the US. This involves providing some detail of events in the early industry. I also try to indicate the contours of interest in the micro. Although there are limited quantitative data available for this period, there are sufficient when taken in conjunction with more qualitative accounts to enable us to ascertain the size of computer hobbyism and some aspects of the profile of the early user.

We then move on to the issue of the visions which framed the micro within the hobbyist community - very different ones from those discussed above. There were various theoretical inputs into hobbyist discussions of the future, particularly ones drawn from a countercultural movement. From the perspective of the present day, it is easy to view the micro as simply being another consumer product originating from large corporations, whose capitalist logics and values determined both the existence and configuration of this machine. In contrast to this understanding, it is important to indicate how the micro could be located within a variety of political frameworks, and

was indeed seen as an 'alternative technology' by many of its early developers and users (3).

Next, I examine the features of the hobbyist micros developed by this community of enthusiasts. Through this exercise, I aim to show how the artefact which was produced by and for hobbyists was framed within interests and visions very different from anything which chip and computer producers might have anticipated.

Finally, the chapter charts the early development of computer hobbyism in the UK. This last section consists of a fairly brief coverage of events, since the nature of hobbyist interests is discussed further in later chapters. Once again, I try to indicate the extent and form of interest in this artefact within the British context.

THE COMPUTER AND SEMICONDUCTOR INDUSTRIES

COMPUTER INDUSTRY

Technologically, the computer first emerged through a series of gradual developments. During the Second World War, teams sponsored by the military and intelligence agencies in the US, Germany and Britain developed the first large digital computers (4). These valve based 'mainframes' filled rooms and required numerous attendants. In relation to the focus of this thesis, it is worth pointing out that computers did not necessarily have to be this large. In 1942 Anastoff, an American university professor of theoretical physics, had built a prototype machine about the size of a large desk in order to help solve some complex mathematical equations. Although it was never fully completed and had more limited capabilities than later computers, many of this machine's design principles were later adopted in the construction of mainframes. In the last few years, a number of historians have come to regard this small machine as the earliest

computer, particularly following a controversial legal judgement over patents which found in Anastoff's favour (5). Nevertheless, it was the mainframe that became viewed as the archetype of the computer.

After the war, there was still demand for more complex machines from the military and other government agencies such as the US Census Bureau. Although not the first company to enter this new field, the giant business machine producer, IBM, eventually moved into computer production. The multinational quickly became the market leader and has dominated the industry ever since. Since it accounts for three-quarters of world-wide sales (6), IBM has continued to determine the structure of the industry, while smaller firms have to find specialist niches or adopt strategies that fit in with IBM's plans. In addition to these producers who rented out their mainframes, there was another layer of firms called 'service bureaux'. These bureaux provided access to mainframes which they themselves had rented from others, so that smaller clients could pay for computer services without having to lease a whole computer.

The only form of computing in those early days was batch-processing. Under this system, departments sent programs and data on punched cards to the operating staff in charge of the machine. After queuing with other 'jobs', these programs finally ran on the computer and were returned to the respective departments after a period of time. An alternative, more 'interactive', form of computing later emerged which became that with which microcomputer users were to become familiar. Military requirements for instant computer analysis in their defence system led to work in the 1950s on 'real-time' computing - i.e. information which had been fed into the machine was dealt with straight away (7).

The next development in computing was the 'time-sharing' arrangements which originated at MIT in the late 1950s and early 1960s. Under this system, a number of users were linked to a computer from terminals. The mainframe would then quickly switch back and forth between their various programs. It was soon possible to transmit data down

telephone lines, enabling users to buy computer time on terminals distant from the parent machine. Within a few years, time-sharing became the fastest growing segment of the computer industry (8).

Concurrent with these developments, there arose a new type of computer which utilised these interactive features. About the size of a filing cabinet, the 'minicomputer' was used mainly for laboratory analysis and industrial control. The first, and largest, minicomputer producer was Digital Equipment Corporation (DEC), which started in 1957. Since this market was ignored for some time by mainframe manufacturers, DEC and other new entrants were able to find a niche. They boomed in the late 1960s (9).

The general public's experiences of computers was felt only fairly indirectly during these years. Computers became known through the space programme, but awareness of their increasing pervasiveness was initially limited to payroll slips and bills. Airline booking terminals provided the earliest chance to see an interactive service. By the late 1960s computing had percolated through to schools in Britain and the first computer science curricula started to appear. More and more schools began to acquire computer terminals, especially from the mid- to late 1970s (10).

During this time, at least some of those in the industry had visions of how home consumers might utilise computer services in the future. For example, James Martin was one ex-IBM employee who spent a good deal of his time giving talks and writing books on computer futures, based on discussions in which he had been involved while working within the largest manufacturer. In his writings from the early 1970s, Martin foresaw a future of terminals within the home accessing distant large machines. These computers could be used for information searching and for interactive services such as home based shopping. Martin also painted a picture of the computer being used for games such as chess, for doing calculations, for word-processing, and for the storage of personal data (11).

Such speculations fitted in with the specific technological trends which were supposed to be restructuring leisure according to the literature on 'post-industrial society' which was also emerging in the early 1970s (12). Daniel Bell and later writers referred to new means of consumption and to the rise of new high-tech leisure goods. These writers anticipated the growing importance of the role of information, and of the communications technology which handled this new commodity. These developments would enable the spatial breakdown of home and work. Many of these themes later appeared under yet another guise: as the 'telecommunications revolution'. The terminological change occurred especially when viewdata (eg Prestel) and teletext (eg Ceefax) appeared in the late 1970s (13).

In fact, we shall see how hobbyists and other commentators represented these proposed applications of the computer as aspects of the 'micro revolution', when stressing the micro's role as a terminal. However, the point I want to underline here is that all these speculations were originally formulated as part of the 'computer revolution', and it was the technology of the mainframe (or mini) which was expected to deliver such services.

SEMICONDUCTOR INDUSTRY

The semiconductor industry originated with the transistors which appeared in the late 1940s as replacements for valve technology. The next milestone was the integrated circuit. popularly known as the 'microchip', which was first released in 1959. In both cases, military support was important both in terms of funding initial R&D and by the military acting as a major purchaser for the first expensive chip components (14). As late as 1965, the military purchased 70% of all chips which were produced (15). The US government also underwrote this new technology via the demand from the space programme's efforts to put an astronaut on the moon (16).

The other main customer for both transistors and later chips was the computer industry (17). Once chip prices started to fall, these components found many other industrial applications. In terms of industry structure, the US dominated semiconductor industry became, unlike the computer industry, very competitive. This was partly due to a continuous process of employees leaving existing firms to start up their own spin-offs. These congregated on the West coast, especially around what became known as Silicon Valley (18).

Initial government funding was important for setting up manufacture of integrated circuits. Without this support, the first chips would have been too costly to develop for commercial buyers. However, various industry analysts have noted nature of these components is such that improvements in their complexity could be achieved at little extra cost in the silicon material from which they are made or in the labour costs of assembly. Therefore, a phenomenon known as the 'learning curve' is said to have occurred once the production of new types of chip had been set up (19). Improvements in the circuitry design through experience and new techniques meant that either the price of the chip could be reduced very quickly or far more facilities could be offered by the chip at the same price. These changes occurred faster with chip technology than in the case of other components. The falling price of 'computing power' was in part brought about by general improvements in computer hardware and software design, but itself partially reflected chip improvements. These two developments of falling computing and chip prices caught the imagination of some commentators, who forecast a new age being ushered in by the rapid rate of change of these high technologies (20).

It was this same 'learning curve' phenomenon which allowed rapid changes in chip based goods, such as calculators and watches. A number of semiconductor firms decided to expand from the capital goods sector to also supply consumer products. These producers continued to employ the marketing policies which had been geared to the components field - policies of which a number of business analysts

were critical (21). From these policies, one mode of competition which was practised between semiconductors and in relation to other chip goods manufacturers was in terms of offering ever-increasing functions: even if customers might only rarely use such facilities (22). The other mode of competition was via passing on the benefits of reduced costs, the consequence of which was a very rapid fall in general prices. Both of these tactics contributed the formation of an expectation among potential buyers that there was a very fast rate of change and obsolescence in chip based consumer electronics. This very expectation, as well as the particular policy of many micro producers, was later to be of significance when home computers made their appearance.

From the start, some semiconductor producers had foreseen the possible pervasiveness of chip technology. These manufacturers saw how integrated circuits eventually replace certain types of mechanical components (eg switches) and even allow the development of new types of product. The first example of such a new product was the pocket or 'transistor' radio. Patrick Haggerty, the chief executive of Texas Instruments in the 1950s, explained how this product was a symbolic good in that it was meant to demonstrate the possibilities of new transistor based technology (23):

'We all knew we were doing pretty well in our semiconductor endeavour (but) we were facing a world that was pretty skeptical...It seemed to me that it was imperative for T.I. to generate some kind of dramatic demonstration that reliable transistors really were available in mass production quantities and at moderate prices'

When Haggerty tried to market the product through radio firms, the latter initially turned him down, arguing there was no market for such a device. However, T.I. eventually found a firm which agreed to retail the pocket radios, and the machine proved to be a great success. Here we see the willingness of semiconductor producers, and especially of T.I., to risk pioneering very new product areas once the goods were

technologically feasible. Later, we shall see this spirit at work when T.I. gambled on micros (24).

The equivalent vehicle to draw attention to the new microchip was to be the calculator. Haggerty was still at T.I. when the chip appeared. On his initiative, the company spent some years developing a calculator to demonstrate a new product which used this technology (25). In this instance T.I was not the first to the market. The first chip calculators had appeared in 1963 (26). By the time that T.I. and other semiconductor machines were ready in the early 1970s, several small firms were successfully mass producing calculators (27). Shortly afterwards, the new consumer departments of semiconductor firms found a second chip product which was, for a while, profitable: this was the digital watch (28). As we shall see, the third product area with which several companies were willing to experiment in this era was video games.

Thus, consumers in the 1970s were becoming accustomed to these chip based precursors to the microcomputer. Some of those working in the semiconductor industry even started to characterise these consumer electronics as 'fashion' and 'impulse' purchases (29):

'*I find that the calculator and the watch industry is opening up a completely new awareness of the public. The public is now electronics minded. They are looking for the next gadget to fiddle with.*'

This observation highlights the way in which the latest high-tech devices could be objects of interest in themselves, beyond their 'practical' or utilitarian functions. Part of the attraction of the so-called 'brown goods', such as hi-fis and photographic equipment, lies in the fact that people can play around with them as the latest gadgets. High street shops such as Dixons and Currys have themselves been referred to as 'adult toy shops' (30). And the consumer electronics which they sell can be used by buyers as part of personal style, as 'personal furniture'. The fast-changing nature of chip based

products made it easy for these goods to take on the fashion dimensions which were already shared by other consumer electronics.

ORIGIN OF THE MICROPROCESSOR

As demand for semiconductor products increased, some chip manufacturers anticipated an imminent engineering bottleneck. The requests for new chips, each designed afresh for a particular purpose, would soon outpace the semiconductors' R&D capacities. One possible solution was a more general-purpose chip which could meet the wide-ranging specifications of manufacturers' clients.

The microprocessor chip was developed by a recently formed American semiconductor firm, Intel, in 1970. Since its origin in the late 1960s one of Intel's founders had talked about the possibility of making just such a flexible chip (31). He saw the general chip as a component which could be adapted, or programmed, for a specific purpose at the point of manufacture of a dedicated device such as a calculator, or a clock. The opportunity to implement these ideas arose when a 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, one of Intel's chief engineers, Hoff, came up with a more general-purpose chip. This was the 'microprocessor'. The new chip was based on the principle that it could parallel the working of the central processor (CPU) in a computer. Such a design meant that, unlike other chips, the microprocessor needed to be programmed in a form of computer language. Initially, the Japanese company had the exclusive right to the new component, but from 1971 Intel negotiated the option to sell this microprocessor chip to other clients (32).

At first, the new microprocessor was far from being an obvious success. The next few years saw internal resistance to developing and promoting the new product. There were two main reasons for this (33).

Marketing staff had a different view of the potential applications and sales of this new chip. They felt that the market for such a device would be limited to a few minicomputer companies. Secondly, the programming required that Intel supply supporting services which it had not previously been geared to do. Whereas the semiconductor firm was in essence component suppliers, selling large numbers of chips, the microprocessor seemed to require Intel to offer customer facilities more like that of a computer manufacturer.

Potential customers were also wary. The microprocessor designers were kept busy, via seminars, attempting to persuade possible clients of the value of the new chip (34). These designers had emphasized the structural similarity of microprocessors to the larger mainframes and, indeed, 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 with contemporary computers. Critics, including those from the computer industry, compared the microprocessor's specifications unfavourably with that of a minicomputer and for some years the trade press called the chip itself a 'microcomputer' (35). The comparison was also shown in customer's inappropriate enquiries about how to repair the chip 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 (36).

Those same ambiguities concerning the identity of a small computer as opposed to that of a component are captured in the debates which were still occurring a few years later in Britain. One contemporary journalist recalls (37):

'(in 1974) I was taking up a job on a paper called "Electronics Weekly" ...I 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 and 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 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 reasons they were held to be nothing like computers were never explained, it was just "known" they were nowhere near as powerful as computers...'

The Intel view, and that of the other semiconductor producers who were soon producing these new chips, was that the microprocessor was a component. Fundamentally, the company's vision was not of a future where products would be promoted as 'microcomputers'; rather it was a future where the new chips were embedded within other products. Many of the Intel staff involved in the microprocessor project envisaged early sales going to calculators and minicomputers. The other role which was soon discussed was that of replacing or supplementing functions which had previously been controlled by computers (38). For example, if microprocessors were placed in industrial equipment, (making them 'intelligent' rather than 'automated'), then these chips could replace the control of processes by minicomputer. Intel staff also proposed a role for the microprocessor in the development of 'intelligent terminals', where the new chips would be able to conduct some of the data processing in the terminal before data were transmitted to larger computers (39). By 1975 there were about a dozen or so companies that were producing these microprocessor chips for the type of applications outlined above as well as for some new goods which they had not anticipated (40). In a later chapter we will see how arcade game machines and later video game consoles were examples of such new products using these components.

Intel and these other producers foresaw the potential of microprocessors as providing new programmable facilities in a wide range of goods. And, in fact, they acted on this basis. Throughout the period in which the microcomputer has developed, more and more

goods have incorporated these new chips. This is a issue to which I will return at the end of this thesis. The key point to stress for the moment is the vision which became dominant in the semiconductor industry. As with other chip technology, the possible revolution of microprocessor technology was seen to lie in its potential pervasiveness.

THE COMPUTER INDUSTRY AND THE MICRO

To sum up the above point, the semiconductors had framed their microprocessor within a wider model of the way the chip revolution would unfold: bringing 'intelligence' to more and more commodities. Computer companies were clearly not working within this component orientated framework. We have already seen that the computing industry had its own views concerning the way in which its own technology would develop. The microcomputer may have been conceivable, and there were some initiatives. But the future scenarios available within this industry anticipated no place for smaller machines.

Xerox produced one of those initiatives which moved away from the dominant paradigm. The multinational had only relatively small computer interests, and ultimately approached the technology from its interest in office equipment. Xerox had set up the Palo Alto Research Centre, PARC, partly as a showpiece intended to explore technological frontiers (41). PARC had no commitment to develop commercial products, although its ideas and staff were later to influence innovations in the microcomputer industry. However, the research centre was responsible for one innovation which was adopted by Xerox. This was the Alto workstation. Developed between 1972 and 1974 and about the size of a large desk, the machine was conceptualised as 'the office of the future'. The Alto even utilised the new microprocessor technology and the when its designers later looked back on their work, they joined other claimants in asserting that their device was really

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 therefore taken up in limited numbers (about 2000) by institutions with large administrations.

At least the Alto represented a possible route for developing smaller machines: as equipment for business and administrative applications. Xerox could have been the first large corporation to develop micros, branching out from its office equipment concerns. In fact, Xerox actually moved on to construct smaller scale and cheaper versions of the workstation. Yet, the pace of that initiative was such that the company's products did not appear until a few years later. By then, they had been overtaken by developments from the hobbyist quarter.

It was the foremost minicomputer firm, DEC, which went furthest down the road to producing a small machine (42). The manager of their educational sales, David Ahl, had organised a team to develop a micro in 1973. DEC had previously sold some of its existing range of minis to the education sector and so hoped that purchases might increase if the firm could produce a cheaper computer. The company might even attract some private purchasers. One problem in this latter respect lay in the fact that DEC itself, as a large computer firm, was geared 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 to subcontract DEC's small machine to hobbyist kit firms. Ahl also looked into the possible means of producing and retailing an up-market home computer. A year after starting, the project the team produced the first prototypes. These models were about as large as a television. They were literally scaled down versions of the company's minicomputer design, since the team chose not to introduce those alterations which would make use of microprocessors. The plan was to sell these machines for $5000 each.

While the engineers in DEC'S top management supported Ahl, it soon became apparent that DEC's marketing staff were very doubtful about

the new product's future. Here, we see the main factor which inhibited all the computer manufacturers from developing small machines. The marketeers view ultimately remained that the computer time-sharing services which were offered by existing mainframe and minicomputer companies could better supply to institutions all the functions which were potentially available through the small machines. Therefore, a microcomputer would offer little extra utility even in an educational, administrative or business capacity, let alone for a consumer market. Although the management was split, the marketing analysis prevailed. It is indicative of the power of these scenarios within the computer industry that even at this late 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. The general visions of the computer and chip revolutions within which these high technology companies operated helped to block such a line of innovation. Within the paradigms of the time, the microcomputer was no obvious progression from the semiconductor and computer industries' existing concerns (43).

THE FIRST MICRO PRODUCT: THE HOBBYIST MACHINE

As a preliminary to discussing hobbyist initiatives, it would be useful to clarify certain points about the micro's technological features. The eventual emergence of a form of microcomputer amongst electronics hobbyists was made possible because of the general nature of computers and of their building blocks. The core of the microcomputer basically consists of an organisation of chips into logic arrangements. Hence, expensive tools for precision engineering were not required for the micro's construction. In addition, most of the computing principles which were involved in the micros operation had already been worked out in the previous decades. Those general knowledges

were widely available, as opposed to being the closely guarded secrets of corporations (44). A final condition which facilitated the emergence of hobbyist micro was that those enthusiasts who initially built micros had the tacit skills to mobilise those wider electronic and computing knowledges and techniques - as we shall presently see.

Once the microprocessor chips which constituted the building blocks were accessible, the relative 'makability' of the micro allowed a hobbyist involvement. The same point had been true of early radio technology and a number of commentators have drawn the analogy between the early history of hobby micros and that of ham radio (45). In the years 1975-1977, a cottage industry flourished. After this period, firms such as Apple started to emerge into larger corporations while established companies such as Tandy entered the field. These few firms became market leaders until the end of the decade. During those first 5 years the microcomputing organisations and press which arose helped to convey the image of a microcomputer 'movement', particular when fed by the undercurrents of countercultural theories which existed in the US context.

The first concern in this section of the chapter is to sketch out an overview of the process by which the computer became the object of interest for a hobbyist project, and indeed came to be constructed as the focal point of a new hobby. More theoretically, I address the issue of the particular nature of the circuit of production in which the hobbyist micro was located.

The second set of questions deal with the nature of this hobbyist product. Enthusiasts created a form of the micro which reflected the central practices and values of hobbyism. Here I want to outline how the micro as a text, and the production strategies which framed it, matched the nature of the hobbyist activities.

The First Microcomputer Product

Although most people did not think of computers in general as personal items, there were cases where some enthusiasts bought their own minicomputers, even at a price of $20,000 (46). Certainly, examples of hobby designs for computer circuits (47) and even relatively small machines built for personal use can be traced back to the 1960s (48).

Once the microprocessor appeared, electronics hobbyists such as the British journalist quoted above soon realised the new chip's potential role as the core of a microcomputer. The amateur electronics press, which addressed these hobbyists as a 'community' and acted as a public forum for enthusiasts, reflected and promoted awareness of this possibility. By early 1975, one of the American electronics magazines had carried a non-commercial hobbyist design (49). The policy of these media soon developed into a further initiative. One journal actively sought out and encouraged designs for a small commercial computer, even negotiating the nature of the machines which it wanted to see developed (50).

One small firm responded to these overtures, enticed partly by the promised publicity of a cover story which was being offered by the magazine. That company, MITS, had started life producing model rockets. The firm had just suffered losses in the calculator kit market and was in financial difficulty (51). Its hobbyist owner decided to take a chance on a new improved microprocessor which had been released by Intel in 1974. He bought the microchips in bulk to get a low price, gambling that the machine would sell in considerable numbers. MITS sold its kit machine by mail order for just under $400. This device, called the 'Altair', was the first machine proclaiming itself to be a microcomputer.

That these developments marked some turning point was by no means immediately clear to all industry observers. Even MITS staff were unsure whether their product would sell. Demand for the machine,

stimulated by the publicity it received, turned out to be beyond their expectations (52). The level of interest astounded everyone. Surprise at this demand, and at the other manifestations of hobbyist enthusiasm over the next few years, itself became part of the reason why contemporary and even later accounts could describe this machine as the start of a 'micro revolution'.

To gain some impression of the amount interest shown in this first period, we can briefly look at just a few measures. By 1977 there were 70 computer clubs in the US. One California club alone grew from nothing to having 8000 members by 1976 - 12 months after starting. That same year, a medium-sized microcomputer fair attracted 5000 visitors, with 100 firms showing off their products. Finally, the magazine *'Byte'* had by 1977 achieved a circulation of over 50,000 just over a year after its first issue (53).

As we have seen, this dramatic demonstration of enthusiasm was so sudden only because the product tapped into and allowed the manifestation of a potential interest that had already been expressed by some. Both before the Altair appeared and in the years after the launch, there were a number of other influences in the American context which supported an interest in such machines. I now briefly consider how one framework in particular - a 'countercultural' analysis - was used to interpret the significance of the emerging micro.

Countercultural machine

We have already noted how a view of post-industrial society arose in the 1970s, according to which developments in high-technology were one important motor of change. Later, we will see how these themes were mobilised to sell home micros in 1980s Britain. But, even amongst early hobbyists, some of these notions of a future information-centred economy and of a leisure based lifestyle may well have added to the way in which the micro seemed 'revolutionary'. Apart from these

general scenarios of post-industrial life and the influence of technology, some more specific commentaries on the future of computing also circulated. Researchers at Xerox' Palo Alto centre not only developed technology. These specialists had been given a free hand to do basic research, which entailed wide-ranging discussions concerning notions of 'personal information needs' and questions about the nature of potentially 'friendly' computers (54). Throughout the 1970s, a number of their ideas about future scenarios filtered through to the hobbyist movement as well as to a wider audience.

An even more influential vision was that of a radicals espousing countercultural values. The analysis of these social critics had a number of related but distinguishable strands. One theme was a concern about the politics of information. This fear related to the secrecy of the state and of big corporations and to way in which these agencies controlled access to the mainframe computers which held information. In place of this system, these countercultural critics wanted both to gain access to the existing information which was held on computers and to establish an arrangement for creating and distributing new types of information which would be of use to 'the people'. To achieve this, the counterculture critics wanted a decentralised, non-bureaucratic form of computing (55).

Here we start to see a second strand to the analysis, which drew on the ideas of a 'convivial technology' which were put forward by writers such as Illich in the 1970s (56). Illich's style of politics did not simply oppose technology, but sought technological 'alternatives'. Such an approach continued a tradition from the early period of counterculture in the 1960s, in which a form of rustic communalism could be blended with, and indeed enabled by, high-tech (57). In the 1970s, a variety of 'appropriate technologies', such as energy saving or producing devices, could draw upon some of these earlier sentiments. MacLuhan's image of the 'global village' seems to have found particular resonance in theorising the role of alternative computing, as Roszak notes (58):

'...one pictures the computer terminal as a sort of heath or campfire, around which, by way of modems and satellite transmitters, the clans gather to exchange gossip and graffiti with their counterparts half a world away.'

A final theme which fed into desires to make the computer more convivial and accessible was the argument that it was important to make technology more familiar. Whereas the other concerns were chiefly based around the telecommunications potential of the machine, this theme assumed that a first step to a 'people's computer' entailed dissipating some of the aura of these machines. Even before the micro appeared, some countercultural enthusiasts had run courses where participants could gain hands-on experience of the computer terminals. These courses were considered to be a valuable political project (59).

Other initiatives included the founding of the journal, the '*People's Computer Company*' in 1972 to discuss these issues - with later publications following. Also in that year, a mainframe called 'Resource One' was set to enable such initiatives as the creation of alternative mailing lists and to promote computer education. In a further effort to bring 'computer power to the people', the 'Community Memory Project' was started in 1973. Here a mainframe allowed information exchange for anyone who wanted to take part via terminals which were located in various public places (60). The next step that some countercultural engineers were planning just before the Altair appeared was a 'convivial personal terminal' to access the mainframe from home (61).

When the Altair was announced, the computer counterculture press welcomed the machine (62). For these activists, the micro represented a new means of decentralising computers, and of bringing computer power under personal control. Micros had the potential to be terminals and link together in networks of communication. These small machines also provided a way of demystifying computers through allowing individuals to own them. The *People's Computer Company* devoted pages to the new microcomputer, as the centre of the now

imminent revolution (63). Furthermore, the coverage of other countercultural press, such as the *'Whole Earth Catalogue'*, allowed news of the micro to reach a wider audience than the (mainly male) computer enthusiast (64).

The importance of this countercultural strand amongst the early computer hobbyist producers and users can be judged from the backgrounds of prominent figures in 'Homebrew'. This was the first and most well-known early club, from which about 20 companies later emerged (65). Meanwhile, the plans for the convivial terminal mentioned above, were transformed into a design for a new microcomputer - the 'Sol' - which became one of the more successful of these early micros (66).

The Early Microcomputer 'Movement'

In the two years following the launch of the Altair, a small scale industry grew up around this machine and related products. The design was copied by both start-up and existing firms. The most well-known of these companies was Imsai. Other firms provided improved parts for the machine, hardware add-ons and some software. Nor was Altair the only model. Semiconductor companies such as National Semiconductor (NSC) sold 'evaluation kits' for industrial purposes. In effect, these had the same structure as micros and were seen in that light by the hobbyists that bought them (67). Those working within firms which produced chip products could also get hold of chips and construct their own machines (68). By the end of 1975, one survey revealed that a quarter of hobbyists had actually built their own micros from the basic microprocessors and supporting chip components (69).

Some of those hobbyists who worked for firms which were capable of making small computers were enthusiastic in encouraging their employers to develop these new products. For example, Jobs and

Wosniak, the founders of Apple computers, tried to persuade Atari and Hewlett Packard, respectively,to take up their design. Others working in semiconductor firms also proclaimed the merits of the new machines (70). Usually these ideas were not adopted, especially after some of the other consumer orientated chip products had lost money. This lack of interest on the part of larger companies helped to insure that the market initially remained a cottage industry.

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 demand. Magazines, fairs and new clubs provided a structure for the new hobby, facilitating the flow of equipment, spare parts, and technical knowledges. They also organised this enthusiasm and helped create a sense of community, a sense of being a pioneering movement (71). This provided extra motivation to develop the technology, as Wosniak himself pointed out (72).

Lastly, these public forums provided opportunities not only to talk about technical matters, but also about the future of computing. Here the visions of the computer manufacturers and semiconductor producers were re-worked around the new micro. According to these re-visions, home control functions would some day be organised from the central microcomputer, instead of programming the discrete chips in household products. Meanwhile, users would still be able to access distant computers, with the micro eventually doubling as terminal. Moreover, some of the services envisaged as being provided by mainframes, such as word-processing, certain forms of data analysis, games etc. could now be handled by the micro independently.

By 1977, the nature of the industry started to change a little with the entry and emergence of the bigger companies, (to be discussed in detail in a later chapter). The design of one hobbyist employee was taken up as Tandy's TRS-80 micro (73). This retailing giant soon became market leader in the last few years of the decade (74). Another new micro was the PET, from the calculator producing multinational, Commodore. Both companies employed some of the new

approaches which were emerging into the market, such as selling ready-made computers instead of kits. These larger firms also distributed their products through retail outlets and adopted a more active marketing policy. Yet, both companies were still used to catering for hobbyist markets and continued to regard enthusiasts as a key source of sales. Finally, we have the firm which grew to become the other main force in the industry with the help of venture capital: Apple. As we shall see later, this company played a central role in changing the image of computing. All three firms eventually became significant in a new type of market which was emerging: for business micros.

The Nature of the Hobby Micro

The final dimension of this early American history which I want to consider is the question of the nature of these first micro products. In other words, I want to look at the ensemble of features which constituted the micro artefact. Admittedly, particular products differed to a degree during the first few years of the industry. And, by the end of the decade, new types of machine, such as the Apple II computer, co-existed with the older forms. Nevertheless, a number of elements were shared by these early products. Many of these points about the nature of the micro also applied to the hobbyist machines which were later developed in Britain.

The very appearance of those early machines bore the imprint of the hobbyist context. Some idea of this can be attained from descriptions and pictures of the Altair itself. Although subsequent machines changed shape, many still kept many of same fundamental features as the MITS device. This design reflected the primary interest in function. The early micros consisted of a metal box, (often literally 'the black box') with toggle switches, blinking lights, and wires coming out of all sides.

The description that the industrial design historian, Adrian Forty, applies to early radio products seems appropriate here. He characterises these devices as 'rude assemblies' with the look of 'raw technology' (75). In a similar fashion, these micro artefacts portrayed themselves as equipment for experimentation. Even though they were producing a marketable product, the producers were mainly designing for themselves and making the machines which they wanted to own (76). Such an approach was successful because the designers were close to and shared the same values as their customers - for whom aesthetic considerations not so important. It was only when the larger firms entered the field with their greater concern for marketing that there was much consideration of industrial design principles.

To use such microcomputers required their owners to have or acquire fairly sophisticated knowledges. This fitted in with the key theme of the hobbyist enterprise, which was precisely the improvement of such expertise. With little software available in the early years, and indeed not enough memory to run software on the earliest machines, the hobbyists had to program the machine to get it to do anything. Repairing micros when they broke down - by all accounts fairly frequently - was another challenge. In fact, it was not until the Apple that micros first acquired a good image for reliability; a factor which started to make micros far more attractive for business users (77). For the less self-sufficient, the difficulties involved in operating the early machines, compounded by sparse documentation, must have been one major impetus to seek the benefits of club participation.

In the light of this overview of the knowledges and technical skills which were required, it is not surprising to find that a large proportion of these early enthusiasts were programmers and engineers by trade or used computers in a work context. These hobbyists usually had a considerable degree of knowledge about computing (78). We can note at this point that these enthusiasts were also mostly

male, although further discussion of this aspect is reserved for subsequent chapters (79).

Lastly, we can consider the self presentation of these start up companies and their approach to selling hard- and software. Marketing existed only in a fairly minimal way: the product's arrival was, literally, announced. There was no need for any discussion of possible applications: these, of course, were the prerogative of the hobbyist. Sales took place at stalls in computer fairs, in clubs, through classified ads in the hobbyist and computer press, and very gradually through the computer stores which were beginning to emerge. The whole industry was like a club, the easy-going nature of which was visible in the images presented by these small companies: Loving Grace Cybernetics, Kentucky Fried Computers and Intergalactic Digital Research (before it became plain Digital Research) (80). Their very names indicated the fun and humorous side of this community.

HOBBYISTS IN THE UK

The Changing Nature of Electronics Hobbyism

General developments in technology, including the new chips which were appearing, had started to create a new problem for more general electronics hobbyists. Certain equipment or components could no longer be improvised through adapting readily accessible spare parts. Here RS, who worked for a firm which was later to cater for these enthusiasts, outlines the changing situation (81):

'*(...) everyone had (previously) been happy to play with ex-MOD equipment, but by the early 1970s the old war-surplus valve sets were beginning to dry up. Also there had been sufficient advances in semiconductors that people wanted to experiment...and there were things that needed to be bought. For VHF, which was the up-and-*

coming wave band, you simply couldn't sit down and wind your own coils (...) You had to buy precision manufactured parts (...)'

Yet, access to these components was initially difficult. The sales administration of electronics manufacturers, including semiconductor firms, was geared to a capital goods market, as in the US. These producers organised their accounting procedures to accept bulk sales to approved customers who maintained accounts; there was no mechanism for accepting individual orders. There was also little interest in doing so (82).

By the mid- to late 1970s a layer of intermediary distributing firms started to emerge. These enterprises bought components in bulk and then sold them in smaller quantities to other companies and to hobbyists (83). It was only with the appearance of these small distributing companies that widespread experimentation with chip technology amongst electronics enthusiasts became possible. These distributors sold both the basic chips as well as products, and designs which incorporated integrated circuits (84). For example, the firms sold calculator kits and even video game kits - and eventually microprocessors.

The Arrival of Microcomputers

When the Altair was launched, we saw how a climate of expectation had been fostered in the US by certain electronics magazines. Although some of these journals were accessible in Britain, that general level of anticipation was far weaker in this country. The computer journalist cited earlier recalled the view from this side of the Atlantic (85):

'... 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."'

With the rise of hobbyist clubs and new magazines in the US, editors in Britain soon took microcomputers more seriously, giving coverage to developments in America (86). A number of my hobbyist interviewees recalled reading such articles and looking forward with envy to the day when affordable machines would be be available in this Britain.

From 1977, American products such as the Altair and Sol began to arrive in Britain. However, these micros were considerably more expensive for British hobbyists to buy than for their American counterparts. A machine which cost $500 in the US was sold at £500 here (87). Given lower average incomes, most hobbyists found these machines prohibitively expensive and the same was true for the PETs, Apple IIs and Tandy TRS-80s which appeared from 1978. Some hobbyists bought these machines, but most sales went to education and business purchasers. During these early years, the Commodore PET emerged as the most popular machine in Britain and on the Continent. Unlike its American competitors, Commodore put most of its sales efforts into overseas markets (88).

Some enthusiasts had managed to construct their own 'homebrew' devices from the mid-70s. As noted above, access to the basic chips was at first limited in the days before intermediary distributors. Initially, it was only hobbyists working in locations such as companies which sold electronics parts (89), in firms using these chips (90) or in institutions such as schools and colleges (91) who could acquire the core microprocessors. But by 1977, the microprocessor was becoming more available. 'Development kits', intended as an introduction to microprocessors for working engineers, were reviewed in the electronics press as a way into rudimentary chip programming. One kit in particular, National Semiconductor's SC/MP (called 'Scamp') Introkit,

appeared to be very popular (92) and was even used in the construction of larger micros.

The first public demonstration of this interest came in August 1977. Four hundred people attended the first one-day conference concerned with the issue of how to build a micro. This number was far more than had been expected and meant that some of the visitors had to be turned away (93). A far bigger demonstration was to follow shortly afterwards with the launch of the Nascom 1 in late 1977.

Nasco was the UK subsidiary of an American distributor of semiconductor products. The company was familiar with the electronic hobbyist market, and its American parent was in contact with microcomputer hobbyists in the US. The British subsidiary set up a separate firm, Nascom, to produce a kit microcomputer, the most basic version of which cost nearly £200 (94). The 600 people who attended its launch in November was again considerably greater than had been anticipated (95). The company sold 400 machines in the first 2 weeks following the launch (96), and had 7,000 enquires in the period immediately afterwards (97). Despite the antecedents noted above, many commentators regard this machine as marking the start of 'hobby computing' in Britain.

Shortly after the Nascom launch, the first British microcomputer magazines, *'Personal Computer World'* and *'Practical Computing'* were founded in early 1978. These were intended to cater for hobbyist, educational and business users (98). Both were initially sold at exhibitions in order to gauge demand before achieving a wider distribution. They remained the two chief hobbyist publications until the end of the decade.

Some organisations which predated micros had existed for enthusiasts of computing. The Amateur Computer Club (ACC) was a national body which had been founded in 1971 and by 1978 had 2000 members (99). Although intended for those with a general interest in computing, the

ACC was also a forum to discuss the new micros. Some other microcomputer clubs also existed (100).

The magazine *Personal Computer World* successfully fostered more clubs from October 1978 by a mixture of providing encouragement and guidance as regards how to set up groups and by announcing where and when meetings were taking place (101). During the first 11 months of following this policy, PCW had been contacted by 33 clubs, virtually all of which had been newly formed. The magazine also received 20 requests from people seeking other enthusiasts with whom they could found clubs (102). Flourishing clubs attained as many as 50 members, and one club in North London had on average 150 people attending at least one of the 6 meetings which it held during the week (103). Such big groups soon sub-divided into special interest groups, often around particular machines. Newsletters also started to appear by the end of 1978 (104).

Over the next few years Nascom remained the market leader in Britain, despite the fact that 70% of its output went to the continent. Yet, the company advertised very little, since demand was more than it could meet. By mid-1979, the pattern of sales had shifted so that a majority of machines went to industry and educational institutions (105). Other companies, large and small, were soon providing alternative cheap kits. For example, Commodore took over sales of the 'Kim' computer when it acquired MOS Technology and micros such as the UK101 and Tangerine appeared from small British firms.

It was at this time that the firms which were later to have such an important influence on British developments entered the field. Clive Sinclair's main company was 'Sinclair Radionics'. But, he had also launched a separate firm, 'Science of Cambridge', and it was the latter which, stimulated into action by a hobbyist initiative, developed the MK14 (106). The chief engineer at Science of Cambridge, Chris Curry, then broke away from the Sinclair firm to form Acorn Computers with the help of Herman Hauser. This new company continued to produce

improvements on this early MK14 hobbyist kit. Both the Sinclair and Acorn products sold reasonably well in the last years of the decade.

SUMMARY

The computer and semiconductor industries were aiming to produce artefacts and services which had some of the later use values of micros. On the whole, however, the paradigms operating in those industries meant that these agents were less likely to develop the general technological configuration of the microcomputer product: that is to say, a stand-alone, general information-processing device. Certainly those paradigms allowed even less for the more specific technological form of the early hobbyist micro: that of a machine inviting exploration of its inner workings. Unlike some of the other technological products that have been the subject of critical analysis, the micro was not to be a product of the R&D and marketing departments of large corporations, even if some of these were later willing to embrace and transform the artefact (107).

In this chapter, I have dwelt upon the countercultural influences, even though they will be not be developed further. The rationale for this decision to limit discussion is that these sentiments had less resonance in the UK. In addition, by the time the early home computer appeared, countercultural notions had diminishd even further (108). However, the countercultural dimension is significant, if only because it shows the flexibility of meaning which can be imparted to technological products (109).

The microcomputer clearly could be located within a diverse and complex set of frameworks. Admittedly, the countercultural analysis shared some of the same themes as the post-industrial literature: principally in valuing information and communications. Other commentators have pointed out how advertising copy of firms even such as IBM could later appropriate some countercultural elements for its

own sales pitch (110). But ultimately, those radicals who were concerned with the politics of information, convivial technology and demystifying the computer did not share the consensus view on which much of the post-industrial literature is based, nor did they adopt a simple ideology of progress. These social critics drew on a 'traditional' political strategy of technological alternativism.

Some writers have argued that the counterculture analysis was naïve (111). To stress the benefits for 'the people' certainly meant that there was little consideration of how the actual use of technology might be shaped by existing social relations - such as those of gender. Yet, feminist critiques of particular forms of appropriate technology are already emerging. For example, energy saving schemes seen as part of an idyllic return to rustic life may actually create more domestic labour for the women (112). Zimmerman provides a totally different set of readings of the impact of the micro from those of counterculture analysis. When she looks at possible consequences for women, such as an increase in consumption work and in isolation, Zimmerman highlights how little the counterculture approach considered gender relations (113).

In that those early enthusiasts did not take into account such existing relations, the counterculture approach bordered on positions that its advocates would surely have wished to avoid. The danger was always that alternative technology might well move towards becoming a 'technological fix' to the hierarchy and the secrecy of which the counterculture movement is critical. Furthermore, the technology was portrayed almost as determining its own use, in that these social critics were very confident that a new 'progressive' set applications would arise. This underestimates the influence of the practices into which technologies are inserted.

These seem to be some of the paradoxes of the countercultural analysis. One last paradox is particularly relevant to a theme I later cover. These critics aimed to demystify the computer, disassociating themselves from the sense of technological wondery created by the

corporate marketing departments. Yet, their own fascination with technology is apparent in the accounts of early hobbyist activities as well as in some of the optimistic countercultural representations of the impact of the machine (114). While not 'mystifying' the computer, these activists raise the machine above a mundane object and in a sense contribute to its identity as a piece of 'gee whiz' technology (115).

Finally, I would like to view this early hobbyist period in terms of the circuit of production outlined in the introduction. The key point is that the relationship between the producers and consumers of this new cultural product was initially a very close one. Various producers were usually hobbyists themselves. The public arenas in which micros were discussed - the magazines, the clubs and the fairs - were shared by all. There was no separate forum for producers. Therefore, unlike the way in which the semiconductor and computer manufacturers speculated about what future customers might want or be persuaded to buy, these producers 'knew' their audience better. Hobbyist producers received a good deal of feedback, and generally shared the same interests and wanted the same types of product as their customers.

So, the nature of the product fitted into these hobbyist practices. Whereas some of the corporate visions of chip and computer futures would have required users to adopt very new practices, this was not the case with early hobbyist micros. Nor did enthusiasts need to persuade potential customers of the benefits of products. The small computer could easily be slotted into pre-existing hobbyist interest in the exploration of new technologies. This form of the circuit provided one precondition under which early micros were made, for the most part, by males for males.

SELECTIVE CHRONOLOGY: EARLY MICROS AND THE BRITISH MARKET

References are to Britain
unless otherwise stated.

Date	Computer Industry Developments	Other Relevant Events
1977		
	'Commodore PET' released in US	
	'Apple II' released in US	
	'Tandy TSR-80' released in US	
1978		
		Horizon programme 'Now the Chips are Down'
		Early Government discussions and schemes.
1979		
	Atari '400' and '800' released in US	
	Texas Instruments '44/9' released in US	

1980

'Sinclair ZX80'	BBC contract award to Acorn
'Acorn Atom'	

1981

'Sinclair ZX81'	W.H.Smith deal
'Commodore Vic 20'	DoI scheme
'Acorn BBC'	DES scheme

CHAPTER 4: THE EMERGENCE OF THE HOME COMPUTER

In the very early history of the micro, we noted that by the late 1970s much larger firms were entering the market or, as in the case of Apple, emerging from the hobbyist start-up firms. By virtue of their structure, history and size, these corporations helped to introduce new conditions as they came to dominate the US microcomputer industry. In this chapter, the focus is on the plans formulated by these companies for developing what was known as a 'home micro'. In particular, I attempt to detail the breaks and continuities between these new products and previous hobby machines. The first two sections of this chapter examine the policies of the large American producers.

By way of contextualising ideas about a home machine, we first need to appreciate the emergence of a different microcomputer paradigm: the business machine. This new form of micro eventually developed some strikingly different design principles, and a sharply contrasting image to hobbyist machines. In fact, we could well consider it to be a different product. What might be seen as just a progression from the hobby micro really entailed a new underlying conception of the computer's role and of the relation of the user to that technology. During the late 1970s, sales to small businesses grew sufficiently so that these latter buyers and hobbyists were seen as constituting the two main markets for micros (1). After outlining the origins of this business market, I intend to look particularly at the early history of Apple. The Apple II machine has been seen by many as providing a new model for business micros, and opening up that market considerably. Paradoxically, this Apple micro was originally intended to be a home computer.

Next, I examine the evaluations of different commentators and companies concerning whether a home computer could become a common feature of everyday life. Was there a sales base beyond hobbyists and

could micros be sold through other than hobbyist marketing channels? (2). In other words, could the micro become a consumer electronic? There were a range of differing opinions, of suggestions about transforming elements of the product to produce a new identity, and of speculations about the best way to promote the machine. In the light of these public debates, , I focus, first, on the approach of Tandy and Atari before giving considerable attention to that of Texas Instruments. It was the semiconductor giant which had the highest hopes for this new product (3). After noting the specific circumstances and strategies of these particular companies, we can begin to appreciate the overall trajectories that were emerging.

The second half of the chapter shifts to the British context, which in many respects provides a striking contrast to the American plans. We start with the rise to prominence of Clive Sinclair's company. Many people have viewed its early machines, the ZX80 and ZX81, as marking the start of home computing in Britain. Sinclair Research was the earliest computer manufacturer in Britain to actively promote home micros through the national press - Tandy's efforts had been much lower key. Through this policy and other innovations, Sinclair Research helped to create a mass market for the home micro as a consumer durable. Its machines were the first to begin to attract a wider audience that had not necessarily had any previous computing or electronics interest (4). The total number of ZX80s bought was soon greater than the previous combined sales of all micros in Britain (5). That very success of the ZX80 and ZX81 first attracted the attention of the management journals to this field and resulted in a range of articles depicting Clive Sinclair as a model entrepreneur (6).

The appeal of these Sinclair micros was substantially the same as the hobbyist one. The user bought the machine for itself, to explore the device, rather than purchasing the micro for any applications it might offer (7). Apart from the fact that this was a very different emphasis from that of the American companies, Sinclair's earliest home computers were distinguished by the degree to which they had virtually no practical uses or benefits apart from being a vehicle for

learning to program. The micros sold on this basis, combined with a symbolic value as a piece of the new computer revolution. The ZX80 and, initially, the ZX81 constituted a model of what I call the 'self-referential' home computer.

Although Sinclair was the first to develop a home computer as a self-referential machine, there remained strands of this approach in the products of other companies. After Sinclair had demonstrated that there was a demand for micros solely on this 'try it out' basis, other companies were willing to pitch machines partly in those terms. All firms, big and small, had planned to base at least some of their marketing on the theme of 'familiarisation with computers'. After Sinclair, that familiarisation to some extent became identified with learning to program.

However, Sinclair was not alone in the market of 1980 and 1981. Examination of his two main competitors reveals that the overall trajectory of the micro in the British context was a complex one. The first of these contemporaries, Acorn, shared an orientation to the hobbyist market and programming. On the other hand, they also foresaw a path to a more useful computer - ultimately attempted via the BBC micro. I take this opportunity to outline briefly the BBC's computer literacy campaign and various State initiatives. These two developments could easily constitute research topics in their own right. In this thesis, they receive limited coverage because I prioritise the work of commercial producers. It seems appropriate to deal with these two sets of initiatives at this point, since both were particularly important in relation to Acorn's history.

The last section of the chapter deals with Commodore, whose policy represents a much greater contrast to the Sinclair micro. Of all companies producing cheap, popular machines in Britain, Commodore requires a slightly different form of analysis because of the split between the US based parent and its relatively autonomous British operation. Commodore is of interest through its marketing innovations, reflecting the orientation of the British subsidiary. The

firm was also one of the earliest to try to develop the main conception of the micro that was discussed among US producers: as a machine to play software.

The significance of these developments for the issue of gender will be outlined in the next chapter. To preview this, one central theme I develop is the gender implications of a self-referential hobbyist product. The transformations the American producers expected the home computer to introduce would have made a break with hobbyism. Thus, the home computer could have become less 'masculine' than it had been in its earlier hobbyist location. Instead, in the British market, producers such as Sinclair and, to an extent, Acorn, produced home machines which preserved some continuity with hobbyism. In other words, a key element in the trajectory of British home machines did not derive by automatic progression from that of the earliest micros. The self-referential machine arose from particular and contingent policies, albeit ones framed in a wider context which constrained the options open to all producers.

US BUSINESS MICROCOMPUTERS

Once machines were available and selling to hobbyists, some small companies quickly saw that a business market might exist for these microcomputers. The firm Imsai targeted small business users in the US as early as 1975 (8). The company's intention was to sell packages of soft- and hardware to meet individual client requirements, in much the same way as larger computer firms operated. 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 strategy was employed, which used the pressure of telephone sales. Yet, at this early stage, the reality of the machine still fell considerably short of the grand plan.

However, elements of the hobby machines still lingered on. The Imsai micro remained unreliable. Its instructions were written by engineers for engineers. There was initially no software. And, in appearance, this solution to business problems was still described as looking like a 'pile of electronic test equipment' (9). Imsai nevertheless represented the start of a new trajectory. Soon, others were to follow, some of whom started to concern themselves more with the aesthetics of micros (10). This included experimenting with re-configurations of the machine, such as having monitor, keyboard and microprocessor circuitry all in one structure.

In the years following Imsai the industry witnessed the rise of separate software houses which operated in a symbiotic relation to these hardware companies. Some catered for hobbyists, but others saw promise in this developing business market. By 1977 a word-processor for micros called 'Electric Pencil' was available (11), while Databases and Spreadsheets like 'Visicalc' appeared shortly afterwards.

The Apple Microcomputer

Arguably, the biggest single boost to the business sector came with the launch of the Apple II in 1977. For many, this machine marked the new face of micros. Apple's computer became a model for business micros, for which the name "personal computer' was increasingly reserved. If IBM was finally to legitimize this product when it entered the market in 1981, Apple has been seen as being chiefly responsible for bringing these machines to the notice of a wider public, and for putting the microcomputer on the map.

Yet, this product was not intended for a business market at all. We have seen how hobbyists were looking forward to the day when the micro-revolution would reach a far wider audience. We will shortly see how more general computing journals started to carry features on the possibility of a mass marketable machine, while the consumer

electronics trade press speculated about whether the micro industry could join its ranks. It was at this home market that Apple aimed its first commercial product.

Apple was the biggest company to emerge and survive from the hobbyist movement. The Apple II was widely recognised as having a good design for its time. However, it was to be other qualities which differentiated Apple from its contemporaries were other qualities. One of the founders, Jobs, had sought and obtained venture capital backing. These funds underwrote a far bigger marketing drive than other small firms could muster. The company was also concerned with its corporate image, in contrast to the light-hearted approach that existed among many other hobbyist firms (12).

Apple's machine broke with previous industrial design styles as part of the attempt to reach a wider audience. This involved prioritising an ideal of 'user-friendliness' by distancing the Apple product from the appearance of anything like a 'black box' or of industrial equipment. The Apple II was the first machine to adopt a low, wide form encased in plastic - entailing a production process which was more expensive than the sheet metal used by competitors (13). When that new shape initially gave rise to over-heating problems, solutions other than installing a fan were adopted. It was felt important that the micro should run silently, in order to avoid creating apprehension about whirring machines (14). On the whole, there was an attempt to de-emphasise the micro as technology. As their industrial designer pointed out (15):

'We were selling a solution to a problem, not a machine.'

Jobs wanted to follow the example set by the sleek calculators of his former employer, Hewlett-Packard. In addition, he noted the styling of other 'brown' and 'white' goods (16). There were definitely to be no shapes that in any way connoted science fiction type gadgets, and the futuristic designs at first offered by another designer were rejected (17). The final shape had no sharp edges or screws jutting out. Its

soft curves were in neutral, light earth colours. Elements of this new computer aesthetic were to be widely adopted in the industry.

Apple's target audiences included existing hobbyists, but staff also thought that they might reach professional workers who had previously shown an interest in consumer electronics such as programmable calculators (18). Hence the company advertised in journals such as 'Playboy' and 'Scientific America', as well as in the hobbyist press. The fact that the appeal was aimed mainly at males is not only shown in the choice of magazine. In the words of one commentator who adopts a slightly critical tone, the advertisements depicted 'a kitchen with a women merrily at work beside a chopping board while her husband sat at the kitchen table using the computer to attend to more worldly chores'. The less gender-specific ad copy still maintained some of the traditioal hobbyist emphasis on how users could write their own software (eg household finances, recipes and biorythms). Home control was seen as a later possibility. To underline this initial targeting of the home market, the company did not exhibit its computer at the main business fair that year, but focussed on the chief consumer electronics show (19).

Within six months, the company had changed policy, switching its primary focus to the business sector. Its marketing agency argued that the time when consumers would use computers in the home was far away (20). Subsequent advertisements worked to remove any impression that the micro was a plaything, especially by depicting the machine in work contexts.

The gradual success of the Apple II in its new business role has been partly attributed to the cottage industry of firms which emerged to support this particular micro. No large network exists for corporations such as Tandy, which had proprietary design and produced all additional soft- and hardware itself. One particular boost to Apple's fortunes came when the spreadsheet software 'Visicalc' was at first written solely to run on the young hardware company's micro.

Spreadsheets had not previously existed on the larger computers, and so this program proved very popular in business circles (21).

The Growth of the Business Market

Other large hardware manufacturers such as Tandy and Commodore joined Apple in switching their main focus to this business market. Once it became clear that there was a potential business audience (22), these companies recognised that this sector could be more lucrative in terms of buying services which had high proftability margins. As SU, the British manager of Tandy, explained (23):

'*(...) you have the software to get into place, you have to put the support services in...the national parts, the repair services (...) there's more money to be made...because it's a bigger ticket to begin with and then (you have) all these other things as well (...)*'

That change in policy was also manifest at the level of functional design. For example, Tandy prioritised the development of the 'reliability' of these machines, rather than trying to produce a cheaper micro, because this was the feature that was so important to business users. Meanwhile, other existing producers, such as Exidy, also announced there decision during the 1980s to aim solely at the 'up-market' business sector (24).

Over the next few years, the business micro developed into a different product from the hobbyist machine in yet further ways. The more generally readable documentation reflected the perception of the user as being a non-expert. Within a short time, support for the user, in effect, was bundled with the machine in the new retail structure which arose. Dealers supplied advice and back-up services, in much the same manner as the suppliers of larger computers. But most importantly, a new era of marketing was introduced. This entailed much more active promotion, the overt emphasis of which was on the micro as a tool, not

a toy. Implicitly, though, microcomputers were still sold as other office equipment had been sold: partly on the basis of their modern image (25).

Some hobbyists still bought these up-market products, regardlessly. In fact, despite its new focus, many still continued to regard the Apple II as a hobbyist machine (26). After all, it was still possible to intervene in workings of the micro and it was easy to delve into its insides. As we saw in the last chapter, machines such as the Apple II were taken up in the home and for the first time attracted users who possessed less expertise than the early enthusiasts. The eventual arrival of much higher priced machines was to create a division between home and business micros even in the US. But, in the late 1970s, the price of machines such as the Apple II in relation to American incomes meant that these micros to some extent could still break down product boundaries and cater for both markets. This was less feasible in the UK.

US DEBATES ABOUT THE FUTURE OF HOME COMPUTERS

In the late 1970s, articles in computer journals and in the consumer electronics trade press discussed the feasibility of 'home computers' (27). 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 the microcomputer acceptable as a domestic item?

Optimists thought that the home micro could become a pervasive technology, like the calculator. Each year, the trade press noted the failure of this mass demand to materialise. Yet there were always some producers and consultants who maintained that the boom was imminent (28). The evidence of sales was itself problematic to assess. There was no sudden up-surge in demand. And sales to non-business

users were certainly not at a level sufficient to support any major expansion by producers. Pessimists interpreted this pattern as reflecting a residual amount of hobbyist interest, which appeared to be already starting to dry up by 1978 (29). The doubters regarded enthusiasts as the only real home buyers, and so could talk of the home market being saturated by 1980.

Tandy's Low Key Policy

In the light of these wider debates, companies such as Tandy were willing to persevere in the market, but only with a low key sales effort. This retail giant had been used to dealing with hobbyists as well as their mainstream consumer electronics trade, and so Tandy staff had initially wanted to stock micros made by others but labelled with the Tandy brand name: 'Radio Shack'. The company had approached Imsai to this end (30). When a hobbyist in their own organisation developed a micro, Tandy was willing to give the product a trial run in 1977. Yet, the TRS-80 was never the focus of a major marketing campaign. Instead, the micro was just one new item which the retailer was releasing (31).

Consequently, Tandy's advertisements in the national press showed micros alongside other goods. The retailing chain continued this policy in Britain. Advertising copy was a straightforward statement of machine specifications. By 1979, Tandy's micro sales amounted to $100m, mainly through US outlets (32). Nevertheless, the company switched its emphasis to the business sector, as well as promoting sales to educational institutions. Tandy continued to make the TRS-80 available to the public and to advertise the product, but there was little optimism about the future of a mass market (33). Even though this mass retailer benefited considerably from demand for the micro, it had little commitment to actively trying to establish the micro as a major consumer electronic.

Atari's Home Computer Dilemma

Atari is the subject of further discussion in later chapters, when I chart the development of the arcade and video games industries. Through seeing Atari's leading role in these other spheres, we will be better able to appreciate the company's policies on computers. However, the general gist of its approach can still be indicated at this stage.

The games machine producer turned down the chance to develop micros at first, when Jobs offered the company the chance to market the Apple machine in 1975 (34). A few years later, Atari changed its policy and in 1979 produced some 'home' machines. By this time, there were a range of research projects within the company, many of which did not relate directly to games. This R&D, in fields such as telecommunications and control, never materialised as products. Nonetheless, that work represented a willingness to diversify away from a corporate identity solely based in games products (35). Some personnel within the company saw the micro as potentially being the core part of system of microelectronics, and certain design features of the Atari machines anticipated that the micro would be connected to other electronic devices (36).

The two machines which were launched together, the Atari 400 and the more powerful 800, were aimed at both hobbyists and general home users. The latter machine did indeed build up some following amongst enthusiasts. More generally, Atari chose to stress the educational uses of the machines, in order to differentiate the micros from games console products. To support that identity, the firm commissioned a range of educational software (37). However, the marketing of the micros was kept low pitch, due to a combination of reservations about the future of this product and the worry that the home computers might adversely affect the sale of the Atari games machine.

Texas Instruments' Optimistic Visions

The launch of the Texas Instruments 99/4 Home Computer in the same year, 1979, was a very different matter. TI had the ambition to create a new market. Given the considerable resources at its disposal, many industry commentators thought that the semiconductor multinational might well succeed, and that this would allow others to follow on its coat-tails. In the next few years Texas spent $20m in an attempt to dominate a new field, as it had done in the case of calculators (38). TI had also started projects on scientific and business micros, but decided to drop these in favour of concentrating on the home machine (39). Texas followed a very different path from other companies. Not only did it avoid trying to cater for both a home and business sectors, but the semiconductor firm also chose to make a break with the hobbyist market.

As we saw, Texas Instruments had established a tradition of creating new markets. It was a very technically driven company, headed mainly by electronic engineers who had a strong belief that 'technologically valid products would sell themselves' (40). This approach had proven successful before. To maintain momentum, there was constant research on a range of new types of product, even though many projects never saw the light of day (41). Given such a corporate culture, we can appreciate why TI was willing to gamble on the success of the home micro - if the potential gains were high. Their European manager, TJ, noted that the company certainly saw considerable potential if it could open up this market (42):

'...I think there were a lot of dreams...it was not a business product in the sense that anybody said, you know "We'll sell so many, and that's the revenue number and that's the budget you ought to put in"...it was more a belief that...it's almost like a childlike kind of assumption...that computing is here to stay (...) computers were going to be more pervasive in everybody's life (...)'

If micros were indeed going to be pervasive, with the possibility of many related products, then these machines might be a very lucrative proposition. TI produced internal documents at this time which speculated about a future in which the micro was the core part of vast array of interconnected home electronics (43). TJ discussed the possibilities foreseen by Texas and the marketing strategies that were considered:

'...there were many platforms that were reviewed...you know, whether this was (for) computer literacy...or an educational product, in the sense of purely for children's education, and so on, and so forth...or whether it was for games...or whether it was actually going to be a personal management product in the sense of home budgeting..and so on...and the dreams were, at that time, that the home computer would be the microprocessor that's based in the house, that allows you to run your household...in a more efficient manner...(that) included entertainment, education of your children or whatever, and computer literacy...and on a longer term basis included management of household functions like central heating and...drawing the curtains and dimming the lights (...) and it included giving you an advantage in your professional life...of being comfortable with computers...when you went into a business environment it ws likely to be a definite asset to be computer literate...and this was before anybody had sold the product...Sinclair was not even heard of!'

As with other manufacturers, the broad emphasis lay on the multifunctional machine. But within that framework, there was a decision to focus more specifically on education. This approach capitalised on the reputation which TI had established by the previous success with its 'Speak and Spell' devices (44):

'TI's strongest platform was education, and not just computer literacy...but education on a broad front..whether it's basic arithmetic, reading (etc)...within TI we took the decision that computer literacy wasn't the key...in the sense that there will come a time when it will not be important to understand how the computer works, and how to

write programs...what will be important is to sit in front of the keyboard and have software that does things (...) so the kind of do-it-yourself car repair mentality was not the appealing thing to us (...)'

Thus, the computer literacy that was envisaged was something like a general familiarity with using a computer. Literacy did not mean the learning of programming skills which had proved to be popular with hobbyists and which had been advocated in the early Apple ads. TI geared the machine for the novice, making it difficult for hobbyists to intervene and change programs:

'(...) the principle behind the product was very much...you plug in a cartridge, you press a couple of keys and you're straight into the program...and you use the software to achieve results (...)'

Texas were successful in dissuading a hobbyist following. By trying to make the micro into more of an appliance, TI had removed the forms of control which hd been appreciated by enthusiasts. Unfortunately for their plans, Texas never acquired the mass market demand to replace hobbyist sales. While some argued that this failure indicated that the time for the home machine was not yet ripe, others noted that the sheer cost of the Texas machine also placed the micro outside the price slot of most consumer electronics.

TI had chosen to produce a heavily engineered machine in preparation for the home computer's future multifunctional uses. As a result, the price of the micro was raised to $1100 - or $1400-1500 if bought with a monitor (45). Given that Texas Instruments produced all its own software and peripherals, the company ultimately supported its machine less than contemporaries such as Apple, with whom many companies lived in a symbiotic relationship. Ultimately, TI had a very expensive product, initially without the amount of software and hardware to underpin the range of uses which it proposed.

Other firms also came to share some of the same emphases as Texas. Apart from the occasional mention of home control, the broadest stress was that the micro should be mainly a machine for running software. This view was apparent not only in company advertisements, but also in the computer press articles which saw the home market's future as being based on 'canned software' rather than programming (46).

The other common feature to which many in the industry gravitated was the promotion of the home micro as an educational machine. Again, the merits of this marketing platform were publicly aired in computer journals (47). The micro was still generally shown as a multifunctional machine, but advertising often focussed on the educational nature of the micros. Meanwhile, firms commissioned and encouraged a range of educational software to support that identity. While it is difficult to trace the exact decision-making processes which led to these emphases, there where a number of factors which rendered this option attractive.

First, let us consider the alternatives to a software-running machine: the use of the micro for telecommunications or home control. Although I cover these developments in more detail later, some points can be made here. Videotex services - (ie the teletext from broadcasting companies and viewdata information accessible by phone) - were only just emerging in the mid- to late 1970s. Their appearance caused a good deal of excitement about a home information revolution. The possibility of linking these with micros in some way was an option which had been discussed at a fairly early stage (48). We saw that TI saw this option, and both they and Atari carried out R&D in this field in the late 1970s and early 1980s. Tandy was also interested. In 1979, the retailing firm released a separate videotex product, consisting of keyboard and modem (49). In the long run, such peripherals were a basis for further sales, while they also added value to the micro itself by virtue of making it more useful.

Nevertheless, in 1979 these developments still seemed to be at least a few years distant (50). The technical side was still under development, costs were high, and the practice of using these telecommunications services was still unfamiliar to the vast majority of the public.

Many similar drawbacks applied to home control functions. This application may have been frequently mentioned in advertising copy, but the associated R&D projects in firms such as Atari were only just starting in the late 1970s. As with home information, the value of this usage still had to be established in the public eye. And even if demand for some form of home control could be encouraged, many questioned whether such facilities should even be centralised around a micro - as opposed to having more discrete programmable control points (51). For a variety of reasons, then, telecommunications and home control were initially far more difficult options to realise than producing software for home computers.

The business uses of a micro were relatively more established. A 'cross-over' product to the home gradually became more feasible as the 1980s progressed, and as more and more people became familiar with software at work. It became increasingly common, in the US and UK, to see products pitched at the professional who worked partly from home (52). We have already encountered the business software which was adapted to the home - the personal finances type of material which later came to be called 'personal productivity' software. However, demand for this facility still had to be created, in the sense that it is not clear that people either want to run their households employing the practices of an office or organisation, or that they have enough 'information' to justify buying a micro to 'process' this data. The word-processor might have been the easiest cross-over, as a replacement for the popular home typewriter, but the usefulness of some of the spreadsheets, databases etc was a little more difficult to establish. Finally, there was the cost. While it was possible to use some of the software without extra peripherals, the clearer resolution

of monitors, disc-drives and printers were widely recognised as being necessary to make these applications more attractive.

The major categories remaining around which a micro's product identity could easily be organised were games, programming and education. There were, of course, miscellaneous software items such as programs for checking biorythms, or for weight-control. For want of a better word, these have been referred to as 'Lifestyle' software. This genre started to appear alongside the earliest commercial micros. But while companies inevitably added such software to their lists in order to demonstrate the multiple uses of the home computer, the range within this 'category' was very diverse and could not in itself form the basis for a coherent product identity.

The role of the micro as a games machine was both attractive and problematic for these producers. Ultimately, games-playing was to become the major use of computers in the early 1980s. The complex processes by which this occurred are the subject of several later chapters and so will not be covered here. It should already be clear from this chapter that the computer as a programming machine was still seen by producers as being a hobbyist product, whereas a home computer needed to offer other functions. Hence, while programming could be retained as one use among others, many of the bigger companies felt that it was difficult to lay too great a stress on this aspect.

It would seem that, by default, the educational focus could be reasonably attractive. Educational aids were familiar products, and they did not necessarily require more than the core micro to run them. Yet there were also more positive reasons for this emphasis. While some of these will be examined later, one immediate appeal was that the software developed for home use could tie into the sales of micros to educational institutions. The educational sector was just emerging as another possible market, targeted by the firms such as Tandy (53) and Apple (54). The significance of this educational marketing platform, and the link between home and school markets, was

to grow even stronger with the information technology initiatives introduced by various national governments in the 1980s.

EARLY HOME MICROS IN BRITAIN

The policies of the different producers in Britain were shaped by more general constraints operating in this national context. In Britain, the contrast between the hobby and office-oriented computers remained far more acute than in the US because of lower average disposable income. On the one hand, the high price of computers such as the Apple II, costing over £1000, limited their sales to the business, education and scientific fields. In these settings, personal computers were also used with disc-drives, monitors and printers. On the other hand, producers attempting to find a home market in Britain acknowledged the need to devise even cheaper machines than those aimed at American domestic users. The peripherals, in particular, were the costly parts of the system. Many firms operating in this country abandoned all or some of these, or at least relegated them to the status of additional items which could be added to a core system.

As a consequence, options such as using the micro to run business-type software were even less practical for many of the early machines in Britain. (In fact, it was only by the mid-80s that the falling costs arising from the mass production of business machines enabled Amstrad to offer a whole system at a price which proved more acceptable for a home computer market). Hence during the period of the UK 'boom', the type of home micro which was available consisted of only the core part of its office computer counterpart: 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 came to think of the machines in the British market as makeshift, and not proper computers after all. The office based 'personal computer' was the definer of the 'real' micro, in appearance,

convenience and capabilities. The contrast between this machine and many British home micros was continually to threaten the latter with the status of being toys.

The Sinclair Micro: The Self Referential Machine

To understand why Sinclair Research chose the particular product it did, we need to set the scene by making a number of points both about its founder's previous enterprise and about the later firm's perception of the British electronics market. Sinclair had previously sold both hobbyist products and consumer electronics. He had also developed cross-over products between these two categories of commodity on previous occasions. Sinclair Radionics, the original Sinclair firm, had initially sold calculators as kits to hobbyists before aiming for a wider market (55). OC, one of the Sinclair Research marketing staff, explained the view of the British market current within the company which led the firm to adopt a similar strategy with micros (56):

'*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 should be judged with some qualification. For example, half the sales of these early Sinclair machines were abroad, a large proportion of which went to the US (57). Nevertheless, the quotation above expressed a widespread view, often articulated as the idea of the British as being a 'nation of tinkerers'. When we first achieved that important statistic of having the greatest

number of home computers per capita, many attributed this earlier popularity in Britain in large part to a (male) hobbyist tradition.

We saw how Sinclair had originally entered the computer field by supplying this hobbyist market with what was really a device to learn about microprocessors: the MK14. Later advertising and PR was to associate Sinclair with Information Technology, and stress the important role of micros in the future of the nation (58). In fact, Clive Sinclair had initially had doubts about whether the MK14 would sell, and only decided to develop this product line once that kit proved to be an unexpected success amongst hobbyists (59). Sinclair himself remained unenthusiastic about micros. However, he 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 to come to fruition in the late 1970s but for financial difficulties, a veto by the National Enterprise Board and the demise of that first company. The first designs for a new home micro were sold off (60).

Once Sinclair had set up again as Sinclair Research, he decided to produce a computer cross-over product, hoping to find an audience among the existing hobbyist market, as well as to pick up some sales amongst those who had no previous involvement with computers (61). Sinclair explained his plans (62):

'(...) I thought that if we could make a computer that was the right price we'd certainly get the hobbyist market, cos' we'd be better priced than the competition...but then in addition there could be a huge, totally untapped market, amongst people who would like to learn about computers at home..have one to actually learn about programming...so we advertised the product in two directions...one directly to the hobbyists, which we were pretty confident would succeed...and it did (...) and the other thing we did was to advertise it nationally, in the colour supplements, the national newspapers...which was a risk, and just an experiment to see if there was indeed a possible market of the man-in-the-street...who didn't have

computing as a hobby at all...but was excited by the idea of actually being able to get his hands on one of them...and learn about it.'

Yet the hobbyist and man-in-the-street were not just two distinct publics which were being addressed. As with previous products, the enthusiast was to play an important role in the process of marketing to a wider audience (63). Hobbyists were seen as constituting an important group of 'opinion-forming end-users' (64), who gave a visibility to the product beyond advertising. Later, hobbyists were to be used as a leading edge in another way, when the Sinclair public relations apparatus drew attention to the applications which amateur enthusiasts had discovered (65). In other words, hobbyists provided a form of labour, freely given in the pursuit of personal interest, but utilised by the company (66). Of course, that fostering of an association with hobbyist strands itself added to the technological identity of this particular product.

The Design of the ZX80

The ZX80 was a product designed down to a certain price point. The question was: what machine could be constructed below a threshold price of £100 and be called a computer? (67) This was a familiar Sinclair approach to new electronic products (68). As with so many other product development strategies, this decision was later portrayed by some as being an obvious move, that was just waiting to be 'seen'. Yet it was by no means obvious at the time. The policy of many other British hobbyist firms ran instead in the direction of adding more functions (69). Hence one contemporary view within the British market saw the ZX80 as being inferior technology or, put more mildly, as being a very basic machine (70). 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 be explored. 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 ZX81 and then the introduction of Spectrum, that third parties could write programs for his machines. The fact that the micro was oriented towards programming was widely acknowledged, including by Sinclair himself. Sinclair now argues that what he valued most was allowing consumers to gain some general familiarity with computers. This was much the same overall aspiration as was held by many other companies. Sinclair recognises that programming was not the only route to such familiarity, but looking back he felt that programming was the way through which he could realise such a goal at the time (71).

In appearance, the ZX80 was smaller than previous hobby machines and enclosed in white injection molded 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 (72). 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 (73). The enclosed shape was without monitor, while the membrane keyboard abandoned the look of a typewriter. The form revealed no function at all. Thus, on the one hand he was starting to make a break with previous hobbyist design by introducing certain styles more reminiscent of consumer electronics. Sinclair Research staff were conscious of trying to go even further down this path with the later Spectrum (74). On the other hand, there were distinct continuities from the hobbyist machines - more so than in the case of the American microcomputers. Certainly, the appearance

and very smallness and lightness of the ZX80 distanced the micro from the image of the office personal computer.

Marketing the ZX80

Since the design of the Sinclair machine had distinguished the product so entirely from the business model, the chief role for advertising copy was to persuade the public that this device was still, in essence, a computer. The opening paragraphs of the advertising copy read:

> *"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. After several more paragraphs of reassurance, there followed the technical specifications more familiar from the hobby orientated ads. This listing of features, albeit in what was seen by the company as the style of 'fast-moving consumer electronics' (75), still serves the same purpose as in the hobby context. As in the case of the imposing pictures of isolated computers which remained for so many years a dominant style of advertising, the listing of specifications draws attention to the machine in the abstract, as opposed to the machine in any context of use.

While the ZX80 started to attract a wider audience, the bulk of sales were still seen by the company as going to hobbyists (76). The ZX81, produced in 1981, was a second attempt to broaden sales to a wider market. OC recounts (77):

'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.'

Comparison with the Sinclair description of the ZX80 illustrates that this successor was fundamentally located within the same conception and the same policy. However, there were some differences. In the incremental move towards a consumer electronic, the advertising attempted to be slightly less technical. Furthermore, in the period around 1981 and 1982, the PR and marketing staff were trying to replace Sinclair's 'cheap and cheerful', corporate image with a more respectable and professional one (78). The company, and Sinclair himself, were being projected in this new light, which may well have reflected on the product identity of their wares.

The technical innovations in this new ZX81 machine made it more reliable and smaller, while giving the micro more memory - all at a reduced cost. These technological advances won a design award for the company. In terms of industrial design, the ZX81 became even more of a black box as the micro reverted to the Sinclair house colours. Its form still revealed no function, although unsympathetic competitors were later to recommend a role as doorstop. Apart from the marketing strategies outlined above, there were further new initiatives, such as giving the machines away in competitions and arranging reviews across a wide media base (79). Yet arguably, the establishment of a major retail outlet was really the most significant change enhancing the process by which the machines became the latest brown good.

W.H Smith, the bookselling chain, had been looking to achieve a more modern image for some time (80). 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, W.H.Smith had still used them to attract attention within its experimental computer corners in the late 1970s. By the 1980s ,the retail chain was looking for a cheap enough machine that

had a computer identity; to this end, it was W.H.Smith who took the initiative in approaching Sinclair. The ZX81 was to be positively promoted. In the face of some reservations by branch staff, this tactic proved successful from Smith's and Sinclair's view. The retail industry had made its contribution to establishing the home micro.

The ZX81, even more than the ZX80, provided one further challenge to other conceptions of the nature of a home micro. This challenge lay in the very price of the machine. OC notes (81):

'I think it became an impulse buy, ultimately, for many people (...) it was such a low price good that it was in the impulse bracket...and a lot of people bought one just to fiddle around with a computer (...)'

Being an 'impulse buy' located Sinclair's micros into a very different type of commodity category from previous microcomputers. The company had hoped that people would buy their product in order simply to try it out and see what a computer was like - even if they might not continue to use the machine. The corollary was that the use of these micros was potentially short lived. In effect, they became a 'disposable' item. It was against this aspect in particular that criticisms of Sinclair's machines arose (82). A disposable computer was a world away from the vision of the micro as potentially part of the infrastructure of daily lives and as a resource or tool with a more permanent place in the home.

Yet, even such disposability had another potential meaning for manufacturers. Hardware companies came to represent their later machines as being on an up-grade path from what became seen as 'starter' computers such as those of Sinclair (83). This same thinking was later embodied in the idea of each consumer progressing through a range of machines from the same company. The computer could perhaps became a commodity like the hi-fi. Many in the industry came to think that the route instigated by Sinclair might still lead to the micro becoming more than a fad - the home computer might yet stabilise as a consumer electronic.

ACORN AND THE BBC

Even compared to the other smaller firms which were to emerge in the late '70s and early '80s, Acorn was recognised as being a very technically-driven company. Descriptions of the company given by staff in some ways resemble accounts of Texas Instruments (84). Acorn's founders were themselves technical specialists. They gave the R&D team considerable freedom to follow up its main interests in developing hardware, although the company had also set up a supporting software arm (85). Publicly, Acorn set out to build their reputation around the technical quality and innovativeness of their products (86).

This approach led to some different design emphases to those of their closest competitor, Sinclair Research. For example, Acorn did not follow a policy of achieving a low price at all costs. One manifestation of this was the fact that the 'Atom' computer, second in popularity only to the ZX80, was designed with a 'real' keyboard. Its keys resembled those of a typewriter, as opposed to the membrane arrangement of Sinclair machines. From the start, the policy was to keep product specifications high relative to other British machines, while publicly stressing Acorn's standards and professionalism (87).

The Atom was initially produced for the hobbyist market (88). Thus, the micro was sold firstly in kit form and advertising focussed on the technical features the machine offered. Unlike Sinclair, Acorn continued to limit those ads to the the specialist press during the first years of the decade. However, Acorn joined Sinclair in anticipating that a central use of the machine would be to learn about programming. This was reflected in certain programming facilities which were available and in the manual's guide not only to the language 'Basic', but also to the more complex computer assembly code familiar to the keener hobbyist (89). On the other hand, Acorn allowed for more uses than solely programming. The company had from its origins embraced the notion of 'expandability'. It was possible to buy

extra items to gradually expand the core machine into a more versatile micro at double the expense (90).

Educational institutions were soon identified as another strategic target. Chris Curry, one of the founders, was impressed by the success of Apple in the American education system. Acorn soon became one the earliest companies in the British context to adopt the longer term philosophy of entering the home market through fostering familiarity with Acorn machines at school (91). Hence, Acorn also advertised in the magazine '*Educational Computing*' and produced some software packages to run on the Atom. Company engineers devised a networking system, 'Econet', specifically with the school market in mind (92). Although Acorn had only limited initial success in the educational field, these efforts represented the start of an identity and expertise which the firm was later able to consolidate.

Acorn was one of the companies that came to foresee the possibility of a bigger home market existing beyond the hobbyist one (93). Accordingly, not only did adverts for the Atom slowly change to a form which was more accessible to non-experts, but the company started to assemble some ideas and paper specifications for a new machine: the 'Proton'. This micro was still basically part of their same marketing strategy, with the key line of development being a generalised increase in 'power'. One of the R&D staff, UD, clarified what this term implied (94):

'...we knew that (...) we could, you know, make massive increases in the power of the system...by the power I mean processing speed, memory size, graphics resolution...all of these things, you know, swept up to encompass computer power...and we just said, you know: " This market's here, it's growing, and the more powerful the machine, the more market share we'll take."'

Such an overall enhancement of specifications was a line of development which many computer engineers preferred, as we shall see when we consider Commodore's plans. It was certainly a trajectory

which appealed to the hobbyist press. Even at the stage when some of these ideas were only being mooted, the suggestions received a warm reception in computer magazines.

The BBC's Initiatives

In 1978, the TV documentary series 'Horizon' had screened a programme called 'Now the Chips are Down'. Most commentators, including the initiator of the BBC Computer Literacy Campaign, have cited this particular programme as a catalyst behind the concerted efforts of a number of agencies to promote awareness of Information Technology (95). The contemporary Labour Government soon instigated initiatives in ministries such as the DoI and the DES. These projects were later continued, in altered form, by the succeeding Conservative administration (96).

The State initiatives themselves reinforced the views of some staff within the BBC that the Corporation should devote considerable programming resources to looking at the impact of computing on society. The immediate result was some more programmes on this topic, which were accompanied by similar moves on the part of ITV. Those in the the Continuing Education Department perceived yet further manifestations of 'interest' in the growth of computer magazines and clubs, in the availability of new, low cost computers, and in the increasing use of micros in schools (97). The Department proposed a set of television series that formed a Computer Literacy Project.

The BBC often produces supporting material such as books for its educational programmes. On this occasion, the Department argued that the Corporation should extend such support, so that the TV programme became 'part of a learning system, although the most prominent part of it' (98). It was felt that the introduction to computing would have more impact if the audience could have 'hands-on' experience of the machines. That meant providing software to complement the

programmes. Finally, the Department extended support yet further when, to avoid having to produce versions of the same software for every machine, the Campaign initiators proposed that the BBC should license a hardware system of its own (99).

The scale of such an enterprise was a new departure, and it was always going to be controversial for the BBC to single out any particular private manufacturer. One participant in the planning, DK, described how the feeling of 'going out on a limb' existed in the Department (100). A good deal of internal criticism ensued within the BBC, as well as double-checking to see whether such initiatives were allowed by the Corporation's charter. Apart from any commercial commitments, the credibility of the 'neutral' BBC was at stake when it came to choosing a hardware company (101). There followed a whole range of consultations with DES, DoI, Local Education Authorities and pressure groups like MUSE. The result was a set of programmes, a related National Extension College course, a range of software commissioned to various agencies and the decision that the BBC would negotiate with Acorn to produce the machine that would be endorsed (102).

Whereas Acorn had always had one eye on education institutions as a market, this was not initially a target audience of the BBC organisers. DK explained (103):

'There was really no expectation that it would have a very significant impact on schools. It was felt much more to be a home machine, to be marketed to (...) the home and interested hobbyist (...) There wasn't a conscious feeling that it would go into schools.'

In addition, the proposed BBC machine was to be more accessible than some earlier micros, and more of an infrastructural machine. This notion echoed back to discussions which had envisaged the home computer as having a central place in the home. DK described the Corporation's key specifications:

'(the micro should be) "user-friendly" and expandable...(it) shouldn't be thrown away...it should be real system, and should end up doing real jobs'...'

Nonetheless, the view that computer literacy included programming skills had by now become established even within the Department, as DK noted:

'(There was) a difference of view here between a number of us on the project...but personally I couldn't give a damn about the programming aspect (...) However, you couldn't say that to most people. To most people it was getting hold of it and learning to program and a lot of the people at the Beeb felt that too.'

While there remained a place for programming in the Campaign, the view eventually prevailed that computer literacy was something much broader. By a process which included piloting the TV series, it was decided to put more emphasis on exploring the system by gaining familiarity with applications such as those made available through running various software. While the BBC had a number of potential targets, including more motivated hobbyists who wanted technical detail, the decision was made to prioritise a wider, potentially interested audience (104).

The BBC machine

The combination of BBC specifications and Acorn preferences led to a micro which was designed both for learning about computer programming and capable of offering many applications - at a cost. In terms of familiarising users with the operation of computers, the BBC machine had extra facilities to encourage a good programming style (105). On the other hand Acorn were in accord with BBC in wanting an infrastructural machine, as UD noted (106):

'(...) What we were trying to do was to make sure our machine was the machine that was always used (...)

Although the micro could stand alone, its general design allowed the BBC machine to be a modular system by virtue of having the most developed input/output facilities of its time. The machine could control a very, very wide variety of the peripherals supplied by Acorn and others (107). In fact, a whole third party peripherals industry grew up around this machine.

Industrial design was also partly based on this wider conception behind the new micro. The general 'wedge-of-cheese' shape had become a norm since the appearance of the Apple II. Acorn accepted this parameter, allowing the size of a standard keyboard size to determine some of the machine's dimensions. However, one extra requirement was that the micro had to fit under a monitor. This partly anticipated a role in schools, but also the decision reflected a view that the home-based machine would not be constantly re-assembled in relation to TV sets. UD explained:

'I think those domestic consumers who did plug one into a TV...if the computer then found a permanent home in the house...and wasn't just brought out by the children on a Sunday afternoon...they rapidly went back and bought a monitor...or in some cases a portable TV.'

Shortly after the BBC had started making its preparations, the DES announced a programme which involved commissioning educational software and training teachers in computer literacy. At the same time, the DoI announced its scheme to partially subsidise the introduction of micros into schools (108). The BBC machine became one of the two micros which the DoI agreed to sponsor (109).

The new demand from the education sector, in particular, meant that sales of the BBC machine were far greater than had been expected. Private customers also bought more machines than had been anticipated in the initial estimates. The micro was especially well received in

hobbyist circles, with extremely favourable and enthusiastic reviews from the computer press (110). In fact, my interviews suggested that a new generation of hobbyists formed around this machine, as clubs arose solely for BBC users. There was also a strong demand from an unexpected quarter - business. Although Acorn had anticipated that they might pick up a few small business users, by the mid-1980s the computer company's staff saw business users as being the biggest source of sales, followed by hobbyists, with educational institutions in third place (111).

Yet, to put these sales into perspective, the main 'Model B' BBC machine and its slightly cheaper version (112) achieved nowhere near the private sales of the computers from Sinclair and Commodore. Acorn's micro sold better than had been predicted, making it commercially successful. But the BBC computer remained an 'up-market' machine, being somewhat dearer than its contemporaries. Since demand far exceeded supply, Acorn did not develop a major advertising campaign for some time. When the company eventually advertised, the computer's overall image was one of quality, as 'the limousine of micros' - for which, of course, users had to pay a price.

Acorn policy and products, in particular the BBC micro, show an ambiguity between two different conceptions of the nature of micros. The first conception was of the computer as a useful machine, offering facilities which could be employed in the home and in other contexts. Certainly, BBC staff also specified such a micro in their joint project with Acorn. Despite the fact that its cost excluded the BBC micro from what became the mainstream market, many commentators saw this machine as being the one in the British market which most represented notions of an infrastructural computer. On the other hand, the origins of Acorn in catering for a hobbyist market had left its mark. The company shared with Sinclair a certain emphasis on the micro as a self-referential machine. This was made manifest in some design decisions. The BBC Literacy Campaign, and to some extent the various State initiatives, also enhanced this self-referential theme. Arguably, the design of the BBC micro, even more than some other machines,

reflected the two different tendencies at work within the British market.

THE COMMODORE SOFTWARE PLAYER

We saw how Commodore, the US based multinational, had been selling its PET computer to the hobbyists and business markets from the late 1970s. Although it had fairly large computer sales in America, the company had always concentrated mainly on the European market (113). In 1980, the founder and president of Commodore, Jack Tramiel, proposed that the company develop a new low-cost machine. Like Sinclair, Tramiel felt that the important route to such a mass market was to drop below a price threshold, rather than offer improved technical features. This met with opposition from some of his key engineers. The R&D staff wanted the product line to develop in the direction of offering more facilities, in the same spirit as Acorn's engineering team (114). Nevertheless, Tramiel's will prevailed.

The Vic 20, as the low-cost micro came to be called, was thus engineered down to a price point. But a difference from the Sinclair approach was that Commodore's machine would have to do more than be a vehicle for learning to program: the Vic 20 had to more than a self-referential computer. Commodore's micro, had to be able to run software. In addition, the Vic had to appear visually more like the ideal of the 'Personal Computer'. A compromise was reached, whereby Commodore's machine used existing domestic electronics as peripherals as Sinclair's ZX series had done. The Vic micro used a TV set as an improvised monitor, while a cassette player replaced disc-drives. On the other hand, the Commodore micro had slightly more memory than Sinclair's machine, plus the option of considerable expansion. The computer also had coloured display. And the Vic 20, with its typewriter style of keyboard, at least resembled part of the office machine.

While the initial product formation and design work took place in the US and Japan, the British and other subsidiaries operated with a considerable degree of autonomy as regards how to market the microcomputer (115). Commodore were a little unusual compared to contemporary British computer firms in that the UK subsidiary had assembled a team of staff who had been accustomed to marketing a wide range of goods (116). Thus the British arm of the company saw themselves as primarily marketeers, while portraying Sinclair as more of a technologist (117). As we have seen, that is incorrect. Sinclair Research clearly marketed its product, and the British company retained staff whose role it was to specifically organise this operation. Nonetheless, the background experience with other than technological products meant that the Commodore subsidiary approached home computers in a manner very distinct from its rival.

British Technological Culture

Many managerial staff in the US parent company had worried that the Vic 20 strategy would not work. They feared that such a computer would be seen as a toy (118). However, the marketing staff and advertisers in the UK were fairly confident that this micro could be successful in the British market if it could be presented a consumer electronic. This was based on the marketeers' view of the mechanisms at work as regards the general category of brown goods. Over and above any specific use value of the micro, the product could achieve some success through being identified simply as the latest piece of home technology. The account manager of Commodore's advertising agency, KC, explained this overview of the British consumer electronics field (119):

'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 TV's 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 would need qualification if we were judging their validity. For example, video was first introduced in the US on that grounds that North Amercia was a more important market (120). Nonetheless, the argument does capture an accepted wisdom found elsewhere in the industry. This is the argument that both producers and the public have become mutually geared to certain categories of new technologies. If you could give a product features to fit into that general identity there would be a fair chance that it would be successful. The widely shared Sinclair view of Britain as a 'nation of tinkers' has, then, a slightly different formulation: Britain as a 'nation of gadget lovers'.

In fact, when these advertising staff looked back on the development of the market, they felt that for a while this is exactly what happened with the home computer. Apart from the initial success of the Vic following its launch in 1981, the whole computer industry benefited from this consumer electronics mechanism over the next few years. KC's view was that:

'(Micros) were very much a "must have" for Christmas '83. The video recorder market had peaked by Christmas '83, 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.'

Micros were next on the list.

Marketing the Vic 20

The orientation of Commodore UK led the company to introduce certain new approaches to marketing at a fairly early stage. It is difficult to identify whether they were the first to make such changes, because competitors quickly copy each other's innovations in the microcomputer industry. These Commodore marketeers had very similar plans to Sinclair concerning high-street retailing and mass media advertising (121). The Commodore staff focussed especially on those transformations to the product which they needed to make in order to attain the perceived qualities of a consumer electronic. One manifestation of these efforts occurred when, soon after the initial launch, Commodore introduced packages which included the Vic micro, beginner's software and tape recorder. The motivation for these innovations was not just an effort to attract the end-user. As CK, the marketing manager for the Vic, explained (122):

'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 a product configuration designed for the benefit of 'brown goods' retailers was felt to be important. The commodity was being put into a form where it could be sold without the type of back-up support which had come to be associated with specialist outlets. The boundaries of the office product included such services, since this support had been deemed necessary owing to the intrinsic complexity of computers. The starter packs were part of the process of re-defining those boundaries, given that mainstream consumer electronic goods had to be capable of standing alone.

The other main difference from competitors lay in the audience which Commodore tried to reach. Although some hobbyists bought the Vic 20, Commodore decided not to make use of the hobbyist sales base as stepping stone and not to employ hobbyist-orientated appeals. The marketeers had great doubts about the potential success of what they saw as an 'intellectual' sales pitch. This did not mean refusing to promote programming entirely - no manufacturer at that time missed the opportunity to bnefit from the contemporary public discussion of the future demand for computing skills in Britain. The difference lay in the stronger emphasis that the Commodore micro had to 'do something', and it had to 'be useful'. KC explained (123):

'(...) The people in our agency have worked in the food business as well as in the high technology business...that's why our ads never looked like technology ads...'cos we were looking for consumer benefits all the time (...)'

Thus, Commodore avoided technical jargon in its ad copy and specifically listed applications of the machine. Some advertisements depicted contexts of use rather than focussing attention on the abstract qualities of the machine. Other ads literally showed the range of software. The micro was usually visible in one corner, but the machine was given a low profile. The technological operations were never stressed.

For reasons outlined previously which applied to all producers, the applications were mainly derived from running software. Commodore's marketing campaign was assisted, in this respect, by the fact that it managed a small software operation. The firm could never produce as much software as the third parties who were eventually to write for Sinclair. But the American company had more software available for its machines than many of its British competitors.

On the other hand, even Commodore's advertising staff admitted that the sheer novelty of micros had to count for a good deal. KC, like other advertisers, recognised that these very basic micros were of

some, but limited, utility. For example, he noted that it was quicker to manage most household budgeting with pen and paper than with the Vic 20 computer. In relation to functions which were being offered, both he and other advertisers acknowledged that they had occasionally 'fudged the issue' by presenting the uses of the micro as positively as they had done (124). The limitations on the micro's usefulness were even more acute when the machine first appeared:

'I suppose they weren't (initially) very useful things (...) I always took the view that the home computer is a dispenser of something...it's a bit like a cigarette machine...unless you put the software into it, you can't get anything out the bottom...and there really wasn't a lot of software around in those days.'

Eventually, Commodore was successful in establishing their machine as a software player. However, it was mainly one particular type of software that came to be played. The micro came to be chiefly used for playing games. Some Commodore staff had wanted to emphasise the games aspect, as we shall see later. Yet, the company, along with other producers, came to view the rise of games as creating new problems. To appreciate both this development and Commodore's policy on games, we will first need to take a wider view of the whole games machine industry.

SUMMARY

In this chapter, we have seen a range of innovations as regards different elements of the micro product. These encompass more than mere technical changes. Such innovations cannot be thought of as some straightforward and automatic progression. These developments were guided by attempts to locate some form of microcomputer product within categories of commodity which were different from the original hobbyist one: as business equipment and as a consumer electronic. The innovations were simultaneously structured by the another set of

considerations: namely, by conceptions of the artefact's underlying role. In practice, the British context saw a good deal of continuity from hobby micros by virtue of the early self-referential machines of Sinclair. But, this was only one possible conception of what the home computer could be like.

All these processes occurred both within a set of general technical and marketing constraints, and in the context of particular company histories and contemporary circumstances. Technically, I have tried to show why the software player was a more feasible option in the late 1970s. In terms of marketing, I have tried to indicate how the particular national context shaped the choices of producers operating in Britain. Much is attributed, sometimes negatively, to the policies of particular companies such as Sinclair Research. To redress this, it is important to remember that the concern about lower disposable income than in the US influenced the decisions of all producers in Britain. Within these constraints, reviews of the history and corporate culture of companies like TI and Sinclair cast light on their particular decisions.

In the late 1970s, we found a new type of business microcomputer slowly emerging, with the Apple machine constituting something of a watershed. The idea that the micro, in some form, could be a popular consumer electronic was somewhat more debatable - and continues to be so. There were already domestic sales at that time. However, a number of those in the industry felt that for the micro to become a more mainstream brown good, some radical changes to the product were required. These included, many argued, a change in the underlying conception of the role of the artefact, compared to its contemporary function in hobbyist circles.

The most radical conception, followed enthusiastically by Texas Instruments, was of the micro as an infrastructural machine which had a part to play in many aspects of everyday life. However, technical and cost considerations meant that some of those functions had to lie in the future. Instead, the specific implementation of that conception

was that of the micro as a software player. Within this framework, the particular marketing platform which was widely adopted across the industry stressed the fact that the micro was an educational machine.

In the British context, the pressure to cut the price of micros was even greater than in the US. This led to most firms abandoning peripherals as necessary adjuncts. Sinclair, and later Commodore, engineered their products down to produce micros of limited capacities, and by so doing they established a mainstream price range for subsequent machines. Those machines which tried to offer more facilities, such as those of Atari and later the BBC micro, seemed overpriced. These latter computers, although quite profitable, were not seen as being in the same mass market as were the cheaper machines.

However, even at this stage the office 'Personal Computer' was becoming the definer of what counted as a 'real' micro, in appearance, convenience and capabilities. The contrasting nature of mainstream home micros was to prove problematic. Only some years later was Amstrad able to bridge the gap again, first by packaging its early computers to look more like office micros, and later by offering machines which could perform some of the functions of the business machine within the consumer electronic price bracket.

The basis on which Sinclair Research sold its early machines was related to the very low price achieved by the company. Whereas TI had wanted to make a break with hobbyism, Sinclair considered that the self-referential appeal could be a way to sell the micro as a consumer electronic. Sinclair was not totally alone in this view, in that many American companies also tried to gain some hobbyist sales. The small British company was unique in that this was the sole role of Sinclair micros. Furthermore, the offer of gaining familiarity with micros was interpreted in terms of developing programming skills.

The ZX80 represented an 'ideal-type' or 'pure' self-referential machine. Even later Sinclair machines moved towards providing more applications

via software. On the other hand, through the initiatives of Sinclair and Acorn, an undercurrent of the self-referential conception lived on in the British market. Later machines may have been software players as well, but these micros were sold partly, or even mainly, on the basis of offering computer literacy. More specifically, programming continued to play a greater role than had originally been envisaged by companies such as TI (125).

The BBC Computer Literacy Campaign and the State programmes were themselves partially formulated against the backdrop of these commercial developments. These initiatives cannot be treated as purely external factors, although there were clearly other considerations which influenced the nature of these developments. Both the BBC and the State projects encouraged contemporary public discussion of the future demand for computing skills. The expectations which those programmes created only helped to justify still further the supposed value of learning about micros. Computer manufacturers certainly exploited these campaigns in their own marketing pitch. So while the BBC, at least, wanted to promote useful micros, its efforts also enhanced the undercurrent of the micro as self-referential machine.

As opposed to this latter conception, there were attempts to fulfil the ideal of the infrastructural machine. In terms of facilities, that notion was best represented by the BBC micro. Of the more popular, mainstream computer manufacturers, Commodore was the earliest to specifically promote the software player ideal. The relation between this and the self-referential conception was complex. Some producers were quite willing to see the Sinclair micros, or even some of their own basic machines, as stepping stones to a more permanent micro. They argued that these 'starter computers' provide familiarity, but then users would be hooked and want 'really useful' micros. Other producers and commentators have criticised the Sinclair products, saying these machines helped to spoil the British market. For such analysts, the self-referential micros may have shared the name of 'micro' with the infrastructural machine, but they were totally different products. Furthermore, the limited capabilities of the

former misled potentially interested consumers about the benefits of 'real' computers, while whole idea of micros as a disposable, impulse buy went against these commentators' vision of the direction in which micros should develop.

CHAPTER 5: MICROCOMPUTING AS A MALE HOBBY

I have already started to indicate the scale of differences between early male and female interest in micros. This chapter first aims to identify in more detail the different manifestations of interest and specify some of the qualities of hobby computing as an activity. Then, in the light of feminist writings concerning both gender and technology and gender and leisure, and utilising the limited empirical evidence to hand, I suggest ways in which existing gender relations may have structured computer hobbyism as a predominently male affair.

The sections which examined the design features and marketing practices connected with the first American hobbyist machines and with early home computers draw attention to some of the processes by which the micro was represented culturally as a particular kind of technology. These sections dealt with the question of how products, as texts themselves, addressed audiences. Now, I shift attention to the role played by key texts which represented micros to hobbyists: the hobbyist press. In particular, I examine themes within the electronic hobby journals of the late 1970s and within the first microcomputer magazines.

The purpose of this exercise is to further draw out these key elements of the technological identity of micros which were constructed for the earliest, pre-1980 hobbyists. One main point at issue is why these machines had such a great appeal to a pre-existing community of male electronics enthusiasts. We cannot assume that microcomputing was some automatic or obvious progression for this group. Yet, many of these hobbyists even gave up their previous interests to totally embrace computing as their new object of devotion. We should seek to explain the nature and degree of this male interest, as well as asking about female interest. Such a question is given added salience since the interest which was

manifested by this group created the first 'visible' association of men and micros.

There is even less available evidence from which to derive any account of the diffusion of interest which occurred in the first years of the 1980s. However, we can note some possible changes in the technological identity of the micro which were brought by such factors as the Literacy Campaign. In addition, some measures suggest that there was a degree of female interest in micros at this time, although impressionistic observations indicate that the diffusion amongst males was greater.

The fact that some interest was shown amongst women defined the strategy adopted in the second half of the chapter. Through discussing certain themes raised by the literature on gender and leisure, in conjunction with comments arising from my interviews (1), I formulate some hypotheses suggesting why it may well have been easier and more attractive for males to develop microcomputing as a hobby.

The second half of the chapter is divided into two parts, the first relating to the more private aspects of computer hobbyism and the second concentrating on its more public manifestations. The former refers to the involvement in computing as a home based activity (2). However, even here we need to be careful about characterising such behaviour as 'isolated'. Hobbyists still read magazines, and so kept track of the wider developments which were covered in this particular public forum (3).

Finally, attention shifts to a specifically 'collective' dimension of microcomputing: computer clubs. Women remained largely absent from these particular venues, even though they were willing to participate in other public forums such as computer classes. Hence, we have to ask about the specific features of the clubs which structured participation. This question is important because clubs continued to have a degree of visibility to a wider audience: the clubs were represented at such events as computer fairs, and provided feedback to

the producers who sometimes supported these 'user groups' and who were often invited to address club meetings.

THE CONSTRUCTION OF THE MICRO AS A HOBBYIST PRODUCT

Electronics Hobbyism

At one level, the projects suggested and products available in the 1970s hobby electronics press clearly offered use values. These items often provided new facilities or options of more refined monitoring and control of home equipment. The biggest category of projects and products was tools - for example, such items as oscilloscopes. There were also accessories for cars, such as equipment to notify if lights have been left on. We find items for the home generally, such as electronic locks. Other hobbies are catered for, as in the case of model radio controllers, infra-red headphones for listening to music, and dark room timers for photographic interests. Finally there are games devices such as an electronic 'Mastermind' (4).

Arguably though, the hobbyist who is assumed to show an interest in such a diverse range of electronics is motivated by something beyond the narrowly conceived use-value of any particular item. The electronics which were offered in the magazines were so pervasive, entering into so many aspects of daily life, that this technology appears to be part of a more general personal style. Often consisting of the 'latest' technology and anticipating goods which may some day become available for a wider market, these items can be props to self-identity and enable the representation of self to others. One advertising agent whom I interviewed conceptualised these artefacts as constituting 'technical jewellery' (5).

What becomes even clearer when talking to hobbyists is that it was ultimately the technology per se which was interesting and more

important than its particular application. Exploration of technology was the central goal. This encompassed not only designing artefacts but also building kits or experimenting with pre-assembled products. These activities constituted a vehicle to learn about the workings and properties of the technology. For example, MG described his interest in the new chip products which preceded micros (6):

'(...) I was always interested in electronics. I used to build amplifiers and that sort of jazz (...) When calculators started coming out, the joke in the family was, "Daddy's always buying a new calculator!"...'cos they fascinated me. I was more interested in just how jolly good they were...and so during the calculator phase in the early 70s I tended to buy programmables because they were quite exciting..not for any other reason than that they were fun. You programmed them and that meant, you see, that you could show off. And then the ping-pong games (kits) started coming out. You could buy the game from people such as Comp Shop, up at Barnet. And I started getting the soldering irons out and kept building something (...) I got involved in that in about '77, '78....'

The main point was not so much any utilitarian end value of these items, nor even playing with electronic games. The pleasure, and any sense of expertise, came from understanding the inner structure of the mechanisms and appreciating how they might be applied.

Finally, that interest extended beyond do-able projects or available products. Accounts of large scale technological initiatives around solar and wave energy or space exploration were the regular material of feature articles. Hobbyists seemed to value keeping abreast of state-of-the-art technology more generally. On the basis of my experience in the later computer clubs, I would suggest that these topics were important in providing an object of talk, or a verbal currency, among hobbyists.

By the mid-'70s, the magazine *'Practical Electronics'* was giving considerable coverage to microelectronics in feature items, project

plans and product news. Articles on the latest developments in and uses of integrated circuits, microprocessors, and computers figured regularly. Writers and editors discussed the general significance of programmability for electronics, together with the changes which microchips were going to bring to electronic hobbyism. This innovation was going to entail a major transition, greater even than going from valve to transistor technology (7). From 1977, as it became feasible for amateurs to obtain components in this country, the magazine ran courses which explained how the microprocessor worked.

Thus, we can see how this press reconstructed 'programming' as the new challenge for electronic specialists. The journal emphasised the sophistication of the new technology, and the 'trauma' of this change (8). Such a stress on the difficulty of programming appealed to an audience of enthusiasts. In the course of my interviews and participation in the club, several male hobbyists mentioned how part of the attraction to micros was the feeling that you had to be 'clever' to make sense of this technology.

This particular press maintained some of its traditional emphasis on electronic equipment. For example, the magazine noted that programmable electronics would 'expand the scope of amateur built equipment enormously' (9). But in addition, building and programming these computers were clearly presented as being challenges. As with the American electronics press which had first publicised the Altair, affordable microcomputers and microcomputer kits soon appeared in the reviews and product news.

The stress on the newness and difference of programming, as well as on the whole new realm of micros, turned out to have its disadvantages as far as this particular journal was concerned. Many electronics enthusiasts seem to have made the break with their previous interest to take on computing as a hobby in its own right (10). There was some resistance to this trend. When *Personal Computer World* started up, the electronics press, which was owned by different publishers, refused to carry PCW advertising on the grounds

that the newcomer was a competitor (11). Yet, by now there was too much interest. There was also sufficient potential within computing to allow this area to be constituted as a separate field of hobbyist activity. A new hobby, with its own public, could emerge.

Obviously, this particular specialist press did not cover the new microelectronics and computing in isolation from other media. But, we can see how a journal which reached and helped to define agendas for its hobbyist readership was engaged in constructing a particular technological identity for these new artefacts. Even before the Nascom, it was clear that the workings and applications of the new microelectronics and microcomputers should not only be of interest to electronic hobbyists; these technologies were the new area with which to become familiar. The projects and products in this microprocessor and microcomputer field were a foothold into that wider technological revolution which attracted these enthusiasts.

Microcomputer Magazines

Even before the first microcomputer magazines, the general computer press had given some coverage to hobbyist developments in the US (12). However, it was the earliest hobbyist computer journals which made the first attempts to win over those working with larger computers to the merits of micros. For example, the first edition of PCW expressed the following countercultural sentiments. These could only have been directed at those who were familiar with debates about the use of computers (13):

'..just when it seemed that the computer giants had given the the titans of government and business the means to reduce us to numbers, the micro-computer for personal use has sprung up on the scene, increasing our power to turn ourselves back into people. By that I mean that we can no longer be regarded as data for and attendants on the computer but can now use it for our own purposes...'

Similarly, the article called 'Power the the People' evoked the decentralising themes and slogans of the US movement (14):

'Only through the widespread popular understanding of the languages of logic can we protect our personal values and rights from the encroachments on those freedoms resulting from programmed implementations of laws and procedures by narrow-minded technologists.'

Even the convivial technology theme found its way into this press, whose editors announced that they wanted to model the journal after its American counterparts (15):

'PCW is part of the "small is beautiful" movement...at last science and technology has given us a product which isn't big, noisy, greedy for energy and expensive...'

On the whole, the countercultural arguments appear to have been less familiar in the British context (16). However, the offer of access to and, indeed, total control over a computer seems to have had some appeal. LH noted the sentiments amongst hobbyists who, like himself, came from a computing background (17):

'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.'

The problem was that the dominant vision within computing foresaw mainframes and minis offering more services and facilities. Micros, in the early years especially, could do far less than their larger relatives. My interviewees reported how the small machines were often ridiculed by some programmers who enjoyed the capabilities of mainframes. To counter this, autobiographical accounts in PCW emphasised the new challenge of squeezing programs down to fit into the restricted memory of such a small computer (18).

Finally, the magazine provided rationales which justified having an interest in micros, even in the face of the major computing paradigm. PCW indicated how micros could one day replace mainframes in fields such as education and health. In the first few years, a whole range of such articles appeared which discussed the social applications of these small machines. These forecasts together with those of later writers revised the predictions concerning the changes which the mainframe computer was going to introduce into our lives. A computer revolution could be achieved equally, or better, through these microcomputers instead of through their larger counterparts.

Micros as a technological challenge

Although, the magazines announced how useful these products were going to be, at times that 'usefulness' appears to have been almost a justification for interest. The main lines of appeal - slightly different for those from electronics compared to computing backgrounds - were that these micros were sophisticated systems. Learning the relevant new skills would be a measure of hobbyist abilities. The magazines defined this as the most testing new terrain to explore and to master. One key element of the micros identity was that of being a challenging technology.

In fact, there was so much to explore that apart from forming the basis for a separate hobby, enthusiasts could easily find themselves devoting all their energies to simply understanding the workings of these computers. In particular, this is shown by the fact that the nearest that many hobbyists came to achieving an end-product was producing tools. Constructing tools had always had an important place among electronic hobbyists and even amongst some of those who were professionally involved with computing. Although there had been virtually no previous computing 'hobby', in the sense of an organised leisure activity with its own public forums, some programmers nevertheless managed to get access to computers for pleasure. These

'Hackers' will be covered in a later chapter. I mention them now in order to note that, for these enthusiasts, producing better computing tools had also been a favourite pastime.

In fact, micros could be portrayed as the ultimate tool, in terms of versatility of application. My interviewees noted that improving the hardware and software totally occupied many hobbyists. Even relative to electronics hobby projects, computing enthusiasts approached the micro in what could be regarded as an extremely non-utilitarian fashion, in that they often never got to the stage of producing something that looked like an end-product (19). Their efforts may have been appreciated by other hobbyists, but for outsiders there was little 'useful' to show.

The greater participation of males in hobbies designated as being technological suggests that the identity of a 'challenging' technology has more resonance among males than females. Certainly, there are more representations available which show males operating at such technological frontiers (20).

The Diffusion of Interest

In the 1980s, the work of producers such as Sinclair Research and initiatives such as the BBC'S Computer Literacy Campaign facilitated a diffusion of interest to a slightly wider audience than the early hobbyists. This occurred both through the way in which the design of later products opened up micros to those with less technical expertise (21) and through the way in which the above agencies started to represent micros as being more accessible to a non-elite. Apart from the increase in membership of clubs in the 1980s, it was my impression at that time, that micros had started to join the list of topics such as sport, cars, and DIY as part of a fairly common repertoire of 'men's talk'.

The high profile of IT in the 1980s also legitimated an interest for women. After all, the Computer Literacy Campaign stressed that it was important for everyone to know about these developments, and not just for males to achieve that familiarity. That Campaign partially removed the stress that micros were a 'technology'. Instead, these micros were represented as being a new form of product which was concerned with information management. Home computing was at least as much about software as about hardware. In a culture where technological hardware is associated with masculinity, it is arguable that any step which challenges the representation of the micro as being technological helps to reduce its masculine connotations (22). Of course, the Campaign may also have made micros more interesting to a wider audience of those males who had not previously embraced cultural products designated as technology'. But the BBC project may have been of particular importance in stimulating greater interest among women.

One indication that some form of interest actually existed among females is the TV viewing figures for first of the BBC's Computer Literacy programmes. We must be a little careful in our interpretation of these data, since TV viewing is not a direct measure of individual preferences. There is the question of who decides which programmes are chosen for viewing on the family television set (23). Nevertheless, Kennedy notes that whereas the BBC expected far more male viewers, the actual balance for the Monday night showings was 47% female to 53% male (24). That is not a significant difference.

Such measures draw attention to the point that we cannot simply assume that women showed no form of interest in IT and micros. However, I would speculate that the subject gained less of a public currency among women - and that other topics perform that function instead. Hence, there is slightly less incentive to follow developments in micros. This point about public currency parallels a later argument about computer games, although less evidence is available in this chapter. Yet, the topics covered in women's

magazines and a range of feminist commentaries about 'women's talk' suggests that this assumption is a reasonable one.

PERSONAL SPACE FOR THE COMPUTING HOBBY

We now switch to a very different framework, which examines the computing hobby as a form of leisure activity. The category of 'leisure' is in itself problematic in relation to women. Griffin et al. argue that women have very little 'time free from obligation' in which they can choose leisure activities (25). Seemingly 'free' choices are often made to fit in with a network of demands. And when joint leisure choices are made - as in partners going out - it is often males who are the definers of the form which this free time should take. Indeed, these writers put the case that one of women's obligations is itself to construct and enable male leisure.

Furthermore, these and other analysts point out that it is by no means just women with young children who have limited 'leisure', although this group experiences particularly heavy demands (26). The role of organising leisure for children continues when the latter are older (27). And even for younger girls, without the demands of partners or of children, free time for leisure is not what it seems to be, given the background social and economic pressures to 'work' to 'get a man' (28).

Apart from such considerations and obligations, feminists have commented on other constraints on leisure options for women. For example, Deem notes the existence of sexual harassment of women both at night and in certain venues and comments that 'men make public places "unsafe" for women by "policing" them and exercising control over which places it is "appropriate" for women to visit' (29).

Many of the above points are obscured by the type of statistical data derived from survey responses: which is a point to be borne in mind as

we examine any figures concerning leisure. Nevertheless, even the quantifiable data often drawn from Government statistics show that males have more leisure time and options (30). As Deem notes, 'women's leisure does not seem to command the same degree of legitimacy as men's, either in the home or out of it and whether we are talking about time, space, money or resources' (31).

The following section of the chapter examines the different aspects leisure - or what I refer to as 'personal space' - which Deem has outlined. I mainly restrict my attention to adult men and women, since there were few young people in the early hobbyist period. A later chapter of this thesis pays special attention to the experience of youth (32).

Leisure Time

Computing as a subject requires considerable time even to cover the basics of programming. Furthermore, the type of projects suggested in magazines means that taking on the hobbyist role implies a major commitment. Norms established by club participation reinforce this. In addition, and perhaps most importantly, there is a strong rationale for spending blocks of time on this activity. As TG noted (33):

'*(...) Most of the people who I came across who undertake a big job...their actual effectiveness is only about 10%...because every time they come back to it they have to spend so much time discovering where they were (...)*'

Apart from such practical considerations, part of image of the hobbyist (and of the 'Hacker') was of someone who could be totally 'absorbed' in the activity. This was identified as a pleasure both in the magazine literature and by interviewees (34). Such an involvement requires blocks of time. However, studies which examined gender and leisure draw attention to the fact that the 'free time' of many women

is often fragmented (35). Feminists point to the way in which women are permanently 'on call'(36) and note how women often have to merge leisure and pleasure with other obligations in order to manage their primary domestic role (37). Therefore, we would expect that the ability to be absorbed in one discrete activity is actually something that is less of an option for many women. Indeed, 'absorption' may sometimes be possible for male partners (and children) only by virtue of being enabled by women's background domestic labour (38).

Although little quantitative data are available concerning the amount of time which enthusiasts devoted to computing (39), impressionistic accounts suggest that hobbyists could spend a considerable number of hours on their hobby. TG estimated that in his club, members would spend a minimum of 7 and 8 hours a week on their interest (40). Even interviewees whom I considered to be spending a good deal of time on computing marvelled at the energies which some of their peers could find to devote to the subject. One of hobbyists who was impressed, MG, described his own commitment (41):

'*(...) At times I was spending 20 hours a week (on computers). Most likely my wife would say a lot more than that (laughs) (...) Well, I suppose my wife is used to me being a nutter, in that sense....*'

Here, we glimpse how these males were allowed the personal space for this hobby. It is true that MG, TG and many others to whom I talked knew of cases where the issue of time spent on computing had led to conflict between partners (42). Often, my contacts would talk of 'knowing someone' where the issue 'nearly led to divorce'. Indeed, Margaret Shotten's study, which specifically focussed on this question, found some instances where couples split up (43). However, for the most part she noted that overt conflict never emerged. In her sample, the males had usually been engaged in some hobby in which they were deeply involved before meeting their partner. As MG implied, (although it would have been useful to hear the views of his wife), the women had become used to, expected and (to an extent) seem to have accepted the personal space which had been carved out by their partners.

A somewhat different picture emerges when we turn to women who had themselves taken an interest in micros. Both FT and her husband had careers, although her husband's tended to be given priority (44). Once they had acquired a BBC computer, primarily for her husband's work, FT recognised that to learn about computing would be just the type of challenge, and puzzle which would interest her. She went as far as to spend some time late into the night engrossed in some of the games which were available. However, FT realised that computing would be the type of activity in which she would have to invest a good deal of time to be worthwhile. She would either want to take on such an enterprise wholeheartedly or not at all. This is how she had approached her other interests while at university and in the course of her later work. Yet, FT was already conscious that she and her husband did not see much of each other on weekdays. Ultimately, since the computing seemed too self-indulgent, she decided to avoid getting involved with the activity.

In a second example, we see a slightly different experience, but one in which we can still appreciate how some of the issues around gender and leisure operate in the background (45). LK had always been interested in consumer electronics, and had considered buying the Sinclair ZX80 when it first came out. Her room is now a mass of stereo, televisual and computer equipment. Computers became of interest partly through her temporary secretarial work. However, games were her first and main route into micros. While working as a theatrical stage hand, LK had probably spent her free time playing video arcade machines with her mostly male colleagues. This interest later extended from games to wanting to learn to program.

Yet, LK recalls how when she was married, there had always been conflicts over her ability to find free time to develop those interests. Her ex-husband had expected her to to watch TV with him when he returned from work. This appeared to have been one of several sources of antagonism which eventually contributed to their splitting up. Even now, as LK shares a flat with a male friend, she begrudged giving up some of the time in which she was expected to

listen to what had happened during his day. She would have preferred to use that time to follow up her own interests.

Finally, we have the cases of DC and DN, who were able to develop up their interests in computing with less problems (46). DC had been a journalist for some years and was without any partner. The time she spent on her 8 computers could match that of many male hobbyists. She had become interested originally because she had not been able to stand the thought of her nephew patronising her when he had first got a Commodore Vic 20 computer. However, being a freelance journalist, she could justify her hobby by writing about it. She subsequently wrote about microcomputer developments for the computer press, for newspapers and for the electronic magazine *'Micronet'*. Having no partner gave her the free time to pursue her computing interests, which included playing games. DC felt that she would not be able to continue spending nearly so much time on her interest if there was someone else to consider.

DN and her partner both had careers, hers being that of a biology teacher. Apart from becoming a little bored with her subject, there was little prospect of progressing from her current position. As in the case of a number of teachers with whom I have spoken, computing offered an opportunity to branch out into a new career. DN not only found computing to be a new challenge, but she could justify buying a BBC micro and spending a number of hours per week working on the machine because of its role in relation to her paid work. She took charge of computing in the school and subsequently left teaching to take up a job where she now prepares computer based material for the education sector (47).

These outline case studies illustrate some of these considerations from the leisure literature. Already, we see the emergence of the issue of justifying time for computing.

Physical Space and Money for Leisure

Deem points out that 'it is rare for women who live with others to have a space of their own for leisure, whereas men and frequently children too if they do not simply leave the house, often have special places to go to even in cramped housing conditions - a room, a corner of the garden, a shed - where they are likely to remain undisturbed.' Deem adds, 'for most women, the only space which is likely to be given over to them is the kitchen.'(48). In fact, this latter point was exactly the experience of one interviewee: LK (49).

While the core of a micro may not take up too much room, magazines have always displayed and promoted a range of equipment to extend and improve the original machine. A monitor to replace the TV, disc-drives, printers, interfaces, modems and other peripherals can soon occupy a huge space. TG, who visited a number of hobbyists in their homes, described how the spare room was often appropriated as the computer room, with equipment racked up on shelves on the wall. Where this was not possible, ingenious methods were found to store equipment One hobbyist stored hardware in a bedroom wardrobe in which he had installed new shelving and hooks for mounting items such as soldering irons (50). The literature on gender and leisure raises the question of whether many women could command this degree and type of space for personal interests.

The general issue of financial resources for leisure is a little more complex, depending on how the family income is managed. Deem outlines four chief variations (51). Where both partners earn, there can be a pooling system. Alternatively, each person may manage his or her own income, only agreeing to joint expenditure. Where only one partner (more often the male) is the only or main earner, an allowance of a set amount may be handed over for family expenditures. Alternatively, the whole wage may be given up, after an amount for personal spending has been removed. In the last case, Deem notes the tendency for men to keep back some money for personal spending in a way which is not

possible for non-earning wives. This lack of reserve funds severally reduces the latters' leisure choices. We might add that even in the case of women who have paid employment, average income is lower for females than for males - a point which is also relevant when comparing men and women without partners. In sum, we can see a basis for there being less options for women to engage in major spending on hobbies and interests.

The next step is to relate general family finances to the case of computing. Even in 1977 American hobbyist circles, commentators pointed out how expensive this computing hobby had become. The editor of one computing journal noted how a whole microcomputer system was comparable in cost to buying new boat, car or trailer - and so it was fairly dear even then in relation to US disposable income (52). As has already been noted, those systems were often too expensive for hobbyists in this country. Nevertheless, spending on cheaper British systems mounted up after a while. TG estimated that in his club, average equipment cost half the annual male wage - although he added that club members' salaries were higher than the national average (53).

Against this background, several of the hobbyists to whom I talked knew of some conflicts over the amount of money some of their peers had spent on computing. MG admitted that he wasn't allowed to buy all the items which he wanted (54):

'(...) In about '79 things like the PET came out...£700...there was no way I was going to get away with (anything like that)...

LH: 'What do you mean "get away with"?'

MG: *'My dear wife (laughs)...she always accepted that I had toys but...we suddenly went into a new (price) bracket (...)'*

However, when kits costing only a few hundred pounds appeared, MG felt that he was able to get away with buying these items out of what he

called his 'slush fund' - which sounds very much like the personal income held in reserve which we noted above.

In the pre-1980 period, the cheapest core computers cost a few hundred pounds, as did most of the peripherals to add to the system. While, in the post-80's, the less expensive (and smaller) machines from companies such as Sinclair Research may have made this hobby more accessible to all, the ZX80 still cost £100, while the ZX81 cost £50. At that time, these were by far the cheapest machine available. The BBC Model B micro cost £400. For some single women, such as BC, machines somewhere in this range were affordable. Alternatively, if both partners had an interest in micros, the home computer could become a family purchase. However, the various studies of leisure suggest that more men would be able to find the money to take up such a fairly expensive interest as a personal hobby (55).

As Deem notes, 'No wonder then that much of women's household leisure consists of needlework, knitting, cooking, reading, TV watching, writing letters, day dreaming and snatching quick naps. All of these activities can be fitted into a fragmented time schedule, don't require large blocks of time, are cheap or free, require little space or equipment and can easily be disposed of or stopped when work obligations intervene' (56). Here, I have tried to demonstrate how computing as a hobby does not easily fit in with these demands on women's 'leisure'.

Justifying a Microcomputing Hobby

The above outline illustrates how women have relatively greater limitations when making decisions about their leisure. From the examples of women who showed some interest in computing, it appears that pursuing that interest often has to be justified in terms additional to any pleasures which the activity might provide. For instance, DN and DC could make use of computer skills in relation to their work. FT commented that if other people had somehow benefited

from her involvement in computing, she might have further developed that interest in micros. If this had been the case, she pointed out that her husband would have 'simply had to do washing up'. But she felt computing was too self-indulgent an activity for which to 'make time' if only she benefited (57).

More generally, the particular 'leisure' activities in which women engage are often referred to as 'extensions' of their roles. For example, many women are engaged in voluntary work (58), or develop crafts which produce items such as food and clothes for the family and for friends. These choices could be understood as partly arising from a situation where greater constraints on personal space require greater justification for pursuing an interest. Such an emphasis on justifications would seem to fit in with the tenor of many feminist analyses of the conditions experienced by women.

It is likely to be difficult to disentangle motivation from justification in practice. Since 'interest' is itself such a vague concept, it is still an open question as to whether we can always distinguish some basis of appeal from the grounds which legitimate following a leisure activity. However, where some 'interest' seems to have been expressed, but a hobby fails to develop from that interest, differentiating between the two notions of initial motivation and legitimation seems to be a promising way of attempting to explain those actions. As we shall see, this distinction is also one which is employed by some producers. One marketing strategy assumes that there are people who for various reasons are already motivated to buy certain goods, in which case the role of the advert is to supply 'reasons' to justify the purchase.

Justifying interests was not an issue which was solely faced by women. Since early microcomputer hobbyists were not working within the dominant vision of the future of computing, they often faced criticism from those who worked with larger machines. KE(2) recalled how he was forever having to defend his interest against the derogatory comments of his university contemporaries (59). Similarly, MG and QS

felt the pressure to justify their involvement both to those at work and to others (60). Some of the early microcomputer magazines picked up this theme, and via their letters pages, editorials and other features this press attempted to provide legitimations for the hobby. LH remembers some of the discussions which took place among hobbyists in the 1970s (61):

'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 a 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.'

The importance of micros was legitimated by the BBC Computer Literacy Campaign, the micros in schools scheme, and the general high profile of I.T. - as well as by the advertising of micro producers. Yet, while these developments may have made it easy to justify a general interest in computers, it is a slightly different matter to partake in the actual hobbyist activity. To cast further light on the issue of participation, I now shift the focus to the issue of computing's 'educational' value.

The Literacy Campaign provided a major platform for defending the hobby as having educational content: enthusiasts could now argue how familiarity with computers was valuable. However, such an argument was at best only partially convincing. Often hobbyist knowledges were quite intricate and detailed regarding such matters as how to run programs faster or how to make other subtle alterations. Such knowledges had limited applicability, and for many it is never put to

use for the benefit of any audience apart from other hobbyists. Therefore, any claim that the content of hobbyist learning constituted 'useful knowledge, could be contested.

Meanwhile, the 'tinkering' approach to learning - the informal exploration of systems by small projects - itself reflected the way in which the micro was a 'toy' for the hobbyists. Many enthusiasts themselves refer to their computers as 'toys', thus acknowledging how the appeal lay in playing with the machine. Of course, there are schools of educational thought which maintain that play is the best approach to learning (62), and indeed, this was the argument which was presented by many hobbyists (63). But, given a widespread perception of 'education' as consisting of a more formal process, or at least a more systematic enterprise, this 'tinkering' may not have been widely viewed as being constructive.

Hence, while there are 'educational' bases for justifying the activity of computing, whether particular hobbyist goals and practices could be legitimated on these grounds was always open to dispute. Both men and women for whom computing may have had some initial appeal faced these considerations. But, I would suggest that the need to legitimize their leisure choices was less for males (64), given that the latter have a greater personal space in which to indulge themselves. Indeed, we might say that the space to cut oneself off and 'tinker' constitutes just that kind of 'free choice' and exemption from routine demands and pressures which many women lack.

There are counter examples to the line of argument which has been presented here. Sometimes women were happy to view their involvement mainly in terms of self-indulgence, as in the case of LK (66). Equally, some male contacts regarded computing, or game-playing, as potentially interesting but too frivolous for them. However, the issue of justifications in relation to a more limited personal space for women seems to do justice both to the case studies and interviews discussed above and to the general pattern of 'leisure' activities which are adopted by women.

THE PUBLIC WORLD OF HOBBY COMPUTING: CLUBS

One reason why clubs were important in the late 1970s and early 1980s was that they provided a good deal of support for individual projects and for finding out about micros generally. There were few books or classes at this time and the first hobbyists machines were extremely difficult to operate. In fact, it was only by about 1983 that a flood of books and courses started to appear. To illustrate the 'demand' for such support in the early 1980s, when one local club opened in a London library, a queue of over a hundred people were waiting outside - despite very little advertising (66). Arguably, when it became easier to develop the hobby without club support as the 1980s progressed, the advantages of club membership decreased.

However, clubs were not some automatic stepping stone for hobbyists. Even among males, there is reason to believe that a majority of those who maintained a computing hobby did not partake of club life (67). Nor can we simply conceptualise clubs as some neutral form of 'access' to computing. This section focuses on the way in which clubs shaped and sustained a very particular form of interest and had their own specific social dynamics. These factors may well have had some bearing on the male dominated nature of these collectivities.

Very, very few women joined computer clubs (68). There were even less women at these venues than at the other public events for enthusiasts: hobbyist computer fairs (69). That absence of women is important because the overwhelmingly male participation in such public sites itself facilitated representations of leisure computing as being a masculine activity. Cockburn argues that we should look at 'gendering' processes in work (70). Arguably, the sheer visibility of males in clubs was part of the process by which this particular leisure activity was 'gendered'.

Gender and clubs

If we extend the general arguments about personal space, to attend any form of gathering means that women have to make some 'free time', additional to that set aside for home based computing. One mitigating circumstance is where attendance can be justified because the interest is shared with a partner, or even were the predominant motivation lies with the male partner. Deem refers to this situation as being one where wives are 'incorporated' into their husbands' field of interest (71). In fact, attendance with partners and with children seemed to be the main way in which women took part in clubs (72).

The issue of more constrained 'free time' may well underlie the greater participation of men than women in clubs generally (73), including clubs organised for hobbies (74). In addition, leisure analysts have noted the problems of evening classes, given the concern which many women express about the safety of going out at night (75). Certainly LK cited this as being one reason why she would always be reluctant to join a club (76). Furthermore, once clubs become mainly male, and so become a 'gendered terrain', the sheer feeling of being 'out of place' may well be another disincentive to join (77). One hobbyist interviewee noted what he had considered to be a degree of sexual harassment towards a lone woman member in the early years of the club (78).

In contrast to their absence from clubs, women participated in a different collective activity organised around computing. MG noted that in the 'Introduction to Computing' evening classes which he taught for the local Polytechnic, about 20% of attendees were women (79). And at the London Mary Ward Centre, which has a majority of women teachers and women students throughout its classes, about 70% of those in the computer sessions were female (80).

If women demonstrate interest in computers in some public sites, the question arises as to why clubs in particular were avoided. Again,

one factor here may have been the goals of the classes and clubs. Women participate heavily in adult education classes generally (81). Participation in such classes can be more easily justified, owing to their clearer 'educational ' designation and intent, whereas any representation of a computing hobby as educational can be easily contested. Arguably, the same applies to the way in which clubs operated. Here NL describes the reception which newcomers used to receive at the North London club (82):

'*(...) When people came along they'd say "well, what are you doing?" "Well, we're not doing anything. It's you who are doing it" (If they did not have any ideas) we'd say "Well, someone over there is working on...robotics arms...and there are some people over there who are a ZX81 group...and there are some people over there who are working on a micro-mouse...and there's this guy using a micro to analyse temperature variations in his fish tank. Now what do you want to do? What are your interests?"*'

We can see here how the club was very geared to the project form of activity familiar to electronics hobbyists. Furthermore, the clubs themselves developed norms about what constituted a 'useful' or an 'interesting' challenge. As previously noted, a common task which was taken on by my interviewees was to get a program to run more efficiently or faster, even if the program was subsequently never used (83).

The other side of club life was talking, in a fairly unstructured way about the wider set of issues which had become hobbyist topics. During my attendance, one such issue concerned the latest programs for producing mathematical derived patterns: fractals. In other words, apart from long-standing topics of interest, there were more fashionable items of talk. And both talk and projects reflected what was offered in magazines. Whatever the merit of this whole arrangement in terms of learning, the club appeared to present itself as having the type of informality and tastes of something more easily characterised as 'subcultural' than 'educational' (84).

The other facets of club life which I wish to consider is the relation between members, the resulting interaction in these clubs, and hence the tone of these meetings. While in some respects the clubs were a form of mutual aid society, we should not neglect the fact that these venues allowed hobbyists to demonstrate their competence and play the role of expert. This is especially the case in relation to newcomers, but it also occurred in relation to peers. For example, we can note the comments of the head of the original US Homebrew club about the nature of the relationships in that venue (85):

'We were all watching to see if someone else was infringing on our speciality or our little twist. It was difficult to get people to work on the same thing. We all just had great plans with no one else to listen to but other people with their own great plans.'

So, even within this well known body which has often been glamorised in historical accounts as being a cosy, communal meeting place for sharing insights, there was that element of competition and of maintaining one's own expertise. I would suggest that such motivations also entered into the club experience in Britain, for it was often only in this context that hobbyists' specific form of expertise could be appreciated. It was here that enthusiasts could show off and, as TG pointed out, many were 'gluttons for praise'(86). In the club hobbyist expertise fitted in with certain values concerning what counted as worthwhile projects and knowledges, which included such items as programming 'tricks' (87). Outside club circles, these knowledges were not valued in the same way.

Some writers have argued that women often chose to avoid competitive environments, where they feel they would have to prove themselves (88). In particular, Cockburn supplies the anecdote about the way in which female newcomers to a computing department were talked down to - perhaps even more so than males would have been (89). We have to ask ourselves whether women newcomers to computing clubs would have been particularly patronised in what was seen as a male domain. Furthermore, Cockburn argues that, where artefacts are perceived as

being 'technological', these demonstrations of expertise have a particular role to play in structuring masculine self-identity (90). The implication is that the need to exercise such expertise does not have quite the same significance for women.

SUMMARY

With limited evidence available for this chapter, I have attempted to draw attention to some of the issues which may well have had a bearing on the different levels and forms of interest shown in early micros by men and women. In particular, I have paid attention to the technological identity of early micros as represented in the hobbyist press (91) and later in the computer literacy campaign. The second argument relates to the nature of hobby computing as a leisure activity, both at home and in clubs.

Initially, I examined the ways in which microprocessors and then microcomputers were constructed as objects of interest for electronic hobbyists and for computer programmers. The early technological identity of these devices was that of being modern 'high tech'. These programmable micros and microchips were raised above more mundane technologies by virtue of being portrayed as strategic to how electronics and computing would develop. These artefacts were frontier technologies, as radio had been for an earlier generation (92). By learning about the workings of microtechnology, hobbyists could come to grips with the operation of those more inaccessible devices which shared the same core principles.

In addition, those microelectronics constituted challenging technologies in that they offered so much for enthusiasts to explore: so much so that the field could become a hobby in its own right, and one where more committed enthusiasts could spend all their energies simply learning skills and refining tools. In particular, I indicated

how the electronics hobbyist community would be predisposed to welcome any area of activity which was presented in such a manner.

Changes to this technological identity started to occur with the Computer Literacy Campaign and with the arrival of newer machines in the 1980s. While some of the attraction of being modern and of being strategic to our future remained, computing was nonetheless represented as being more accessible and less hardware orientated. These transformations may have enabled slightly more interest among women. However, men still appear to have had an incentive to take an interest in micros, partly fitting in with the role played by such knowledges as a currency of discussion in male circles.

In this second half of the chapter, the form of analysis has some parallels to those analyses of technology as well as of leisure which discuss problems of 'access' for women. The introduction has already listed some of the difficulties concerning such a conceptualisation. In keeping with the criticism raised there, we should not assume that access to the world of hobby computing was simply a 'good thing'. Hobby computing was a very particular form of activity, whose features I have tried to outline.

The surveys mentioned in the introduction, TV viewing and attendance at computing classes indicated that some interest was shown in micros by women. In this light, I asked whether features of hobby computing as it appears to have been practised made the further development of women's interest along these lines less likely. Given various constraints upon women's personal space, would women have found the hobby of computing a less legitimate use of their resources than would a male counterpart?

When we turn to one of the more collective sides of hobby computing, I argued that several features of club life may have contributed to structuring the activity as a male terrain. First, the club's may have appeared far less educational venues than more formal classes. Second, the particular types of knowledges available there may not

have been so valued as 'useful' by women, especially given the non-utilitarian orientation of many hobbyist enterprises. Third, the club as a social event may have been less attractive to women. Various arguments in the feminist literature suggest that the way in which expertise is exercised may be less appealing for females with an interest in computing than for males.

PART TWO:

INTERACTIVE GAMES AND LATER HOME COMPUTERS

SELECTIVE CHRONOLOGY: THE ORIGINS OF INTERACTIVE GAMES

Computer Games	Arcade and Home Games Machines
1962	
'Spacewar' developed and first seen by general public	
1970	
'Game of Life' developed	
1972	
	Magnavox's 'Odyssey' home video game released
	Atari release 'Pong' arcade game
1975	
	Atari release 'Pong' home video game
1976	
	Fairchild's 'Channel F' programmable video game
	Warner buy Atari
'Adventure' game created for mainframe	

1977

Atari 'Video Computer System'
(Programmable)

1978

Midway releases the arcade 'Space Invaders'

Adventure International
transfers mainframe adventure games to hobbyist micros

1980

Mattel's 'Intellivision'
(programmable)
Major growth of Atari

1982

Video games market peaks

1983

Line between computer games and video games seen as blurring when home computer prices fall.
Home computers recognised at consumer trade fairs as being the new 'star' product.
Video games market declines

CHAPTER 6: THE HISTORY OF ELECTRONIC GAMES

COMPUTER GAMES: FROM HACKERS TO HOBBYISTS

The initial three sections of the chapter trace the first lineage of games from their origins on computer through to their adoption amongst early microcomputer hobbyists. As a background consideration, we must remember that the computers of the 1950s were represented as very serious machines to be used mainly for doing calculations and administrative work. Thus, our first puzzle concerns why computer games could have come into existence at all. This first part of the chapter implicitly addresses this question by outlining the organisational and cultural conditions of production of these earliest games. We start with the general economic and institutional framework in which games arose.

Early Computer Games

In the late 1950s and early 1960s, 'Computer Science' was in the process of being constructed as an academic discipline. MIT introduced the first courses in computing for undergraduates in 1959 (1). Meanwhile, a diverse group of researchers had been forming departments to develop a new computing subject matter since 1956. These operated under the umbrella term 'Artificial Intelligence', and one such AI unit soon started up at MIT. Both the course and the new department were to provide an important institutional base for the programmers who went on to develop games amongst their other projects.

ARPA, the Advanced Research Projects Agency, had been an arm of the military providing funding for computer development since the early

days of the space programme. When this programme was transferred from the military arena to the civil body NASA, ARPA was left with a good deal of funding momentum. The agency decided to increase its support of computing and, in particular, for projects on 'basic research', favouring some areas such as time-sharing (2). The new AI department was able to deploy these funds with a considerable degree of discretion and employed the first enthusiastic students emerging from MIT's new courses. This 'golden era' (as seen by many of those involved) lasted until Congress passed a law in 1969 that required all ARPA projects to have a specific justification for military purposes (3). As funds for the previous types of AI research dried up, this community of programmers at MIT was to disperse later to other research centres and companies.

The other important condition was the relationship of MIT to a section of the computer industry: the young company, DEC, which we noted in chapter 3. Formed in 1957, this minicomputer firm was itself breaking away from some of the practices of mainframe companies, and at that time was at the forefront of the newly emerging minicomputer industry (4). DEC not only developed a very close relationship with MIT (5), but fostered a relatively easy-going style to which MIT student programmers could relate. DEC provided MIT with a free minicomputer and any assistance which was requested. In return, the company benefited from MIT research and advice, especially as regards time-sharing, but more generally, in terms of receiving a range of free programs from the AI department. A number of the MIT programmers later went to work for minicomputer firm (6).

Within these institutional arrangements, the AI department was in the process of developing certain new directions in the use of computer technology. At that time, the only model of computing was the batch-processing system dominated by IBM. In 1959, a military department donated a small research computer to MIT. This machine had been built to test faults in mainframes. On this computer, and shortly afterwards on the DEC minicomputer, a number of MIT programmers could experience the more direct, 'interactive' relationship with the

computer, exercising total control over a single unit and receiving immediate feedback from their efforts. In the course of their experimentation, these MIT researchers developed a range of facilities to support this new type of computing, formulating some of the principles by which microcomputers were later to operate.

While this account provides some overview of the role of this department, to appreciate the specific way in which that development was carried out we need to examine the nature of involvement of these programmers. Even prior to the MIT course, many of these students had developed an interest in constructing and exploring systems. The most important of these were telephone and railway systems (7). For example, some programmers had previously been involved in 'phone hacking', which involved mapping the telephone system and techniques to see which phones could be accessed free of charge (8). Others took an interest in the optimum routes across subway systems, holding competitions to test out their predictions (9).

In particular, the 'Tech Model Railway Club' provided the focal point and place of contact for many of those who later worked on the AI computers. It was in this male community that certain practices evolved - such as working through the night, and trying to perfect new 'features'. Here too, a language was developed, which reflected a set of club values, and which carried over into computing. While the term 'hack' had earlier origins, in this context it came to refer specifically to stylish technical innovations undertaken for the intrinsic pleasure of involvement - not necessarily to fulfil some more 'constructive' goal (10). From this concept, the community's members later defined themselves as 'Hackers'.

These enthusiasts took an immediate interest in the latest 'system': the computer. When the research computer became available, the hackers maximized their time on the machine by working in the department at night, when there was less demand for computing power. This system became the new object of fun on which to invent hacks.

One of these hacks was a program to play Chess. Since the ability to play this game had earlier been picked out by critics of AI as a test of intelligence, chess took on an extra symbolic value within this community (11). More generally, the Hackers tried to test out and demonstrate the computer's abilities. As hacks, these projects which were of little use in themselves. For example, some of the projects in those first years included a program converting arabic numerals to Roman ones (12), one for calculating the Mayan calender, which worked in base twenty (13), and a program to solve puzzles generated by a form of solitaire (14).

This approach to computing was very different from the traditional 'serious use' of the machine. Rather than treating computers as mundane tools, they played with them as toys, in the same way as hobbyists were later to treat micros. The heresy of this was reflected in the derogatory views of some of their contemporaries (15). Nevertheless, the AI staff who were in charge regarded these projects more positively as being vehicles through which to learn about this new form real-time of computing.

In addition, there were also more tangible spin-offs in this particular case, both for the university and for parties such as DEC. In the spirit of enhancing tools, the Hackers wrote and improved the operating systems for their first machine and DEC's minicomputer, as well as supplying other programs which would have been very costly to produce commercially. More particularly, the Hackers developed a number of the principles for handling real time computer graphics and later contributed considerably to the development of time-sharing. These enthusiasts also developed programs to produce music (16), to word-process (17), and to handle floating-point calculations (18). The Hackers jokingly called the latter two facilities 'Expensive Typewriter' and 'Expensive Desk Calculator'. At the time these were not seen as appropriate applications for a computer, although we might now see such work as breaking new ground in terms of demonstrating how these machines could be used (19).

The first games were just such non-utilitarian, exploratory projects. MIT students had previously written programs on the IBM mainframes which controlled a row of flashing lights to simulate the motion of a ball in Ping-Pong (20). However, it was the Visual Display Units which were to prove to be the means to much more dramatic visual demonstrations. While types of VDU had existed since the first mainframe, and were in use in the air defence system, SAGE (21), they were still not a standard form of output. The MIT Hackers soon used a VDU with their first research computer to construct a maze in which a mouse would search for cheese. Another 'hack' this time with the DEC minicomputer, was a program to produce swirling patterns on the screen, looking like flowers and leaves (22). It was in the search for something even more visually stunning that the idea of a computerised space battle occurred. Russell, the inventor of the first computer game, describes in a magazine article how 'Spacewar' originated (23):

'Somebody had built some little pattern-generating programs which made interesting patterns like a kaleidoscope. Not a very good demonstration. Here was this display that could do all sorts of good things! So we started talking about it, figuring what would be interesting displays. We decided that probably you could make a two-dimensional manoeuvering sort of thing, and decided that naturally the obvious thing to do was spaceships.'

When the interviewer queried this 'naturalness', Russell explained:

'I had just finished reading 'Doc' Smith's "Lensman" series. He was some sort of scientist but he wrote this really dashing sort of science fiction. The details were very good and it had excellent pace. His heros had a strong tendency to get pursued by the villain across the galaxy and have to invent their way out of their problem while they were being pursued. That sort of action was the thing that suggested Spacewar. He had some very glowing descriptions of spaceship encounters and space fleet manoeuvres.'

In the first version of Spacewar, two spaceships engage in battle, using torpedos to shoot at each other. The program operated in real-time, which meant that the graphics reacted instantly to control. Any motion which was initiated, such as turning or firing, operated while the player chose the next move. In this sense, action was continuous and there was no pause to stop and plan. Once Spacewar was presented to the hacker community, others added new features such as gravity effects and details of solar systems. They also developed the first computer game joy-sticks to control the motion (24).

Russell went on to note:

'One of the important things in Spacewar is the pace. It's relatively fast-paced, and that makes it an interesting game. It seems to be a reasonable compromise between action - pushing buttons - and thought. Thought does help you, and there are some tactical considerations, but just plain fast reflexes also help.'

Here we can see how Russell had translated the fast pace, the 'action', of a written narrative into a computerised form, which demanded physical reflex as well as strategy. Yet even the author of Spacewar was later tacitly to acknowledge another influence in the construction of the game. Russell later reflected that his product was 'really' an elaborate game of pinball (25). As we shall see, this parallel was later picked out by other commentators and was to be important in the subsequent history of the game.

Spacewar fitted into the pattern of acceptable projects in this community. In an article one of the AI staff from that time reminisced (26):

'The first years of Spacewar at MIT were the best. The game was in a rough state, students were working their hearts out improving it, and the faculty was nodding benignly as they watched the students learning computer theory faster and more painlessly than they'd seen before...And a background of real-time interactive programming was

being built up that anybody in school could draw on; one of the largest problems in the development of the game was how to talk to a computer program and have it answer back.'

As with some of the other seemingly unconstructive projects, the game was seen as both a vehicle for learning and for generally investigating new computer techniques. One approach to handling interactive graphics on a time-shared computer was even called 'Spacewar Mode' in honour of its origins (27).

The conditions under which games arose included institutional and financial arrangements which gave enthusiastic programmers access to computers and permitted considerable free rein as regards what they produced. That sanction was because particular products, including games, were valued by staff not so much for themselves but as part of a more general innovation and learning process.

Thus games were present from very early on in the formation of this new interactive type of computing that later characterised the experience of micros. Even in 1972, the writer documenting the work of these Hackers saw the experience of Spacewar, including directness and control, as being very symbolic of the way relations to computers could develop (28). As we shall see, games continued to have a role on computers through to the hobbyists who also used games to discover that interactive relation to their smaller machines.

The Diffusion of Games Genres

There were soon to be other variations on the battle and shooting theme. 'Star Trek' became perhaps the most well known on of such games on mainframe computers (29). Yet, even when alternative types of game were developed, the tastes of game programmers in the male dominated computing field continued to be reflected in these texts. For example, simulations had been one of the earliest uses for

computers - especially simulations of battles for military purposes (30). 'Lunar Landing', which became widely available on mainframes, was a game which was once again located within a space setting. The game simulated control of a spacecraft approaching the moon.

Mathematically based programs were also popular. One such program, which the original MIT hackers elaborated, was 'The Game of Life'. This simulated ever-changing communities of 'cells' as they formed patterns over 'generations' (31). The other well known genre of game started with 'Adventure'. Appearing much later, in 1976, this computer game drew on the structure of fantasy war-gaming and, in particular, on the 'Dungeons and Dragons' interests of some programmers. The player directed an explorer through an underground world. There, the protagonist fought off enemies and overcame obstacles through clever tricks in order to find some treasure (32). This latter genre became, like Spacewar, a cult game in Computer Centres. On the home computer, this adventure format was later to provide the main alternative to the fast-action, 'real-time' form adopted by video games.

The original Spacewar, and these other genres, were not only seen as vehicles for learning. As games, they were objects of interest in their own right. Spacewar tournaments were soon held at MIT and the program quickly spread to other research centres (33). By the 1970s the range of programs had proliferated so that Ahl could even write the book '101 Basic games' for the DEC minicomputers (34).

In the intervening years between the first Spacewar and the advent of the micro, games became an established feature on larger computers. This was due to a combination of the interest of programmers in game-playing and the usefulness of games to computer manufacturers. In 1962, MIT put Spacewar on show to the general public (35). DEC requested a copy, and Spacewar was soon supplied to all their clients. Apart from having a diagnostic role to see if the machine was in order (36), the DEC salesforce also used the games as demonstration pieces (37). Spacewar,and later games, showed an accessible and friendly face of the machine. Later, when graphics capability became

an important consideration, games were often used to show the sophistication of the computer (38). By the 1970s, games had become established as a 'traditional' and legitimate type of program to be found on these machines.

Games and Hobby Micros

From the first appearance of the Altair, hobbyists had sought some manifestation of what this black box could do. As with the early Hackers, they wanted to see and show the computer in operation. The first demonstration of the Altair at the Homebrew club involved the micro creating interference on a radio to produce a simple songs (39). Several programs were developed to flash the Altair's lights in sequence. Games played the same role, providing a manifestation of the micro in action and illustrating the computer's capabilities. By 1975 the 'Dazzler' attachment had been developed which allowed the micro to control the display of a television set. This enabled the writing of games such as 'Target', which simulated shooting airplanes (40).

Within a few years of the Altair's launch, games became one of the first forms of software to be sold as a product. Hobbyists were soon converting the classic mainframe and minicomputer games to the smaller machines, as well as copying the arcade favourites. By 1978, Scott Adams had founded 'Adventure International' to translate the original Adventure onto micros as well as developing new games in this genre. Other companies were also selling simple games to this hobbyist market (41). Meanwhile books and magazines provided 'listings' of games programs, which hobbyists could type into their machines (42).

In addition to this demonstration role (43), games also constituted the new type of challenge for programmers which we saw earlier: that of squeezing the complex structures designed for minis and mainframes

onto the small memory of a micro. Meanwhile, games were still a means to learn about the machines. Programs such as Spacewar could be justified as an exercise in controlling animated computer graphics, while adventure games involved gaining familiarity with the structure of databases. Moreover, it was possible to program and run games even with very limited equipment.

In one of my interviews, an early reporter, and hobbyist himself, commented on the popularity of games (44):

LH:
'...even then [1978], games were very, very much "in"..um..the year before the PET was shown in Hannover (...) until then a lot of people had actually been buying used teletypes in order to play the well known 'Star Trek' game...er..and if you've ever played Star Trek on a teletype at 10 characters per second you know what an exercise in patience it is.'

Interviewer:
'Yes...why were the games popular?'

LH:
'Well, because...(pause) you could program them yourself, you could modify them yourself, you could experiment with them...um...around that time we'd got the first Tiny Basics drifting over from America ..and you could write a 'Lunar Landing' ...very popular game...um...and the first puzzle, of course, was to crack the algorithm...and play the game...and the next one was to say "well any fool can play this game...How can I improve the algorithm..how can I make it run in real time.." (...)'

In interviews with hobbyists, KE(2) (45) included games amongst early projects to explore his machine. MG (46) described the great efforts made by some of those going to a hobbyist club to recreate games such as 'Space Invaders' on small machines before the days when this software became more readily available.

Just as with the earlier Hackers, the hobbyists also saw game-playing as a legitimate activity in its own right, and as being of interest for for reasons that went beyond the particular narrative content of these products. Games were intellectual puzzles, of interest for their own sake. Early computer magazines presented game-playing as acceptable relaxation in the midst of programming. That sentiment was sometimes reflected by my own interviewees. QS (47), for example, saw the spirit of game-playing as being very much like the activity of programming - exploring for the fun of it. On the whole this community never rejected playing as a mis-use of machines. Games were just one use among many. As we shall see, these hobbyists were not only to provide a market for the new computer game products. These enthusiasts were also to be a legitimizing force, pointing to the potentially constructive side of this software genre which other commentators characterised more negatively.

THE HISTORY OF ARCADE GAMES

The rest of the chapter deals with the other route by which games reached a wider audience, apart from the influence of the computing and hobbyist communities. This route was via video games. Video games had originated in two forms: the coin-operation, commonly known as 'arcade' video games, and the home video games machine. Although related at some levels, these forms constituted two different types of commodity. Both originated in the US, which is the main context described here (48).

Arcade Games, the subject of the next section of the chapter, had a more direct lineage from the first computer games. The aim here is to outline the conditions under which the game form was transferred to this new context and to sketch the continuities and transformations which this process entailed. The question at issue is that, once removed from the predominantly male world of computing and engineering, why should there still be more male interest in games?

We then examine the grounds for concern about video games that lay behind opposition to the arcades. It is important to appreciate the basis of these concerns, since they are one context to which later microcomputer manufacturers had to be sensitive.

Finally, I outline some of the analyses of game 'content' used to explain their 'masculine' nature. In contrast to this approach, I point to the explanations which focus on game-playing as an activity.

The First Arcade Game

Nolan Busnall was mainly responsible for the transfer of games to the arcades. This engineer had played both the original computer games as a student and had also worked in amusement parks in the 1960s. Bushnall felt that a computer game could be profitable if it took the form of a coin-op machine. His first plan, when Data General started to sell a cheap minicomputer in 1971, was to run a space game on six time-sharing terminals. However, time-sharing made the games run too slowly. With the help of another electrical engineer, Ted Dabney, Bushnall found that through altering the terminals to try to improve the speed he could generate his game without needing a central computer, simply from the circuitry in a stand alone unit (49). The recent fall in the price of some of the chips which he used made his product seem even more viable.

The result was 'Computer Space', which Bushnall described as 'cosmic dogfight between a space ship and a flying saucer' (50). The two engineers sold the game to Nutting Associates, who enclosed the electronics in a futuristic, curved black fibre glass cabinet and marketed the product that same year. Computer Space was not an immediate commercial success, selling only 2000 units. Bushnall decided that his first attempt was too complex for those unfamiliar with computerised games (51). With the help of another engineering colleague, Alan Alcorn, Bushnall then set out to produce a simple

table-tennis game which had just a ball, two paddles and a score. Their prototype, 'Pong', proved immediately popular when located in a nearby bar. The three engineers formed a company, called Atari, and started selling the game in 1972. They had shipped 10,000 units by the following year.

Other companies entered this new market very quickly. Within a few years there were thirty manufactures of these coin-op video games (52). Even though Atari remained in profit, by the end of 1973 its sales represented only a tenth of the market (53). For a while Atari struggled, even after it had been taken over by Warner. But by the late 1970s, Atari came to dominate the industry again, producing both for the coin-op and home video game markets (54).

Following the introduction of 'Space Invaders' in 1979, the arcade game reached new heights of popularity. A measure of this can be seen in the fact that between 1979 and 1981 game sales rose from approximately $40 million to $500 million (55). In 1982, estimates were that the video arcade business would gross $8 billion, and home sales of video games would be between $2 and $3.8 billion. By comparison, pop music had sales of $4 billion, and Hollywood films $3 billion (56). Revenue from 'PacMan' was estimated to exceed that from the box-office success 'Star Wars' (57). By this time, coin-op games had become an international phenomenon. Their proliferation and profitability increasingly caught media attention, as well provoking considerable critical comment, as will be outlined presently.

Concern about Arcade Games

Coin-op machines were to be found in locations such as American bars and shops as well as in the actual arcades from which they got their name. One factor has been picked out as helping to establish these coin-op games. They came to be taken up by the amusement park owners specifically as part of an attempt to discard the sleazy image

of the arcade (58). The new product was part of the move to introduce more respectability to the amusement park and to make it into more of a venue for family entertainment (59). The homely table-tennis may have been particularly attractive in this light. More generally, the clean electronic hi-tech form of the new games helped signal the modern look of the arcade (60).

Despite these intentions, these video games were starting to run into some opposition by the end of the 1970s. The criticisms from the anti-games lobby were diverse. In the US moral panics resulted in some much publicised by-laws to regulate arcades. At a national level, the Surgeon General issued a warning that video games may be dangerous and addictive to children, while the National Coalition on Television Violence extended its area of interest to include the new games (61). The US was not alone in such actions. Perhaps the most vigorous attack on video games came in the Phillipines where President Marcos ordered 300 machines to be dismantled, smashed or surrendered to military police within 15 days because of their detrimental effect on morals and discipline of youth (62). Even in the UK, the Labour MP George Foulkes led a campaign in 1981 to curb the 'menace' of video games, mainly because of their addictive properties. His 'Control of Space Invaders (and other Electronic Games) Bill' was put to the Commons and only narrowly defeated (63).

One set of worries focussed on, and therefore highlighted, the effect of the technology underlying these games. Critics feared what they saw as the 'compulsive' behaviour engendered by electronic game forms. Such a concern has also been raised in relation to other media technology such as television itself. Furthermore, such addictive 'holding power' had been attributed to the computer environments per se, as manifest in earlier concern about the attraction of hackers to computer technology (64). Those opposed to games argued that players were becoming adjuncts to the machine, from which anti-social dispositions arose (65). That concern was intensified because the majority of users were adolescent, and so these players were still seen as being in a phase of development.

A number of American psychology studies followed from these commentaries, trying to evaluate whether the use of these electronic devices was addictive, or led to a lack of social skills. Even some of the slightly different concerns about game content, about the 'violent' nature of games, referred back to the underlying technology of the media. As with the arguments surrounding TV, the experience of violence through mediating technology was supposed to desensitize users to aggression (66).

In contrast, other concerns which formed a basis for opposition stressed the very opposite of the fears about isolation with the machine. These worries focussed on the collective nature of a video games culture rather than on the technology of games. Many parents and local community spokespeople recognized that arcade machines were a gathering point for youth (67). The games were felt to be encouraging 'hanging around'. In other words, these were the more traditional fears about arcades being 'corrupt and corrupting places' (68). Video games were seen as the new focus of a separate youth culture, distracting young people from more constructive activities. Consequently, a number of studies framed their analyses of arcade life in terms of the issue of delinquency (69).

The Arcade 'Culture'

What these latter worries reflected was the fact that the location of video games within the arcade and certain other contexts had meant that the new machines were incorporated into the existing social activities of these milieux. Amusement parks, and many of the other public sites where coin-op machines were found, were part of street culture. They were mainly male, particularly young male, preserves (70). Some girls were present in these contexts and there were some girl players. The arcade and other public locations were, after all, still meeting places.

Yet observational studies found that the proportion of boys varied between 70-90% (71). That proportion rose later in the evenings. One study looking into 'deviancy' found that very few girls attended after 10:00 at night, largely owing to parental pressures (72). What little evidence exists also suggests a higher proportion of arcade attenders were those from 'lower income families' - which in a British context would be discussed in terms of class (73). So, while the new technology may have been brought in to mark changes, it was itself slotted into a nexus of relations. It seems to be the very traditional fears about 'deviancy' and working-class, male youth which underlay some of apparently new alarm about video games playing.

The role which these electronic games specifically appropriated was that of pinball. Within a few years of the introduction of video games, pinball sales had declined by two-thirds (74). Meanwhile, the major pinball manufacturers were among those companies who were moving into the production of the new coin-op machines (75). In terms of consumption, the institutions which these young males had built up around pinball - the values, rules, and rituals - were transferred to the video game (76). Many would-be players served apprenticeships as spectators. The public display of skill was important. There were times for discussing tactics and giving tips. Rules governed waiting for a new game. So while the games, which were increasingly for single users, were played individually, the activity remained grounded within the social life of the peer group. Some analysts could even start to describe this collective appropriation of games in subcultural terms (77).

As regards the form of games, it has already been noted that the original Spacewar paralleled Pinball in terms of a similar mix of strategy, speed and physical co-ordination. It was this genre of the 'action' game which was developed on the arcade machines. One difference was that players were now pitted against the machine instead of against each other. The rationale of the coin-operation itself helped to determine that this was the game form which came to the fore. Qualities such as the excitement of fast action provided

the type of initial thrill which attracted attention to the machines. Meanwhile, the brevity of games (until skill had been acquired) maximized earnings (78).

Gender and Games

The new video games were different from their arcade precursors in one respect - that of having at least some narrative content. Although we may be able to subject pinball to some form of textual analysis, the 'thin' storyline of the games allowed commentators to see the new form as a medium, and as more comparable to other media texts. Indeed, it was this feature which enabled the transfer of concerns about 'violence' from areas like TV and film to the new entertainment machines.

This narrative quality, along with the possibility of different manoeuvres on-screen, allowed the rate and form of innovation to be very different from the electronic games' predecessor. Pinball had evolved very slowly and differences between machines at any one time was often cosmetic (79). In contrast, a continuous stream of new arcade video games started to appear by the late 1970s. These new releases contained not only different scenarios, but they had whole new configurations of action. The degree of innovation was initially even greater in the coin-op version than in the case of the early home games machines. In other words, the video game manufacturers were now very much one of the so-called 'cultural industries', akin to the film and music establishments (80).

It was this 'media content' which received most attention in explanations of the difference between male and female interest in video games. In particular, the most frequent argument has been that the aggressive/ destructive/violent/mastery nature of many games was a masculine quality (81). Early critics also argued that scenarios such as science fiction settings were male orientated (82).

Stereotypical roles of male and female characters appeared in the plot, or were offered as subject positions to the player (83). Qualities such as the nature of the colour in graphics were also discussed in gender terms (ie more colourful graphics being more attractive to women) (84). Apart from these suggestions, some studies have claimed that they have found differences in preference, such as boys preferring scoring, competition and bombing, and girls selecting games with fantasy elements (85).

Certainly, the case about content seems extremely plausible when we consider some of the more pornographic 'adult' games. For example, the controversial arcade game 'Custer's Revenge' had rape as its goal (86). The next step taken by some of the above commentators was to explain the content by reference to the conditions of production - that the vast majority of game designers were male (87). Clearly, a number of the early male designers of arcade games had come from a background of playing Spacewar - which seemed to have severely restricted their creative horizons (88).

However, the picture was rendered a little more complicated when, in the late 1970s, the game 'PacMan' was found to be nearly as popular with women as with men. This seemed to challenge some assumptions about the masculinity of arcade games. Analysts sought explanations in the particular game content of Pacman. For example, one commentator argued that 'directing the faceless featureless Pac Man through its model-home maze is less threatening and more closely related to hide-and-seek games than to nuclear holocaust' (89). Others also pointed to the very colourful game 'Centipede', involving shooting at a centipede which is eating mushrooms. This was also fairly popular with women and had been produced by Donna Bailey, the only woman arcade game designer (90).

A different mode of analysis, as suggested by the few female games designers in the industry, emphasised the changing context of games-playing (91). Pacman appeared at a time when coin-op games were becoming more pervasive than pinball had been. Video games had

managed to achieve some respectability outside the arcade in places such as lounges and restaurants (92). These designers argued that such sites were more socially acceptable places for women, whereas the arcade atmosphere had been less comfortable. A similar point, in fact, had been argued in relation to pinball itself. It was only when American suburban shopping centres decided that it was profitable to allow arcades into the plazas earlier in the 1970s that some of the plusher chains first managed to attract a few women pinball players (93). The history of pinball thus supports the argument that an important factor in the success of PacMan could have been that video games were becoming generally more accessible.

Yet, what even this analysis fails to address when discussing the popularity of games is the nature of the 'interest' which is involved. As in the case of a record, a particular game may be enjoyable to a wide range of people, or game-playing may be an activity that many people would happily engage in if it was only occasional. Many males and females can have these forms of involvement. PacMan may have benefited from this less 'committed' form of interest. The situation where games have a public currency within particular groups of young males is another matter. This involves a continuous interest in games-in-general, and entails a more regular participation in a collective activity. It was to this core of enthusiasts that the constant flow of new game releases appeared to be principally addressed.

THE HOME VIDEO GAMES MACHINE

The other type of video game device was the domestic machine, also known as a 'TV game'. There are a number of separate points to make about this different commodity form in which games appeared. As an introduction, I first provide an overview of the development of the technology and of the industry. Then, there is the question of why video games attracted the attention of a range of large and small

corporations. Here we find that certain trajectories of development were considered for this commodity which anticipated later debates about the future of the home computer. Thirdly, I explore the changing nature of home games and in particular their relation to the arcades. That leads on to the last issue, where I bring together further evidence concerning gender and the consumption of video games, referring also to the British context.

The Origins and Developments of TV Games

Sanders Electronics, an American defence orientated company, was responsible for developing the first home video game technology (94). Ralph Baer, one of their staff who had trained as a TV engineer, conducted the first experimentation and later directed the project. In a later account, Baer described the origins of a product which was seen as an alternative use of TV sets (95):

'The question of how to make use of home TV sets, other than watching over-the-air programmes, had been bothering me since the early sixties...There were well over 100 million TV sets in the US alone by 1965....The idea of attaching some device to even a small fraction of that many TV sets was a pretty powerful incentive for coming up with something, anything, on which people might actually want to spend their money'

From initially being able to control two spots on a screen, Baer had developed the prototypes for a hockey game by 1967 (96). This allowed the player to hit a puck at different strengths to determine its velocity. The technology at that time consisted of transistors and diodes because integrated circuits were still too expensive (97). Sanders elaborated the technology further until 1972, by which time the company had developed a machine capable of playing 12 games. These were simple hockey, tennis and maze games, many of which were similar to each other (98). Users had to place plastic overlays on the

television screen to provide the background setting for the video games, which did not have automatic scoring. To reprogam the machine for different games players had to plug in circuit cards.

Sanders licensed the product to Magnavox, a producer of television receivers. After some 'acceptance testing' among consumers (99) Magnavox made the 'Odyssey' machine available in 1972, priced at $100 (101). The games machine was not widely distributed because it was sold only through distributors of Magnavox televisions. Advertisements also left the false impression that the TV game would only play on a Magnavox set (101). Nevertheless, the company sold nearly 100,000 games and accessories in the first Christmas season (102). Although these home devices had a much lower profile than the coin-ops in those early years, these domestic video games machines were reasonably successful as a new consumer electronic.

In 1975, Atari released Pong for the home market. Sears Department stores distributed the machine and agreed to buy all the units which Atari could produce. At that stage Atari was still too weak to hold the type of inventory necessary for a seasonal product - yet, its games were mainly bought at Christmas. Sears helped them in this respect (103). After Magnavox had issued legal suits over patent infringement, Atari and subsequent producers of TV games came to a licensing agreement (104). This meant licensing the patent for the technology, but not for the actual games design, from Magnavox (105). The home version of Pong introduced integrated circuit technology - ie microchips - (106) and added new features such as sound effects and ricochets (107). Atari was, for a time, market leader (108). The company wanted to be taken over in order to provide more cash support and Warner eventually obliged in 1976. From 1974, other companies had also started to enter the market. These included pinball manufacturers, leisure specialists and semiconductor firms (109). In 1976 alone, over 30 new companies started producing for this home market (110).

Whereas the early TV games technology consisted of one chip or a combination of chips on which there were fixed programs, by 1976 several companies were working to replace the chips by a microprocessor. The latter had already been introduced into the coin-ops, where the sale price of each unit justified the cost of this technology. In 1976, Fairchild Camera and Instruments introduced the 'Channel F' or 'Video Entertainment System', which would accept programmable cartridges. Fairchild priced the machine at $170 (111) and released 25 game cartridges (112). Soon other programmable consoles were available from RCA, Bally, Magnavox, Coleco, and Atari.

These machines did not sell as well as had been anticipated, and within a year or two many companies had pulled out of the market. It was only from the late 1970s that this programmable market started to boom. Some commentators, including one of the American based Atari staff whom I interviewed, attributed part of the improvement in sales to Atari's shake-up and a very extensive marketing campaign - backed by Warner funds (113). Only Magnavox, Mattel and Atari remained by this time, and of these Atari was clearly dominant with 80% of the home market by 1980. At that time 3.5% of US homes had consoles. By 1981, this had risen to 8% (114). Atari was now the training ground for many designers, a number of whom later founded companies to supply the software cartridges for the Atari and other machines (115).

As this 'boom' picked up, a range of new companies entered, or re-entered the market, although Atari remained market leader. A number of film companies, such as 20th Century Fox, set up software arms and arranged licensing deals. Atari and Lucasfilm, established joint projects. Games were seen by the film industry as both competing for the same 'entertainment dollar' (116) and as being a new outlet for cross-licensing. For similar reasons, various companies from the toy industry also tried to diversify into this area, Coleco being the most successful newcomer. Meanwhile the existing games producers started to branch out into new forms of distribution, whereby telephone companies downloaded the games to homes by phone (117)

Although there were always dissenting voices which talked of games as being a possible fad, the general view which was aired in the trade press in the early 1980s was optimistic. However, the one cloud on the horizon was the rising home computer industry. Initially, microcomputer products were much dearer, and were felt to be catering for a different market. But as home computer prices fell, there were fears that since the micro could also run games, the new product would appropriate the video games market (118). The consensus in the trade press is that by the end of 1983, a year after video games reached peak sales, this is what happened. In the space of 12 months the 'boom' was deemed to be over.

In fact, sales did not 'collapse' but continued steadily (119). Atari's British manager interpreted these developments as follows (120):

'*...so what you got was a situation where Dixons and Lasky's and Rumbelows moved off games machines and into computers, and the games machines have now re-positioned themselves as a toy (...) The retail trade had a...they put the death wish on the VCS (Atari console) really. They believed that computers would actually take over from the VCS...which they did to a certain degree. The VCS sales were rising steeply, and then they started to plateau...and I think they dropped slightly, but settled out to a figure. So certain retailers were reluctant to stock the product and they moved over to computers...which was a technology that was more in keeping with their particular image* ' [as opposed to toys].

Demand was still enough to warrant repeated efforts by Atari and others to produce better video game machines. Later in the interview the manager continued:

' *Worldwide we sold, I think it was getting on for two million (games machines)...despite the fact that computers have been available. And it became fairly clear that there was a totally separate niche for that product, the sub 6 year-old type (...) So that's very much a separate division...toy goods division, if you like.*'

Possible Futures for the Games Machine

The original TV games had been the latest electronic gadget, following shortly after the calculator. By virtue of being about games, the machines were a form of toy. They were also a similar form of toy to calculators in the specific sense of being the first chance to experiment with new electronic effects: in this case, electronic graphics. These machines introduced the idea of playing games on TV. In doing so, they set a precedent for later computer games by being advertised as an 'active' use of television.

Once introduced, they seem to have been regarded as a plausible candidate for a consumer electronic by retailers such as Sears - judging by the amount of support which they gave to Atari. The particular appeal to the semiconductor companies, such as Fairchild and National Semiconductor, was that this product came along at a time when they were branching out from capital goods and in the process of building up a consumer products division. These firms had seen the profitability of chips in digital watches and calculators. Once video games started to use chips, they perceived that here was another type of product that would be suitable for their new divisions. Once it started to become feasible to use microprocessors, video games provided just the type of dedicated application for the new technology which they had been seeking (121).

The main consequence of this technological change to microprocessors was the effect on the nature of the product. Programmable machines created a flexible division between hardware and software. A separate industry could grow up once video games cartridge manufacturers were able to sell games separately to run on the hardware. This, of course, was the key feature of the software player paradigm. Games machines were now potentially like other home-based delivery systems such as the hi-fi. Games software could be bought, collected, and compared in the same way as records.

Many companies thought that these 'programmables' might even have a wider scope than games, despite the origins of the machines. A number of firms described in the trade press how these new games machines were possible forerunners of a larger home entertainment systems (122). Accordingly, these companies developed new types of software which was not of the arcade form. There were the so-called 'adult-oriented' card and board games, and even some educational software (123). In the latter case, some writers in the trade press added a sceptical note, as was later to happen in the case of computers, that the educational label might simply be helping to rationalise sales to parents (124).

Apart from the role as entertainment systems, some of those developing programmables were also aware of a wider potential use to which microprocessor technology could be put. These paralleled discussions in computer circles. In one trade press article, the author first discussed Commodore's new PET computer and then proceeded to outline video game developments (125).

'Many manufacturers see programmables following the example set by home computers, instead of seeing them actually becoming computers themselves; manufacturers will try to expand their utility. (Fairchild's Vice President of video products) emphasizes the point, saying, "The whole area of programmables will do a lot more than just play games. They are going in the direction of further exploitation of the power of microprocessors". Programmable units can help with a family's bookeeping, aid the child with his homework, and many other practical day-to-day responsibilities.'

In another article the video game product manager of National Semiconductor was interviewed (126):

'Looking to the future (the manager) envisions programmable games clearing a path for the first "home" computers....(Manager:)" We are at present working on a product that will compete with programmable games and go one step towards the full consumer spectrum, not just

the electronics hobbyist. But a product like that cannot come into existence until the consumer has accepted less complex products",

Other manufacturers were also aware that the games machine might be a vehicle to computers. One console manufacturer publicised their product as a 'mini-home computers' (127) and Bally, the pinball manufacturer, even provided some facilities for programming in Basic (128). Other firms talked of using consoles for home control functions such as burglar alarms (129).

Whereas the cheaper dedicated machines were now being seen as fashionable toys, the trade press and a range of firms stressed how the new programmables might become home commodities in regular use and a source of entertainment for the whole family (130). This provoked some debate over how to organise the new product's identity. While the toy industry companies, such as Mattel, were interested in moving into this area, others already producing games machines discussed the problems of associating such a system with toys, and in particular suggested steering clear of selling via toy departments (131).

These new programmables were clearly seen to have a potentially bright future, deriving from their ability to run many types of software and due to other facilities which could utilise the underlying microprocessor technology. In 1976, one writer in the trade press captured the overall gist of many predictions, when noting that the ability to constantly make new cartridges available added a longevity to the product (132). Years later, once console sales had started to boom, we can still find echos of these sentiments, where analysts denied that video games would be a fad, because of the room for expansion which the technology allowed (133). We have seen how some semiconductors had viewed this potential, and such a vision may well have been the one that tempted companies like RCA to enter this field, whereas they had shown little interest in the arcade. Certainly, in interviews with the press, Atari staff mentioned that Warner had

bought their company on strength of expectations about these consoles (134).

From these trade discussions we can see that even before the computer had moved beyond a hobbyist market to be a consumer electronic, a number of big corporations had started to think about marketing microprocessor based, software running machines as multi-function home systems. Rather than introduce a totally new product, as in the case of the computer, this route built on an existing commodity: a games machine. As we shall see, in some respects this really was not so different from the later marketing policies of some home computer firms. However, the policy of selling computers for entertainment, and particularly for playing games, was initially a far less explicit one.

Changes in Game Texts

Most of the early games were variations on the bat and ball idea found in behind the Odyssey games and in Pong (135). Pong itself was an example of a game making the transition from arcade to the home machine. Others, such as driving games, also crossed over from the coin-ops. However, that early chip technology caused a considerable time lag in this transfer. The dedicated intergrated circuit chip needed for the home machine could take a year to develop (136).

The companies who introduced microprocessor based technology widened their options by adding cartridges which contained other game forms besides those from the arcades: for example, noughts and crosses, black jack and chess (137). A countervailing tendency arose from the fact that transferring games from the coin-ops became so much quicker using software programming. Home versions could be released while a game was still in vogue in the arcades. Thus, the coin-ops were used even more as a testing ground for products which might then be cross-licensed to a home market (138).

In fact, many industry commentators, including staff at Atari, consider that it was an arcade game which first boosted sales of the domestic machine (139). 'Space Invaders' enjoyed unprecedented success as a coin-op, helping to increase sales in that sector after it was introduced in 1978. After Atari had bought the home license and was able to offer a version for their consoles, programmable sales increased considerably.

Licensing also expanded to other areas, besides hits from the arcade. In particular, there were the film tie-ins. By 1982, the increased rate of new releases was supported by video game magazines to carry news and reviews of latest games available (140). In these circumstances, the games companies and film companies seem to have felt that video games had become the type of commodity which could be linked into the other cultural industries. However, even if not originating directly from the arcade, the overarching form of games - the real-time 'action' - was still derived from that source. The scenario and plot were now simply more varied.

Gender and Video Games-Playing

In this last section, we turn to gender and games in the British context. In fact, I only managed to collect market research data concerning usage in Britain (141). The Atari marketing manager for the US whom I interviewed certainly considered that the it was mainly boys who were interested in the games - and that view was informed by Atari's own research (142). However, it has proved difficult to find independent consumption data to verify this pattern of consumption. Therefore, after outlining some of the specificities of the UK market, I will work on the hypothesis that American market research would be broadly similar to British findings.

While the the American context largely determined the product form, there are differences regarding how TV games were taken up in Britain

generally. First, there was a time lag before video games arrived in this country. Partly as a consequence, the consoles were never as popular here as in the US. In 1981, when 8% of households possessed video games in the US, the figure for the UK was 1% (143). Later, in 1983, when 15% of American households had the games (144), the figure was 5% in Britain (145). The original programmables, where Atari dominated most of the market, cost in the region of £130, while cartridges ranged from $15-35 (146). Possibly disposable income in relation to cartridge prices was another factor which limited interest in the machines in Britain - (later, computer games were a good deal less expensive). Another factor that certainly concerned Atari staff in this country was the fact that the potentially supporting amusement arcade business was not as large as in the US (147). Nevertheless, despite the lower 'market penetration', Britain was still the most significant market in Europe (148).

Public statements by British marketeers suggest that, as in the US, the audience which producers anticipated was mainly male. One of the reasons certain toy manufacturers became interested in diversifying into the area was that toy sales were declining while those of video games, and briefly hand-held electronic games, were rising. These companies felt that the games and toys were competing for the same custom, and that since it was boys' toys that were declining most - e.g. train sets, slot car racing - it must be boys who were mainly switching to video games (149). More specifically, one of the biggest European manufacturers, Philips, was reported as targeting boy consumers (150).

Market research would broadly confirm more interest among boys, although boys were by no means the only ones who were interested in games (see Statistical Appendix 5). Broadly speaking, the market research indicates that:

(a) The ratio of boys to girls wanting TV games for Xmas ranged between 3:2 and 2:1.

(b) Boys were twice as likely to have ever played a TV game - their own or somebody else's.

(c) Boys were twice as likely to have more recently (within the last week) played on a home game machine.

(d) The heaviest users of games were mostly boys.

(e) Boys expressed far more knowledge of games products, as measured by knowledge of brands.

While there could be a number of reasons for more interest among boys, I would propose that a contributory factor for this pattern was the route from the arcades. It was in the public arcades that many people, especially boys, first became acquainted with game-playing as an activity and in the last section I suggested that it is in this public setting that games achieved a currency amongst certain groups. Furthermore, many of the home games were themselves the same familiar hits from the coin-ops, or at least similar to them. This does not mean that at a later period the arcades played that same role. Many people, especially children, later may have encountered video games without having previously having visited arcades. But the aims in this thesis are to conjecture firstly about how electronic game forms first became perceived as 'masculine', and second about how that 'interest' came to be something shared within a social grouping. That arcade experience, at the time when the home commodity initially appeared, may well have been significant in bringing the collective form of interest amongst young males. The nature of that interest will be further explored in a later chapter.

SUMMARY

In this chapter, I have outlined both the roots of interactive games and of the games machine, whose identity was later adopted by the home computer. Some writers have stressed solely the parallels between the experience of games and of computing generally, while others have categorised games as simply being an extension of television. Clearly, such accounts fail to justice to a complex history which has included both of these elements and more. We have seen how

the history of these games can be traced through various lineages, involving a network of transfers between the different strands.

The first lineage lay through computing departments. We saw how a particular male culture of Hackers was able to take root in an academic setting whose exploratory brief allowed a great deal of freedom. The orientation of those programmers was formed through their previous leisure occupation of experimenting with systems. Whether we call this a 'romantic' relationship or not, it was certainly an intense involvement which was itself enabled by the degree of personal space available to young students with no partners and few other social ties. Thus, these Hackers found time to devote themselves to what was, in effect, a form of puzzle solving which was steered by the collective appreciation of their peers.

Games-playing and game design fitted in with that approach. Games were systems which could be developed and played both for pleasure and for exploration. The tastes of this community shaped the various features of the earliest games - such as the battle scenario, the science fiction context, and the use of reflexes akin to those in pinball. At this level, the first games were clearly tied into cultural forms which were more familiar to males. On this basis, some commentators have represented these and other games in this mould as being 'masculine'.

The wider institutional setting also had a role to play in subsequent years. The diffusion of games throughout the computer industry was supported by more than just programmer interest, with the demonstration function of this software playing an important part. Meanwhile, other genres of interactive game emerged apart from the fast-action form which was later adopted by arcade video games. However, although these new genres drew on a variety of different interests held by these programmers, in each case many of the core elements of the text could still be represented as being 'masculine' in orientation.

The earliest microcomputer hobbyists shared many of same values as the original game developers: the non-utilitarian, tinkering, playful approach to technology. But as noted in the last chapter, theirs was a different social context, especially where their personal space may sometimes have been gained within relationships and other commitments.

For these hobbyists, games could be taken at face value, where the plots were nonetheless the equivalent of puzzles operating within a computerised environment, and so somewhat like programming itself. At another level, as with Hackers, this form of software could be seen as a manifestation of programming in action and of the computer's capabilities. As such, games could be vehicles for the hobbyist project of learning and exploration, or used as demonstrations to impress others. The important point is that for a variety of reasons, games found an acceptable place in hobbyist circles, and these enthusiasts were to be important producers and consumers of the first micro games. Thus, this lineage proved to be strategic in the early years of computer games.

The second lineage saw the passage of interactive games from computing departments to a coin-op incarnation. Such a move entailed a transformation of games as they moved into a new social context: that of the arcades. Yet, that location did not totally determine the future of the arcade video game. The very nature of interactive games as texts enabled them to join the ranks of other goods in the cultural industries to an extent which had not been possible for coin-op precursors.

In its arcade form, video games still had a profile as a technology to be mastered, albeit on a different basis to that of its computing equivalent. By virtue of their amusement park location, coin-op games slotted into the relations and practices of at least some sections of, predominantly male, youth. Indeed, the terms of debates and concerns about arcade games seem themselves to reflect their young male audience. The fears appear to be implicitly constructed in gender terms. For example, the worry about 'anti-socialness', and 'over-

involvement with things', especially technology, could be seen as a concern about the way in which a stereotypical 'masculine' quality might become excessive. Meanwhile, the issue of arcade game-playing and delinquency suggests a traditional concern about public spaces which had been appropriated by (working class) male youth.

The brief overview of some contemporary comments regarding how arcade games texts were gendered was limited for a number of reasons. First, the examples given here form the basis of most later comments concerning both home video and computer games. Second, developing a fuller discussion of the nature of these texts would be a considerable enterprise. And this must be viewed in the light that the main emphasis of the thesis is not on the operation of texts themselves, so much as onthe context of their consumption, which has been largely neglected.

However, I can make some observations. Obviously, most current textual analyses of games are extremely crude in comparison, say, to analysis in film theory. This reflects the fact that discussions of gender and games have usually been side points within articles of a more journalistic nature. Nevertheless, the different themes can ultimately be related back to different strands of feminist analysis, such as those about the masculinity and mastery, or concerning how texts position readers.

Even within the terms of these debate, some writers recognised the complexity of evaluation and the consequent problems associated with oversimplified explanations. For example, one of the aforementioned critics started to ask whether Pac Man was really 'violent' after all (151). The arguments which explained the form of texts from their conditions of production are equally problematic. As one writer noted, it was one of the few woman designers who produced 'River Raid, which is considered to be one of the most 'macho shoot-em-ups' of all time (152).

In contrast to these issue of textual analysis, other arguments were emerging which focussed more on game-playing as an activity. According to these, the 'masculine' nature of texts would certainly have to be seen as reflecting the fact of more male users, as opposed to causing that pattern of consumption. More importantly, under different conditions of consumption, with greater 'accessibility' of these arcade machines, the texts do not seem to have so effectively deterred female interest. However, the pivotal point of the argument developed in this thesis is that we must see how the coin-op games machine took the place of an existing artefact, pinball, and in so doing fitted into a pre-existing set of practices. Games skills, together with the new factor of games as an ever-changing media, had a currency for young male peer groups in the same way that computer knowledges and developments had a currency amongst hobbyists. Arguably, this allowed their interest to be of a very particular nature as distinct from more vicarious playing (153).

The third lineage had an origin separate from the early computer games, where games machines could be an extension of TV. Yet, that lineage was by no means separate from contemporary developments in the arcade. The arrival of programmable machines promoted a greater range of software than previously had been the case, as seen in the experiments with 'adult games' and with the film licensing. Yet, this technological development also enhanced certain links with the arcade. The programmables facilitated the direct transfer of arcade games, and as the success of the coin-ops formed the basis on which console hardware abd software sales increased, the arcade form of game continued to structure the nature of mainstream home software.

I would argue that there was another level of continuity from the arcade to the home, which stimulated greater male interest in the domestic games machine. Admittedly, from the figures available this new accessibility of interactive games appears to have attracted a far higher level of female interest than in the case amusement park machines. However, the established practices of the arcade may well have left a legacy. I suggest that these practices stimulated a

greater attraction amongst young male peer groups. The nature of the involvement of these young males is illustrated by the way in which boys greater knowledge of brands suggests their greater interest in following game developments.

Finally, we have a linkage between video games consoles and home micros at the level of the futures which was envisaged for microprocessor based machines. Domestic video games machines constituted the first attempt to realise the potential of a more generalised software player which was capable of applications beyond games. In these terms, the progammable must be regarded as unsuccessful, but at least this artefact established some familiarity with the idea of a software playing product. Even at this stage, we can see that interactive games clearly had a more intimate relationship with the home micro than is suggested by histories emphasising solely developments within computing.

SELECTIVE CHRONOLOGY: THE 'BOOM' YEARS

Hardware	Software	Magazines
1981		
Sinclair ZX81. Commodore Vic 20. Acorn BBC.	A number of small software houses start up such as Oasis and Level 9.	*'Computer and Video Games'* launched.
1982		
Sinclair Spectrum. Commodore 64. Several machines appear such as Lynx, Oric, Dragon 32, Jupiter Ace, Video Genie.	More small software houses. Bubblebus switches to games. Imagine starts up. First ads in the national press. First colour ads. Start of major move to selling through retail.	*'Sinclair User'* and other user specific mags. appear. All the big mag. publishers buy and launch magazines
1983		
Several machines cut prices. Texas Instruments quits market. Acorn Electron Atari losses on video	Entry of big companies such as Virgin, K-Tel and Mogul. Entry of distributors from record industry as well as some start-	More magazine launches. Launch of *'LET'* trade press.

game cartridges.
Lower profits lead to financial problems and some closures, e.g. Jupiter Cantab.
Elan Enterprise appears

up ones.
Beyond launched

(1984)

Mirrorsoft and Domark founded.

CHAPTER 7: THE HOME MICRO BECOMES A GAMES MACHINE

In this part of the account, the aim is to explore the question of how computer games-playing as an activity was constructed, mainly by software producers and magazines. With important exceptions, hardware producers played a more reactive role in this process. Home computer manufacturers held different aspirations for the future of their product. While this thesis can now look back and trace a lineage through video games and its predecessors, that route was by no means obvious to the hardware companies. In a later chapter, I examine the positive steps which these producers took to develop other roles for their machines, and why even those benefiting from the importance of games came to see the identity of 'games machine' as being problematic.

HARDWARE COMPANIES

The period between 1981 and 1983 saw a considerable growth in sales of home computers (1). Sinclair's machines - the ZX81 and then the Spectrum - were the most successful micros. Commodore's - the Vic 20 and then the Commodore 64 - moved into second place. The Spectrum and the '64' ultimately attracted a vast amount of third party software, most of which was games. To this day these particular machines remain the two biggest *de facto* games formats. The 'boom' attracted a diverse range of companies into the industry. However, by 1983, some firms started to incur losses as a result of greater competition and of the price cutting which followed. The biggest firm to pull out was Texas Instruments. Over the next few years, many of the newer entries went bankrupt or left the industry.

If that is the broad outline of events, some of the detail can be ascertained by looking at the history of particular companies. There

were relatively few key players in this market, although these firms had diverse interests and orientations. I start with the three biggest American companies, Tandy, TI and Atari. As corporations with far more resources than many competitors, we would want to understand why these firms never dominated the industry. The fourth American based company, Commodore, was more successful. This firm is of particular interest for the thesis since it was this hardware company which most actively, albeit ambivalently, promoted games sales. The next sub-section deals with Sinclair and Acorn, examining how these two small British hobbyist-orientated firms adapted to games developments. Finally, by outlining two other case studies, I attempt to convey some picture of the later entrants which were attracted into the industry.

Tandy, Texas Instruments and Atari

In many respects this is a fairly divergent group to tackle together. The companies were very different in their general nature: a retailer, a semi-conductor and a video games specialist. Their views concerning how home computers might develop were by no means identical. On the other hand, these companies must all be seen as potentially powerful producers by virtue of being US based multinationals. Unlike some of the big American firms which tried to enter the market later - such as Mattel and Coleco - these three had tried to introduce micros as consumer electronics from the late 1970s. Therefore, Tandy, TI and Atari had had some time to consider their approach.

Thirdly, all three companies produced, or arranged for the production of, their own software (2). By withholding technical details concerning the way in which their micros' operated, Tandy, Atari and to some extent TI hindered third parties from writing software for their machines. One consequence of this policy was that by controlling the range of software which could be run on their home computers, the three companies were in a position to promote particular identities

for their own products. Of special interest in this chapter, and the fourth theme they share, is that none of these companies wanted to represent their micros as being 'games machines'.

As we saw in the chapter 4, Tandy's main efforts went into developing business machines. Although the retailer produced micros for the home, its staff had not shown any optimism about the machines' usefulness. Marketing was low-key. Tandy announced the products' existence along with its other wares. Unlike the companies whose sole product was the home computer, Tandy was in the unique position among micro producers of being principally a retailer. The home micro was just another item.

Certainly there was little incentive particularly to promote the home computer as a game-playing machine. This was partly because the general policy of Tandy, at that time, was to produce and sell everything for their machines, or at least commission supporting goods which could subsequently be retailed under Tandy's brand name. This applied to software. But, for a company preferring to sell high margin products which sold steadily, a form of software which was subject to fashion and which eventually sold on the basis of a chart system was not an appropriate product. The manager of the British subsidiary explained (3):

'We were not in the record business basically...because that is what you would call it. It was low margin, high volume, and our infrastructure is really built around a long lead time (...) it was too fast in and out of the system. Although we do operate that now, it still doesn't fit awfully well in the scheme of things.'

Tandy had been willing to produce and sell the early type of TV games machines which carried fixed programs. But, for the same reasons as above, the company had never carried the programmable games consoles once it was clear that video games software had become a fast-changing product line. Similarly, Tandy was initially willing to produce a range of steadily-selling software to support microcomputer

sales - a range which included games. But the retailing firm was reluctant to produce the ever-changing software expected as games adopted the features of a cultural industry.

Texas Instruments also had little initial incentive to emphasise games. Whereas some of the other semiconductor firms had entering the field of programmable video games, TI had chosen the computer as the vehicle to introduce the microprocessor into the home. As we saw, it was this company which had had some of the grandest visions of how the micro would be part of the home infrastructure, perhaps leading to further chip and electronics sales through intelligent peripherals (4). Those scenarios encouraged Texas to build in a range of facilities into what the company saw as a 'quality' product - far more than would have been necessary for a straightforward games machine. As a consequence, the cost of production of the core machine was very expensive (5).

The particular marketing platform which the semiconductor giant chose to stress was education, although games were considered amongst other options. When games-playing started to emerge as the predominant application in the early 1980s, TI was willing to adopt a pragmatic view. The company still emphasised the versatility of the machine in its advertising, and maintained a strong base in educational software. But Texas also stepped up its own production of games software, especially though partnerships with toy firms such as Milton Bradley. However, that still left the multinational with a smaller games range compared to the amount of software available for machines such as Sinclair's, for which third parties were writing.

In contrast to its other American competitors, Atari's very strength in games products made the company apprehensive about emphasising a games identity for its two computers. As a result, Atari seems to have had certain ambivalences about the role of its home computer (6). Certain features of the design of the Atari 800 micro anticipated that the machine would have a wide-ranging role in the home. We saw how some company staff had optimistic visions for the

machine, and the firm later conducted a considerable amount of research and development, which would have allowed it to diversify away from games.

In a similar way to its rivals, the particular marketing pitch used was that the micro should be an educational machine. On the other hand, both market analysts outside the firm, and many within it, thought that the best path of development might lay in some steady progression from games to home computers (7). To cater for that continuity, the design of its machines also contained enhanced game-playing features compared to the Atari consoles (8), while the bulk of early software remained games (9).

After being launched in the US, in 1979, the company soon faced an additional consideration regarding the market positioning of its new micro product range. Atari's own dedicated games machine was becoming extremely profitable in the early 80's, as was noted in last chapter. Atari's British manager explained the consequences of this for the firm's home computer (10):

'(...) In terms of advertising, the (home computer) product was obviously positioned away from the games machine because there was a feeling that it was going to harm the VCS sales (...) The major push, in terms of emphasis...was towards the game machine...because, of course, that was the one that was making the money (...)'

By 1982, the majority of the company's effort was invested in promoting the games console (11). At the same time, advertising in the US and UK stressed the wider applications of the micro besides games-playing (12). The need to keep a separate identity between the micro and the console also provided a motive to maintain a price differential.

All three companies produced dearer computers than Sinclair. In addition to the specific factors outlined above, this partly came from the fact that all these American machines were geared to sales in an

US market. For example, a good deal of the software produced by these companies was on ROM cartridge technology - the same as was used in video games. There were a variety of factors behind that decision. Third parties were either hindered by patents on the technology or by the cost of producing software in this form. Software could not be pirated by the user. And cartridges were considered to be a more robust medium, seen as less destructible by children. These same cartridges were also a medium which was far dearer than the cassette technology which soon predominated in Britain (13). Thus, both the more sophisticated hardware and the cartridge software produced by these these US firms were less competitively priced once Sinclair products, in particular, came to determine the price point of 'mainstream' home computing in Britain.

Meanwhile, the growing significance of games meant that the amount of games software available became an important criterion for selling hardware. Tandy and TI adapted to this new situation to some extent. Even so, the lack of third party games support made their micros less attractive as games machines. Tandy maintained a low profile, and by 1983 TI pulled out of home computers altogether, after suffering heavy losses both in Britain and in the US. Atari was in a slightly better position, by virtue of its internal games software resources. The games firm remained in the market, but its micros were nowhere near as popular as those of Sinclair, Commodore and Acorn.

Commodore

This ex-calculator firm had switched its main focus to computers in the late 1970s. Its first machine, the PET, had proved successful, going mainly to educational and business markets. As noted previously, the company put most effort into its overseas, and especially European, markets. As a consequence, the PET was perhaps the most well known micro in Britain prior to the success of Sinclair's cheaper machines.

When it moved into computers, Commodore bought a semiconductor firm, called MOS Technology, which produced not only computer microprocessors but some of the chips used in video games hardware. This subsidiary had some years earlier made a particular chip, the Vic chip, through which it was possible for software to control the graphics of a TV. MOS had been looking for customers since 1978 - especially in the video games market (14). In 1980, Commodore, decided to produce a much cheaper, less sophisticated machine than its American competitors. Using the Vic chip meant the ex-calculator firm could cut the price by dispensing with a monitor and using a TV - just as Sinclair was to do. This machine was the 'Vic 20'.

With the boom in video games during the early 1980s, the option to take a slice of that market looked just too attractive a proposition to miss. Unlike Atari, Commodore's ties with the video game industry were sufficiently separate for it to have no machine which would suffer were its home computer to compete with the existing video games consoles. On the other hand, Commodore had the expertise and technology to make the quality of its games-playing a selling point. This was also true for its later machine, the Commodore 64, where once again the parent company utilised the 'state-of-the-art' chips which MOS had initially developed for the video games industry (15).

It became an acknowledged part of general policy to compete directly with the video games industry (16). Commodore staff, and outside commentators noted that a computer at the Vic's price would blur the boundaries between the two types of products, since the micro was only as expensive as the more sophisticated consoles (17). Commodore's US ads ran: 'Why buy a video games machine when you can buy a computer?'

Commodore's UK marketing strategy was more subtle. The British subsidiary had organised some initial market research. In an interview, the marketing manager explained how he had interpreted and acted on these research findings in the light of his marketing perspective (18):

'I then wrote down a list of the answers I would get, alright, 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...very much fourth. And 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. Alright, that is what everyone will say, that is what adults would say..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". And 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 you could only play games (with the video games machine) (...) 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've got "You can do this...and you can do this...(etc) and by the way" at the end "we've got chess and those kind of things" and at the end it's "Space Invaders"...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...and 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"... Right. So we were deliberately trying to say, "Look...this is <u>not</u> for playing games"...'

The decision to produce a cheaper machine, together with the particular relation which Commodore had to the video game industry had facilitated the strategy of promoting the micro as games machine. This was a covert theme of advertising copy. It was a move supported by Commodore's software arm, in the days before before third parties had any chance to write for the machine. Yet while the company initially accepted that games played a major role in selling micros, the more overt advertising copy strove to maintain the notion of the 'universal machine'. Commodore was soon to benefit from the success of games. Yet, even staff in this company were eventually to have reservations about this overall approach, as we shall see later.

<u>Sinclair and Acorn</u>

Two small British companies had made the transition from a hobbyist market to a wider audience, promoting micros as self-referential machines. Sinclair remained clear market leader, accounting for over half of all sales, in 1983 (19). Acorn was third in the British home micro market, although it enjoyed substantial sales of the BBC micro in the education and business sectors. Both companies, while not regarding games-playing as central to the role of the computer, were willing to adapt to the rise of games, and benefited from third party support.

Sinclair has argued that the Spectrum, the successor to the early machines, was more than a machine on which to learn to program (20). Yet, at other times he has maintained that this application remained central (21). Certainly some of the development staff who designed the micro were trying to improve the machine for that purpose, even if they were a little unclear about other uses which the micro might have (22). In general, the different accounts by various staff, and by Sinclair himself, about the purpose of the machine seem to reflect some of the uncertainties concerning both how to develop the artefact and the way production took place in the company. Sinclair himself took far less interest in the detail of the latest product than in previous ones. By now, he was turning his attention back to other projects, such as developing the miniature television set (23). Meanwhile, the engineers at Sinclair Research appear to have held more than one belief as regards how the project was intended to develop (24).

When the Spectrum finally appeared, the major changes included general enhancements of ZX81 features, such as providing colour, more memory, and sound. While the designers were aware of the fact that these would prove important for game software writers, such changes were not simply introduced for that purpose. The new facilities constituted more general or open-ended improvements One of the marketing staff, OC, explained the philosophy which then operated at Sinclair Research (25):

' (...) The product, to a great extent, will create its own marketplace...so that positioning from a marketing point of view was made as flexible as possible to allow it to define itself (...)'

However, within that 'flexibility', the staff at Sinclair definitely saw more scope for the micro as a software running device. The games which by now had started to predominate on the ZX81 showed that this was possible, although OC pointed out how staff had hoped for something broader than games:

'(...) The Spectrum, at its introduction, was supposed to be the somewhat more serious machine (...) The ZX81 had become the games machine...but the Spectrum will be for the educational market proper (...) and it will also possibly even have some small business applications (...)'

In practice, the new Sinclair product was quickly adopted by those software houses which produced games. At the same time, it soon became clear that games-playing was a main motivation for buying the machine. This led to some mixed feelings in the company. The games basis was proving to be too profitable to ignore. For a while the marketing staff even considered producing a cheaper machine still, the LC3, to benefit further from this games market (26).

This new market was also acknowledged in the fact that the programming reference books which were packaged with the machine changed their emphasis to showing how to create games effects. In fact, later compatible machines, such as Spectrum Plus and Sinclair 128, were planned to capitalise on this games software base. And TV advertisements planned just before Sinclair Research was taken over by Amstrad would more directly have pitched the Spectrum family of micros as being games machines (27).

However, that willingness to co-operate with the appropriation of the micro as a games machines always stood side by side with a wariness about such developments. As I will demonstrate later, while willing to make money out of games, Sinclair was not himself interested in this aspect. Furthermore, the company soon had ambitions to build a more up-market corporate image, part of which related to producing a more 'serious' machine. Similar considerations were also to temper the enthusiasm with which Acorn handled games.

Even though their earliest micro sold mainly on the basis of being a machine on which to learn to program, Acorn staff still felt that having a software arm might support hardware sales. Acornsoft, therefore, produced a range of items: educational, home accounting etc,.

This range was in keeping with the identity of the micro as open-ended and capable of multiple roles. On the other hand, the software division was also given a brief to produce whatever would sell, in order not to be too great a liability to the company (28). Staff at Acornsoft made the decision that games would provide their main source of revenue (29). After all, games would certainly be popular with their mainly hobbyist audience, as we saw in the last chapter. This form of software might also be attractive to a wider market. Acornsoft commissioned games from the local university student programmers and as a result were able to offer some of the classic mini-computer and mainframe titles for its machine.

The policy of maintaining the micro's identity as a versatile, universal machine was continued with Acorn's more sophisticated micro: which later became the BBC machine. This approach also fitted in with the aspirations of the BBC literacy campaign (30). Internal documents indicate that the BBC sought as wide and varied applications for the machine as possible. Hence the Corporation sponsored 'taster' software, described as: 'some useful, some frivolous, some only instructive' (31). This range included such items as a home insulation guide, a pools check, and car fault diagnosis package. In the midst of of these, we find game genres such as Star Trek and the Game of Life, which were derived from the larger machines. Other additions included Mastermind, chess and card games. Lastly, there were the arcade titles, such as Space Invaders (32).

On the whole, Acorn was willing to take opportunity from the popularity of games (33) and even took pride in the successful games software which it developed (34). Yet, games-playing was never seen as the main role for its micros, and Acorn's advertising endeavoured to maintain the image of the BBC machine as versatile. In this the company succeeded, insofar as it had an audience in sectors other than the home market. Reflecting this fact, Acornsoft's main sales for the BBC were for business and the educational software before games (35).

Thus, Sinclair and Acorn mainly adapted to the interest in games. While there might occasionally be some regrets that machines were not always used for other purposes as well, they acknowledged that games were an important basis for hardware sales.

Later Companies

We can get some idea of the diversity of the later entrants to the industry by examining just a few of the companies which established subsidiaries or financed new start up companies. The firm 'Oric was launched with funds from a Singapore manufacturing group together with British Car Auctions, and was later taken over by a property owning conglomeration (36). 'Dragon Data' started up as a subsidiary of Mettoy, the toy making firm. This microcomputer firm was later sold to a consortium, which included a wing of the insurance firm, Prudential (37). The 'Video Genie' computer came from a little known Hong Kong firm, and was distributed by the importer, Lowe Electronics. Two of Sinclair's staff broke way to form their own company, 'Jupiter Cantab' (38). Even software houses experimented in the hardware field, with 'Computer Games Limited' producing the 'M5' computer.

Since this whole group of maybe 20 companies, plus the big American ones, accounted for only 25% of the market between them, it seems inappropriate to examine every producer. But, to give some impression of the variety of ways these hardware firms approached the market, I will briefly outline the experiences of two firms: Camputers and Elan (39).

Camputers originated from a small firm of industrial designers - G.W.Design. The parent company had previously been commissioned to produce a microcomputer for industrial purposes (40). By 1982, the home computer market looked promising, and so G.W.Design decided to try out a micro as a sideline, hoping that this would ease some of the financial pressures which it was facing at that time. While Camputers

planned that its 'Lynx' should be a home computer, the firm initially hoped to make some additional sales to business. This consideration shaped decisions concerning the appearance of the hardware.

The machine which finally appeared was grey in colour, had been given a good quality keyboard and expensive trimmings such as gold edge connectors, and was generally designed with a smartness to make it suitable for a desk top. When it became increasingly clear that the machine would not meet the specifications which by then had evolved for a business market, their marketing strategy still tried to build on the industrial design features. The Lynx was targeted at 'the businessman in the home who is apprehensive about the introduction of micros into the workplace ' - who could learn about micros through this machine (41). Camputers also became one of the earliest producers for the home market to offer the CP/M operating system, on which existing business software could run (42).

In those early years when Sinclair and others promoted the self-referential machine, many hardware companies did not see applications software as being important. As hardware specialists, Camputers management initially shared the same views: the machine was to learn to program or else users would write their own programs. The enthusiast who had been hired to write the 'Basic' language for the Lynx also saw the key role of the micro as being to learn to program. One selling point for the machine became the features he supplied for that purpose. In addition, he also added facilities appreciated by a more advanced hobbyist community, and promoted the machine by attending computer clubs. To cater for games, he supplied features such as programming routines to help those writing such software for the micro.

Initially, the company had some success. The Lynx soon became the firm's only concern, and it expanded to take on marketing staff. Shortly after its launch, the first Lynx games appeared, supplied both by individuals who approached the firm with their programs and from software houses which converted their existing products to the new

format. As Camputers realised the significance of software support, the firm advertised for more material, to be published under its own label, Camsoft. The majority of software remained games. But by 1983, the market was becoming increasingly competitive as more and more hardware firms entered the market and consequently Lynx sales declined. In 1984, the company finally closed down.

An example of a micro which originated from a software orientated company is provided by the case of 'Elan', later renamed 'Enterprise', Computers. Intelligent Software was a firm which had been producing chess and game software for other machines. They approached a consumer electronics importer, Domicrest, with the idea for a new micro. As a result, the separate company, 'Elan', was set up in 1982 (43). The plan was to have a micro with generally enhanced features such as memory, graphics and sound. The machine would also incorporate a word-processor as part of the package and have a fairly good quality keyboard. In addition the micro was seen as constituting the core of a possible modular system. To this end, facilities were supplied in the form of connections, 'buses' and interfaces, which would allow other units to be added to the machine. In other words, this was another manifestation of the idea of a home entertainment or infrastructural system, as embodied in micros such as the BBC and TI machines. Since the system design was patented, like TI's, Elan hoped to benefit by being the future sole supplier of peripherals.

Being games designers, the originators of the proposal always saw games as one market. In part, the graphics and sound facilities were to cater for this application, even though the micro was intended for wider uses. However, as delays in developing the machine occurred, the growth in the games market led Elan staff to alter some of their plans. As staff from the industrial designer agency explained (44):

'One of the disappointing things that happened to us was that our original design model was in shades of grey, and it was a very business-like looking thing. And they...the (Elan) management didn't like that. They asked us to make the colours more "toy-like"...'cos

what research they had (...) showed that the main market at that time for home computers was for 11 to 14 year olds. (So) they went to some graphic designers...who came up with the black and primary colour scheme (...)

Apart from that change in design and marketing targets, the original specifications were eventually developed as planned. But by this time, general micro prices had changed, the facilities offered by rival machines had developed, and software support had become an important selling point. While pre-launch reviews of the original concept had been favourable, the machine - now itself called the 'Elan' - looked a far less attractive proposition by the time it appeared at the end of 1983. The firm, renamed Enterprise, continued for a while, even releasing a larger machine, and trying to enlist the support of games software houses (45). By 1985, Enterprise had gone into receivership.

These two firms exemplify the range of approaches adopted by new entrants. One sold just the micro, the other hoped to promote a system. Camputers still emphasised the role of learning to program, Elan provided immediate facilities such as word-processing. The former company tried to find some overlap with the business world, the latter focussed mainly on everyday uses in the home. The experience they shared with the other newer producers was that success or failure was increasingly related to the importance of third party software - especially that produced for the evolving games market.

SOFTWARE

We can briefly characterise two stages in the development of software, following the initial appearance of home machines. Apart from the supporting software which was released by hardware companies, the bulk of early software came from some early users of the home machines as they experimented with programming. This was the basis of the small cottage industry which emerged between 1980 and mid-

1982. From this time on, a number of entrepreneurs with previous marketing experience entered the increasingly lucrative software market. In addition, a range of existing companies from other cultural industries moved into games in what they saw as a 'natural evolution' from their existing interests. The result was an industry broadly organised on the same model as their other 'software' interests such as records and videos.

There are a number of questions we might ask of this history. First, how and why were games software and other types of software initially produced? Under changing conditions of production, how did games change as texts and as commodities? A second concern is the issue of how changes in the industry led to games software rising to predominance over other types. The final question concerns the conditions which allowed games to be seen as an 'evolution' from companies other interests.

Early Industry Structure

It is difficult to establish quantitative measures of the growth of companies and software products in the early 1980s. However, we can construct some picture of those early days by examining company histories and accounts of those people involved in software at this time. As one of the first retailers, FC was well placed to provide an overview of that period (46):

'Some software was written for the ZX80, but not much. (With the) ZX81 people started to be able to make a living in - not even a 'living' - pocket money...by writing a little bit of software and selling it mail order ..and by doing memory add-ons, and selling them mail order...(...) The software houses evolved from ..people who were hobbyists, or enthusiasts or whatever..writing software and putting little adverts in... (Many) were running businesses out of their back-rooms.'

This understanding of the industry's origins is that which is constantly represented in the trade press (47) and certainly my own interviews provided examples of the background which FC described. For example, one of the founders of Oasis, one of the earlier software firms, recalled how he started to write software for micros while working as a programmer (48):

'Originally there were three partners. Then it was just part-time (...) in a spare room. And then we moved to my garage (..) The idea to start a company came from a fella called Pete, who has since left (..) He was trained to be a barrister, his degree was in law and so on. He's now with IBM (...) Anyway, he suggested one day...I'd bought a Video Genie I think, and he said, "Why don't we try to make some money out of it?"...and he went and bought a PET. And the other fella at the time was a salesman...a car salesman. So he was going to do all our selling (...) In those days there wasn't much of a market..at the same time there wasn't much competition. But more importantly, there was very little in the way of overheads for advertising and marketing, because no-one else was producing expensive packaging and expensive advertising. It was pretty cheap at that stage to get into the industry. You could get in for 500 quid.'

In similar circumstances, another of my interviewees outlined how he and his family started producing software under the name of Level 9 in 1981 (49):

'It started as a hobbyist business. At the time I was working for a consultancy which did work in the City of London doing banking [software] packages (...) My brother Nick and Michael were...and still are...very interested in building electrical equipment. So Nick built a Nascom (kit)...one of the earlier machines...and I thought "Why not put a copy of the original Adventure program on it?" (...) And Mike then did a Utility package, which added commands to the existing Nascom Basic (...) They both sold about 300 copies...at about £10 each...so we're talking about, what £6000 coming in...which was about £4000 profit (minus some other expenses)(...) This was part-time. We hadn't

actually decided to go full-time..it was still a hobby thing (...) The business had been going for 3 years before I went full-time..."

Magazine articles discussing company origins provide similar examples of the origin of this cottage industry. These included cases, as above, of programmers who wrote in their spare time (50), of male science and computer science students who wrote in the vacations on the first Sinclair and Commodore machines (51), and even of schoolboys, who started up with the help of friends and family (52).

However, this was not the only source of early software houses catering for the home micro market. One of the companies where I interviewed staff - Bubble Bus Software (53) - had started out in the late 1970s as a firm which assembled small business packages for micros, just as Imsai had once done in the US. Bubble Bus produced programs such as accounting packages for newsagents. As Commodore and others undercut Bubble Bus in this market, the latter decided that it could make money by producing games for home machines. This move, from writing business software to writing games once the market appeared to have great potential, was repeated by a number of other firms (54).

Early demand for software from readers of the computer press and from visitors to the early computer shows supported the initial development of this industry. Meanwhile, the low cost of entry into software writing at this time facilitated this pattern of small companies and amateurs. British computer software utilised cheap and available cassette technology, whereas video game cartridges had been more expensive. Consequently a much smaller number of larger firms had constituted the video games industry. The firms which I interviewed, and the others cited, could also afford to lay out the relatively small amount for a classified ad. With mail order sales, software could simply be run off on blank tapes as and when it was ordered.

A history of the American computer games industry shows a somewhat similar amateur origin using a mail order approach (55). However,

there are important differences which are significant because they hindered US exports to the British market. First, much of the early software was geared to expensive machines such as the Apple and Atari micros which did not have a big user base in the UK. In addition, being geared to disc-drives and bigger and faster computer memories, the games were often more complex than contemporary British ones, making use of higher resolution graphics. Thus, these games could not easily be transferred to smaller British machines utilising cassette technology. In any case, such a transfer was not such an attractive proposition considering that, at $20 each, American wares were orientated towards a different price structure (56). Therefore, an indigenous British industry could develop in the early '80s free from the competition of their bigger American counterparts.

Software Produced: The Emergence of Games

A number of commentators, including that early retailer FC, have pointed out that in this early period a diverse range of software was available (57). Oasis certainly tried out a variety of different software:

'First of all we put up a "Wanted" advert, to try to get some software...and we started off with "K-Board", which was a sort of utility that added extra commands to the Tandy. And we also had a few games...um..."Space Invaders", that sort of thing. None of those did particularly well. And then we did a "Forth" [computer language] for the Dragon, and that did quite well. Then we did a "Chess" for the Dragon, and that did very well (...) Then there was a "Basic compiler"...a "Pascal" [a computer language]...and a few other of these chess-type games...you know...three-dimensional noughts and crosses...that sort of strategy...logic game. And (those) were our mainstays (...) We sold maybe 1000. 2000 was a real big seller (in those days)'

The availability of 'Utility' software such as computer languages and the extra programming facilities was in keeping with the early identity of the micro as self-referential machines. Clubs and magazines showed considerable interest in these programming languages for their own sake, exploring how they worked. The addition of further facilities, such as extra programming commands, allowed the computer to be a more useful tool. The general impression conveyed by various sources was that the proportion of utilities was greater in the early years than it is today (58). If we take the case of Level 9, although the company was to go on to specialize in games, initially it also produced utilities, and had even considered producing hardware peripherals.

Apart from utilities, the range of software was widened by the early system of freelance work. Software house either advertised, requesting programs, as Oasis did, or companies simply attracted unsolicited material (59). While trying to explain the considerable number of home finance packages that software houses released in that period, HK, of Oasis, pointed out the diversity which such sources produced:

'What used to happen was...there were so many freelancers...they would write a program and send it in...it doesn't happen so much now (...) "Will you please market it for me". So a lot of companies thought "Oh, well...we'll give it a try".'

Therefore, early games were only one among many different types of software which were available. HK noted that there was no general anticipation that this application would come to predominate - in fact, Oasis staff had thought that entertainment generally would remain a minority use of the micro. Although some small software producers specialized in games, as part-time enterprises their products only appeared as and when they could find the time to write them. In terms of the types of games written, programmers attempted to imitate a range of existing games, such as card games, noughts and crosses, board games, 'Mastermind', etc. (60). The Adventure genre also crossed

over from larger machines onto the micros. Nevertheless, despite some diversity, most of the games available were copies of the arcade favourites (61). Oasis Software's HK described the early game market:

'Before it all really took off...what most games were were copies of PacMan, Space Invaders (...) It was difficult to sell something that you'd originated (so) there would be 10 or 12 different versions of Space Invaders being advertised simultaneously for the same machine (...) There wasn't very much original software around...'

The acceptability of games-playing and games-designing amongst hobbyists meant that for the new cohort of male amateur programmers who were experimenting with their cheap home micros, writing games was a perfectly legitimate and 'obvious' thing to try out. Meanwhile, the contemporary success of arcade machines provided a familiar model to imitate.

By 1982, the field of computer software was achieving greater visibility - and this was especially true of games. In mid-1982, the first colour adverts appeared in computer magazines, and shortly afterwards some ads were placed in the national press. A few newspapers started to carry articles about micros, and some later inaugurated regular columns. In particular, many of those in the industry remember one piece of reporting concerning the company 'Imagine'. Feature articles described how two friends in Liverpool, aged 24, had launched a company from their front room and achieved a gross profit of £800,000 in the first year. Finally, in 1983, Market Reports on the industry appeared. These pointed to the current and anticipated growth of software, and especially of games (62). Oasis' HK outlined his perceptions at that time:

'It looked fantastic. I mean round about the time that Imagine was booming...that was the...everybody thought "We're all going to make a fortune". There were these big shows in London (...) the money was just flowing over the counter ...companies were really, you know, doing extremely well (...) But then, of course, there was suddenly an

explosion in the number of software houses, so that you suddenly got...you got hundreds. I mean, my brother-in-law said that every time you went to the pub there were three guys talking about starting up a software house (...)'

In fact, although not primarily a games producer itself, Oasis's continued existence and the switch to full-time employment for its staff was enabled by a product which was geared to this new interest in writing game software:

'We did a thing called "White Lightning" (in 1983) and that changed everything. That was the first really successful product (...) At that particular time, games were really very, very big...the papers were full of stories of people making huge sums of money by selling games to companies like Ocean...and everybody basically wanted to be an author. The trouble was, though, that by now the market had come to a stage where the games were getting fairly good...and they were mainly machine code...so...you know, the average bloke couldn't hope to produce a commercial game (...)'

Oasis' product facilitated the writing of games, although originally this was intended to be the firms own development tool, not a commercial product:

'The main reason that we did White Lightning was because we were hoping to a pursue a contract with a company to churn games out. So we were going to use it ourselves, in fact (...) We decided that the public would like to use this...because it made it possible for someone without any real high technical experience of the machine to produce relatively good games.'

But now, the whole approach to the marketing of software had begun to change. In 1980, 39% of sales were mail order, and in 1981 this was still 34% (63), the major retail outlet being specialist computer shops. By 1982 only 13% of sales remained mail order, as brown goods stores and chain stores, such as Boots, started to carry software.

W.H.Smiths was the biggest single avenue of sales that year, accounting for 19% of sales.

The new retail structure soon allowed the emergence of distributors. These intermediary firms were to adopt an increasingly important role in later years, as more and more retailers allowed such specialists to filter out the software which was less 'marketable'. This retail structure also meant that instead of running off software in response to sales requests, production had to be carried out in advance, retailers and distributors had to be won over, and the product had to be advertised to a greater extent.

Such marketing practices, especially through the cost structure which they entailed, provided difficulties for many of the small software houses. On the other hand, this was just the set of practices which was familiar to those companies which were involved in existing cultural industries, such as records and publishing. The next stage of the industry's development occurred when these larger companies moved into the field, and over the next few years squeezed out many of the older producers and the small new entrants. In 1983, there were 500 British software houses. By 1985, this had declined to 350 (64). This process continued in subsequent years.

Later Industry Structure and the Consolidation of Games

The company Domark provided an example of how marketeers who were working in other fields saw the prospects for games software in 1983. XE, one of the founders, explained (65):

'We were working as account managers in an advertising agency (...) and we came across a (market research) report on the micro market...which leant quite heavily on the software aspects. And we thought, really, there wasn't that much good marketing knocking around the software (...) and all the indications were that it was a huge growth industry,

being handled by very, very small people, who had never been in business before (...) They were just printing money, really...'

Two of the companies whose staff I interviewed had also been later entrants, both were cases of publishing houses diversifying into software. The software house Beyond originated from EMAP, one of the main computer magazine publishers. EMAP's regular monitoring of the market led staff to believe that the company could make money in games software. The Mirror Group produced mainly newspapers. The Group had already diversified into video, and now tried a combination of games and educational material for home computers and business software via its subsidiary Mirrorsoft (66).

Many of those already in the industry, or currently entering it, saw games as competing with other 'cultural' products. FC was also the manager of one of the first companies to advertise software in the newspapers rather than just the specialist press. He explained that policy (67):

'We decided that (sales) was going to come from the disposable income of a category of people which was basically sort of 8-year old top 18-year olds...and so we looked at what we were competing with. And we were looking at pop records, pop videos and holidays...things like this. And then we looked at the industries that they were competing with ..how they marketed (...) by using strong identities, personal identities like film stars, pop stars and so on...and they used PR in the mass media. So we followed that route (...) We got (one of our programmers) on television and in every paper in the country...you know, we created a star in the industry...'

In particular, a number of commentators felt that at this time, games were taking sales from the record industry. This was noted in market research on the software market. Both Virgin and K-Tel also gave this as their reason for moving into games (68). In the trade press, the Virgin software manager noted that (69):

'...the people buying computer games are the same people who, until very recently, would have been buying records (...) a lot of the disposable income that used to be spent on records is now being spent on other things. If you go into any computer shop and see who is buying software, it's boys, who, incidentally, are the people you would have expected to find in record shops buying records two or three years ago.'

In fact, Virgin had already diversified into books and video cassettes to match the changing patterns of teenage spending. Likewise, a number of companies which were to move into the games software market, were already operating in several areas of what was becoming to be known as the 'home leisure business'. The new software manager of the firm Mogul, which had video and record divisions, reported how the company had been monitoring games for a while, and had commissioned a report, before deciding that this new area was an appropriate extension of its interest. A number of the companies entering the field, especially the distributors, saw games software as 'a natural progression' (70).

As we have seen in relation to FC's policies, games were not only perceived as competing with other 'cultural products' such as records - games could be marketed in the same way as these other commodities. Some of those who had been involved in computers since the early years, adapted to this new form of marketing. The years 1982 and 1983 also saw the establishment of more start up companies who adopted the new marketing practices. This included the two biggest distributors, Microdealer and Centresoft (71), the former being responsible for the first 'chart system', akin to the record charts. The firms from video, record and publishing backgrounds soon carried over their practices into the new field.

The newly established trade press and trade associations of 1983 talked of the industry becoming 'professional'. This implied that the games commodity was being transformed into a different kind of product, with new conditions of production. Under these new

arrangements, many software companies became simply marketing machines. As software publishing houses, these firms often determined game content - for example, through licensing deals - and then sub-contracted the work of writing the program to other companies (72). Marketing costs, especially of advertising, rose substantially and became a major proportion of the retail price. Finally ,the average period of sales of games software declined to 6-9 months, as the software houses geared up to a system of regular releases each having short chart lives (73).

Under these new marketing conditions, most of the previous small companies disappeared. By 1984 only 17% of companies dated from 1981; two-thirds were under 2 years old (74). Some of the previous firms now became sub-contracted to software houses, some were taken over, while others, such as Oasis, merged. Oasis's founder explained:

'Basically we couldn't produce the next range of products from the money that we'd made from the last lot (...) By now, it was costing you a fortune to launch a new product (...) We decided to go in with "Ocean" 'cos we thought that everyone else was going to do this soon anyway. They'd had other businesses...so I think they knew what it was all about. Coming into this industry, for them, was just changing the product that they sold...and they do it extremely well...whereas for us, we were complete...you know...we were very naive...(about marketing)'

The resources now being devoted to games production also had a bearing on the availability of other types of software. For example, Mirrorsoft pointed out that the chain stores did not like to handle educational software because it did not move as fast as the chart structured games. Similarly, Domark had found distributors unwilling to handle its educational software for much the same reason (75).

As we shall see in a later chapter, both software houses and retailers continued to experiment with non-game products, partly influenced by the fact that the games software market was becoming very competitive. In 1984, while 70% of software houses promoted at least

one games package, only about 30% had only games. Thus, many companies still offered other types of software (76). Nevertheless, these figures indicate how games were becoming the predominant form of software available, with far more games produced and then promoted more strongly than other types of software.

If we now look at the consequences for the games as products, we see that the plots and scenario became more diverse, and less dependent on the arcades. As had happened with programmable video games, licensing meant integration with other cultural industries, via tie-ins with films, TV series etc. Some products became allied to personalities (e.g. 'Steve Davies Snooker'). In addition, there emerged some off-beat themes unique to the British market, such as games about flower-spraying, dustbin emptying and lawn-mowing.

While these novelties enjoyed some success, there was always a new pressure, parallel to that noted in other cultural industries, to stay in the 'mainstream, producing those games appeared to promise the widest appeal. Beyond's CD talked about the role of the software house in finding a marketable product, rather than producing the games which programmers wanted to produce. Here we see transition from the hobbyist rationale for and mode of production. For example, one enthusiast had been producing somewhat off-beat games for a number of years. Even though these products were appreciated by possibly like-minded reviewers, CD remained critical of such wares on the grounds that they were not 'commercial':

'You know, the game has to have other things to make it commercial. There's a character called Jeff Minter, Llamasoft, who produces games ...which will, which are technically very good, exciting games but the subject-matter...[mutant camels]...only appeals to a microscopic proportion of the marketplace. He's always complaining that people don't stock his product (...) There's no point in producing little games about obscure creatures...'

By now, there was also some variation in the nature of the game action, as more adventure, strategy - for example, war-gaming - and simulations became available. Nonetheless, the mainstream game form was still derived principally from the arcade. CD of Beyond commented:

'(...) 'mainstream' (means being) used to a joystick control, single games that go on for a very short time with a high score table...a lot of frenetic activity...very addictive...you may play it for several weeks, get thoroughly bored and then go and buy the next one. That is the mainstream.'

The games industry had been restructured so that games releases were now entertainment commodities which could be 'followed' in the same way as contemporary music. It appeared important to know the 'latest' up-and-coming hits and their reviews. Admittedly, some software firms still resisted this trend, being critical of this fashion oriented trade and sticking to more traditional genres of games (77).

However, most of the bigger companies appeared to be willing to support the the evolution of games into a cultural industry. Some firms experimented with practices such as a form of amateur star system, whereby the 'authors' of games were promoted. However, the main trend consisted of organising attention around the new releases of companies rather than programmers. Games writing became routinised and continuous, instead of haphazard and occasional. Meanwhile, very active marketing of the latest product guaranteed sufficient chart hits for profitability.

MAGAZINES

The first question this section addresses concerns the rapid and substantial development of the computer press. In fact, home computer magazines have been the biggest growth area in periodical publishing this decade. By mid-1983 the number of home computing titles had

overtaken women's interest magazines (78). Yet, the actual market for home computers was smaller than that for photography, or even for video (79).

It is important to pay attention to this proliferation of magazines because these journals were themselves a part of this home computer phenomenon. The sudden appearance of so many computer magazines added to the general impression of a 'boom' and contributed to the visibility of the field, attracting people into the market. My specific interest here is to outline some of the production considerations which structured that massive growth.

The second aspect which I explore is the significance of the magazines' role in relation to these new marketing mechanisms which were emerging in the software industry. In what ways did this press contribute to the changing nature of game products? Not only did magazines provide an important function by supporting that software. The magazines were virtually the only media through which the consumer role of 'games buff' could be constructed. Unlike some other cultural industries, this makes the games fan into a role which was only accessible through the single channel of 'male' magazines.

As my third focus, I examine the nature of the transition from hobbyist magazines to a press which was geared to the micro as an entertainment commodity. In certain senses, some of the tradition of exploring the machine continued to exist even within these new magazines. In the chapter on the early history of the computer, we saw how a specialist press organised enthusiasm and constructed a 'community of interest'. My final concern here is to illustrate how the new magazines re-structured interest around the micro as consumer electronic.

Proliferation of Magazines

Two of the earliest magazines, *'Personal Computer World'* and *'Practical Computing'*, had initially covered business, education and home/hobby uses. IS(1), the founder of the latter magazine described how, by the late 1970s, he felt that the market had grown enough to justify dividing, and later sub-dividing, these three fields (80). In 1979, he created a separate magazine for teachers - *'Educational Computing'*. This was shortly followed by a whole series of titles related to micros in business. IS(1) then focussed on the home market, launching a games magazine, *'Computer and Video Games'* in 1981, and introducing the genre of 'User Specific' magazines (geared to a single company's products) with *'Sinclair User'* in 1982.

In fact, IS(1) was responsible for a large proportion of the early, and longest running, titles in this field. He proceeded by establishing magazines and then selling them to bigger firms to fund his next venture (81). This type of entrepreneurial activity, seeking a range of media market niches in an emerging field of interest, has been noted in relation to other specialist press, such as American car magazines (82).

The consequence of this policy, which was adhered to by other founders as well, was a computer press market segmented at a number of levels. One main differentiation was via the user magazines which were geared around particular companies or even particular machines (e.g. *'Your Spectrum'*). A second dimension was related to a mixture of use and type of involvement. Thus, there were magazines dedicated solely to games, there were the reference/buyers' guides of the *'Which'* genre, and there were both beginners magazines and titles for experienced hobbyists. These two forms of differentiation later combined in the form of, for instance, user specific titles devoted to games, such as *'Zzap'*.

Given that a range of companies were competing in all these different categories, we can see the editorial, or 'market segmentation', basis for a proliferation of titles. By mid-1983 estimates of the number of home computer magazines varied between 40 and 90 titles, with new launches at a rate of one per month (83) In 1984, some estimates of the number of magazines went up to 120 (84), with 15 publishing houses producing in this field (85).

In terms of 'demand', another basis for the expansion of this media market was indeed the interest being manifested after Sinclair's initial machines. Not only were micros complicated products, where magazines had the chance to develop some sort of supporting role. The specialist press had even more scope for material to the extent that there still remained some of the emphasis of the self-referential machine - on exploring machines and their applications. The very nature of the hardware market, with numerous incompatible machines, also facilitated that differentiation - even more so than in the case of video cassette recorders (86).

In addition, some of the magazines fulfilled a role beyond editorial content. In effect, they supplied a cheap form of software in the form of 'listings'. These were the programs, mainly for games, which readers could type into their machine. The nearest analogy would be to sheet music, except there was no equivalent need for a set of skills to play an instrument. Hence, magazines could be attractive as vehicles for directly supplying an application for the micro. Initially two-thirds of *Computer and Video Games* consisted of such listings (87). That proportion later decreased, as the emphasis switched to games reviews and to other games-related features.

The other condition for the expansion of computer magazines was the advertising base. The hardware companies who rushed into the industry in 1982 and 1983 generated considerable advertising revenue. This was soon supplemented, and even surpassed, by the income from games software advertisements, as that sector adopted new marketing practices. Even the user specific magazines, which carried editorial

on all aspects of micros, clearly derived a significant proportion of their income from the numerous full page colour ads for games.

All this proved to be very attractive for the bigger, established publishing houses, such as IPC, VNU and EMAP. These companies began to move into the field in force by mid-1982, buying up many of the existing titles, as well as releasing their own new ones. This type of 'narrow publishing', delivering ever smaller and segmented markets to advertisers, fitted in with that more general trend within magazine publishing (88).

Moreover, as one report on the magazine industry noted, the specialist press was generally the market in which there was the greatest activity at this time when other areas, such as women's titles, were in some decline (89). The report advised: 'In order to stay ahead the specialist publisher must be quick on his feet and be prepared to capitalise on consumer interest which might be fairly short-lived'. The established publishing houses obviously saw the computer press as being an appropriate and potentially lucrative field in which to devote resources, at a time when demand in other parts of the magazine industry was less dynamic.

Magazines as Part of the Marketing Structure for Games

At a number of levels, the computer press came to play an important role in the new marketing practices around this software. Apart from their function as vehicles for advertisements, the reviews, the promotions, and the features provided hard- and software companies with both visibility and good PR. In particular, reviews were considered to be vital not just for end users, but as preliminary guides to the distributors who filtered out games. The magazines acted as a form of 'quality control', contributing to the construction of what counted as being a 'good' game, although my interviewees and other commentators noted the pressure to give positive reviews to

powerful companies (90). Some of the smaller software companies only managed to survive by knowing how to get the various forms of editorial coverage, once advertising became very expensive (91).

What makes magazines important for understanding the promotion of interest in games software is not only the fact that they allowed games to be 'followed' like record releases. The point is that the magazines were the only means by which this could be achieved. For example, although firms such as the one managed by FC attempted some mass marketing in the national press, the vast majority of games' advertising was still channelled through the specialist press (92). Similarly, despite some occasional coverage of the latest games in the national press, the only place to go to for systematic information was in the computer magazine reviews.

If we make a comparison to film, video and records, all of these other products enjoy some coverage outside of a specialist press: in *'What's On'* journals, the national press and even through TV or Radio. In addition to reviews and charts, some of these other cultural products are also displayed to a wide audience via the showing of films or film clips, or the playing of records on radio. Apart from in the arcades and in computer shops, games have generally less visibility. Word-of-mouth, seeing someone else's game, and the magazines were the main ways by which the games could become known.

As I shall demonstrate further in the next chapter, this dependence on the magazines had implications for difference in the nature of interest in games between males and females. Virtually across the computer press, 90% of readers were male (93). It would appear that it is mostly males who can actually be in the position to become games 'buffs'. Second, the producers of those magazines knew their audience. However they might consciously have followed a policy of being non-sexist, these texts appeared to inevitably reflect the industry to which they refer: carrying the software ads many of which clearly aimed at boys, citing the male programmers and industry 'characters' etc. Indeed, at the time of interviewing, editorial staff

at *Computer and Video Games* were wondering if they could broaden out from games to become a more general "boys' magazine" (94). Hence, the only way to follow games directly was to read texts broadly identified as male - for example, by the retailers who position this press in their displays - and whose content was geared to other interests which were associated with males.

To summarise, the magazines are significant vehicles for the new type of marketing of games. To illustrate this importance, by drawing a contrast, Mirrorsoft felt that the only way to promote home education was if a magazine equivalent to the games ones but aimed at parents could carry advertisements for and reviews of that software (95). However, the fact the magazines were virtually the only 'public' place to follow games developments, gave a certain closed character to games as a cultural product, making a systematic interest in new releases only possible through a media seen mainly as masculine.

Magazines and the construction of interest in games

As magazines trying to cover all developments related to micros, the early computer press had provided some space for news of games software. Besides, games-playing was one respectable application within the hobbyist community of readers, although there were some complaints when games later became dominant (96). By the early 1980s, some sections of the publishing world noted the beginnings of a break with the hobbyist relationship to the home computer. LE, a journalist who joined one of these new magazines at that time, explained (97):

'*(...) In April '82 the Spectrum was launched. I think we'd already seen the emergence of...the interest in games, or entertainment software..on machines like the Tandy Colour Computer in the States. The ZX81 was really a games computer, or it was becoming so at the time (...) Popular Computing Weekly was launched to take advantage of the fact that...the market was becoming a consumer market...interested*

in playing entertainment software. Certainly the whole slant of what we were trying to do then was to interest people who were...interested in much more the entertainment side of...using their machine - even if it meant programming their machine to do an entertainment-type game'

In particular, LE described how a number of people in the industry were comparing the possible future of the micro to the way in which the record industry operated:

'I think we viewed the Spectrum as a major step in that direction (...) I mean, at the time we were looking for a machine which would have colour, and some sound...which would take it more firmly into the entertainment area...at a price under £200 or whatever...'

Although many of the new magazines now resembled the other consumer press carrying mainly product news and reviews, there still remained some links with the hobbyist theme of exploring the machine. Even though its founder made a comparison between the journal *'Computer and Video Games'* and *'Hi-Fi Choice and Record Review'* (98), the computer magazine continued to run columns which reviewed and gave advice on how to build micro kits and on other hardware projects (99). Meanwhile, the user specific magazines, although increasingly geared to product reviews, juxtaposed their main items with columns concerning programming and hardware construction.

Moreover, games were not simply for playing. Apart from game-playing tips, there were regular features showing how to break into the games' programming structure with 'Pokes' to see how their inner workings operated and how to make changes so that games worked differently. The very nature of the hardware made such alterations possible in the case of computer games, whereas this had not been so with video games. Not only were traces of the hobbyist tradition found within these product orientated magazines, but the games themselves retained some of the role of being a means to experiment with the machine.

It is around this new amalgam of contents that a range of computer magazines began to construct a community of interest. NU explained how the editorial staff saw the role of *Computer and Video Games* (100):

'We want to (give) it...you know, a nice sort of high tech feeling ..but retaining the sort of clubbiness...'cos I think that's really important (...) I hope that it doesn't feel unapproachable. I hope the kids can feel that they can phone us up...and get someone to talk to...which they do (...) They use the helpline...just sort of general things "can you tell me this, can you tell me that' "I've got a Poke for Manic Miner..can you print it in the magazine"...that's the sort of thing we want to encourage (...) (Things) like the Hall of Fame, where they all get their top scores in...put their pictures in, and that sort of thing (...) We just want to make it feel as though they belong to something (...)'

This particular magazine, as part of the sub-section aimed solely at younger readers, has been viewed as going some way down the path towards a 'club' atmosphere (101). Yet, even the user specific magazines which tried to appeal to a wider age range, fostered a sense of a community of readers through policies such as organising participation via readers' letters and competitions. And as texts, magazines constructed the industry as a shared spectacle for their readers, focussing on latest developments, competition between firms, and producers as characters. Magazine writers presented themselves as familiar personalities, with their own written styles (102). It was through such approaches as these that this media started to organise a community of interest around the new home micro.

SUMMARY

This chapter has attempted to select out those production factors which contributed to narrowing the identity of the micro to

predominantly that of games machine. Although they saw games-playing as one application among others, very few hardware manufacturers actively promoted the home computer as a product to simply replace video games machines. With the exception of Commodore, the larger American companies had reason to resist such a development. Even when games started to come to the fore, many producers still regarded the micro as a 'universal' machine, with the potential for a range of 'serious uses'. This assumption was reflected in the number of facilities designed into many machines.

The particular product configuration achieved by Sinclair and Commodore machines, offering fewer facilities at a lower cost, proved more successful. The latter companies provided enough features for their micros to play two main roles. Their computers allowed the user to learn to program and they provided a cheap vehicle for running games software. Those companies who arrived early in the market and who welcomed third party support soon built up a range of software which became in itself a selling point for their micros: thus these hardware and software companies were locked into a mutually supporting symbiotic relationship. Later companies simply found it far more difficult, though not impossible, to build up such a degree of support. Nor was it just the sheer amount of software which was important. As software became more of a 'cultural industry', the significant point was that the latest releases first came to appear on a few standard formats.

I have also noted the conditions under which it became possible for an indigenous British software cottage industry to arise. From the start, computer games software was influenced by the contemporary arcade favourites, in the same way as video games had been. As the industry grew and moved towards a retail structure, new marketing personnel became involved. In particular, a number of firms from existing cultural industries entered the market, as part of a general plans to diversify across the 'home leisure' field. The result was a restructuring of the industry and of the nature of the games product

so that games production became much more akin to industries such as the record market.

Magazines played a significant role in supporting the rise and changing nature of games. We noted the various factors which enabled the proliferation of magazines. This partly reflected wider trends and general expectations within the magazine industry. The home computer press initially found a role supporting the self-referential machine, and elements of this were to remain even in the later magazines. But by the early '80s there was a shift to a consumer magazine, concerned principally with the latest products. In various senses, these magazines constituted an important part of the new mechanism by which games were marketed, as well as being texts which facilitated a new community of interest around game-playing as an activity.

CHAPTER 8: YOUTH, GENDER AND INTEREST IN HOME COMPUTERS

One way in which to contextualise this chapter on consumption is by comparison with the other main contemporary studies in this field. The research studies being conducted by the Mass Communications analysts, by David Skinner, and now by Brunel are family-based. The researchers concerned interview, and in the case of Brunel observe, a range of of family members in their home. While questions are asked about activities outside the home, the main concern in especially the first two studies relates to the initial buying decision and to the use of the micros thereafter. Since children are statistically the most important users - as I will demonstrate presently - as in my own work, the younger members of the family are a key focus in these other projects.

Perhaps the major issue in these studies is the influence of computer visions of the future on expectations and comparing actual use in the home measured against the idea of an information society (1). Although some parents buy micros as unrequested gifts, and some buy them partly for their own use, many buy micros at the request of children. Another interest in these pieces of research is therefore the role of parents as an intermediary in buying decisions and the later family dynamics between parents and children. Clearly, questions of expectations and the process of buying could be of relevance to any explanation of the popularity of micros.

The dimension of 'popularity' which I address is slightly different, as is the concomitant object of my research. In contrast to the above studies, I pay relatively little attention to parents and instead investigate the nature of the child's interest itself. Why were micros popular with children? Another factor which structures my approach to consumption relates to the key theme in my analysis of production outlined: the emergence of the micro as a games machine, albeit with a 'computer literacy' undercurrent. Hence, games-playing and to a lesser

extent programming are of particular interest. Specifically, having referred to games production as a cultural industry, I now want to examine in more detail what counts as 'following' the output of such a commodity form (2).

A third aspect of the consumption research in this thesis is that it mainly focusses on sites outside the home, although some of my questions referred to home life. The approach taken by those other studies may yet cast further light on gender differences in relation to micros. For example, it is conceivable that micros were seen as being less important for girls' future in the labour market than for boys. In which case, this might have contributed to less 'demand' from girls, or to parents willingness to purchase micros. However, my initial investigations led me to believe that the emergence of a collective interest in computers among boys was a significant factor accounting for young male enthusiasm for these micros, adding a further dimension to and motivation for 'interest' besides the experience of using micros in the home. Thus, the research investigated settings where such a collective interest could be generated and maintained.

The chapter commences with an discussion of statistical data concerning various measures of interest in the micro. I then proceed to my qualitative evidence, initially examining 'talk' about computers and games, and then outlining other computer related activities, both in and out of school.

In the final section, we see how girls' experiences of micros differ. Girls may use the micros in isolation or share an interest with other family members in the home, such as playing games against brothers and sisters. But, neither micros nor games have the same degree of collective currency among girls as among young male peers.

There are two preliminary points to make about the evidence cited here, which is drawn from my observations and interviews with users. One is that the research was conducted a few years after the main period which has been the focus of this thesis. While the details of the

activities which I observed in 1986 may be somewhat different from those in 1983, I would suggest that the underlying elements are the same. Second, those youth whom I interviewed and observed had more of an interest than some peers. This was particularly true of the boys, and to some extent the case with the girls. Nonetheless, by carefully noting the ways in which this sample are exceptional, I still feel that the insight gained from this limited research can cast some light on processes at work both inside and outside school.

QUANTITATIVE DATA ON 'CONSUMPTION': AGE AND GENDER

Age: The Importance of Young Users

Arguably, the view that the micro was the key to computer literacy, as well as the rise of games, contributed to the increasing significance of children and teenagers as users. Although most statistics have been dealt with in appendices, we can start to appreciate the role of younger users from Table 8.1 below (3).

TABLE 8.1: USE OF HOME COMPUTERS BY GENDER AND AGE

Base 1196 males 1230 females	Age-groups						
	Total all ages	7-10	11-14	15-18	19-24	25-34	35-44
Male: % Ever Used	14	11	23	20	11	9	15
Female: % Ever used	8	7	12	10	6	7	7

Male: % Used in last week	8	6	17	13	3	5	7
Female: % Used in last week	4	2	6	4	3	3	4

From the table, we can immediately see the role of young males. In terms of the general familiarity implied by 'ever used', teenage boys provide the largest percentages of any male and female age-group - 23% and 20% A larger proportion of male youth is also more likely to have used micros recently - from which we might assume they are more regular users (4).

However, in this section I want to stress the significance of age more generally. Not only are teenage girls slightly more familiar with micros and more recent users than other women, but there is actually little difference from the figures for older men - in terms of recent use, 6% and 4% as opposed to 5% and 7%.

In Statistical Appendices S8, S9 and S10, we can see from other statistics how older male users become a smaller proportion of all users over the following years, at the same time as the 'games-playing' machine becomes an increasingly dominant identity for the home micro. Sometimes, commentators have suggested that it is males in general who show interest in the the micro. Yet, these figures support the argument which has been put forwarded in this thesis that we must take age as well as gender into account.

Gender

Measures of Interest in Micros

Statistical Appendix S5 discusses the range of problems concerning statistics which deal with ownership of products such as video games

machines and micros. In that appendix, I argue that the various figures concerning the use of such goods are both less problematic and better guides to interest in games-playing and home computers.

When we look at the various statistics on whether young people ever use micros we find the same pattern as in the table shown earlier in this chapter: that more boys have this general level of familiarity with home computers. In fact, there is a fairly consistent difference between boys and girls, approximately in a ratio of 2:1.

One guide to the intensity of use are the statistics on recent usage. These show a slightly bigger ratio in favour of boys compared to the question about whether respondents ever used micros. From these we could suggest that more boys are more regular, less casual, users. This would appear to be backed up by the statistics, albeit limited, available on frequency of usage. Both in terms of days per week and hours per week spent on micros, the girls distribution appears skewed towards lighter usage than the boys, and it is mainly amongst boys that a core of heavier users can be found. This would fit in with the table in Statistical Appendix S8, which also found more heavier users in the statistics for boys.

Details of other measures of interest in micros are dealt with in Statistical Appendix S9. The first statistics that are examined there concern the desire to own a micro. Again we find that this is stronger amongst boys, in a ratio still of about 2:1.

Assessing the figures relating to knowledges about different micro brands is a little trickier, since there is reason to believe boys may claim to know more than they do. Nevertheless, there is an case for taking the statistics at face value to an extent, in which case boys again appear to have more knowledges than girls. Arguably, this partly reflects a greater interest on the part of boys to find out about the machines.

Finally, in Statistical Appendix S10, I examine the different uses to which micros are put. The chief point is that games predominate for all categories of user - male and female. That should be borne in mind later in the thesis, when we see how some producers anticipated that women and girls would not be interested in game-playing

Summary

Despite being cautious about some of the statistics, they can be taken to confirm one widespread perception in the industry - that boys are the most important audience. Although different survey data are frequently incompatible, the figures allow us to appreciate how this interest grew over the early years of the 1980s. Yet, girls' interest, shown in the range of indices covered here, also grew during that period. Compared to boys, this may be less and perhaps different in kind - as we shall see in the next sections. *But the stress on the masculinity of the micro, especially in attributing interest only to fathers and sons, tends to underestimate that there is also a young female audience for this product.*

COMPUTER TALK AMONGST BOYS

The reason for paying attention to 'computer talk' is that it constitutes part of the interest in micros, even though this facet is not picked up by statistical measures of usage in the home. Analysts who have orientated their research around exploring lived cultures, be they those of subcultures, youth, women or whatever, have for some time paid attention to what people talk about. Only more recently have those focussing in particular on the experience of particular products, such as the TV, started to emphasise that related talk is part of that experience (5).

This section outlines the different types of talk concerning both computers generally and games in particular. While it is difficult to chart the emergence of computer talk in any detail, I first attempt to convey some sense of its development in the school which was researched. Thereafter, I elaborate the nature of that talk once it was an established part of the boys interaction (6).

THE RISE OF COMPUTER TALK IN THE SCHOOL

The 1983 surge in sales was complemented by the way in which micros became an object of classroom talk. QW, who had been one of the few with an earlier interest in computing, described the change (7):

'Well, in my class there was (...) me and my friend in the second year (1982) we were the only ones who used to use the computers initially (...) and when there was the form period...occasionally we'd talk about something on the computers (...) After Christmas in the 3rd year (1983) I do remember a lot of people talking about computers (...) and in the 4th year we took a survey...and found that about 20% of the people (in the class) had a computer. (It provided) more better conversation in a way, I mean...at that point, when the computer was pretty popular...about a third of the class talked about them. That's quite a lot compared to what most people usually talk about (...)'

In any particular interview, it was often difficult to pinpoint the way in which someone's interest in micros had arisen. For some that interest appeared to 'just happen', or others simply remembered sensing that micros were 'getting popular'. But, at least one interviewee tried to articulate the way this computer talk contributed to his desire for a home machine (8):

'Friends, people around me, class mates...talking about computers... and how to find out knowledge about them...and that just grew into what I call one of my interests...'

The Nature of Talk: Rivalry

In the school club where I was an observer, at least some of the boys had a perpetual, joking rivalry over computers, deriding features of the micros which belonged to others. Even within one interview, the two boys participating sometimes ventured the odd remark about the limitations of the other's machine. These boys were quite willing to acknowledge this competition, saying that they always 'insulted each others' computers' (9). Nearly all interviewees reported that this type of interaction was commonplace in the classroom and had been so for some time. For example, one boy recalled the comments which peers made concerning his first micro when the company which produced the machine went out of business (10):

'(...) It became unfashionable...the (Dragon) computer was a computer that's gone out (...) It suddenly became something of a relic...museum-piece... everyone was saying, "Dragon Computer? That's something in the attic now" (...)'

Consequently this interviewee was pleased when Amstrad, the manufacturer of his second micro, bought the Sinclair name:

'(...) The bit I loved the most was the buy over of Sinclair computers (...) 'cos everyone who owned a Sinclair had said "Your Dragon's gone up the drain, it's out of date"... but when Sinclair went bust I got my own back (...)'

Routine Talk

Apart from this competitive banter, there were topics which were regularly discussed by my interviewees and others. The most common themes related to games - which will be examined presently. But, there was also discussion as regards both hardware and non-game

software products. These conversations were concerned with such matters as the next machine the boys would like to acquire or the peripherals or software which they desired. As part of justifying these preferences, the boys debated the merits of different products - which would cast light on some of the statistics suggesting boys knew more the different micros available.

As well as talking about product features, there were also discussions about the cost of different products and where to buy them - both in terms of recommending shops and giving notice of forthcoming shows. In the same vein, there was the trade among the boys in news about who might be buying or selling equipment or software, or tales of how they had acquired products cheaply.

In effect, much of the discussion about computers was very similar to talk about toys or other products of interest to these boys. Because of this, I have called such talk 'routine'. The micro as a product had become a 'normal' object of male classroom discourse.

The Role of 'Experts'

The interests of some of the boys extended beyond the discussions outlined above. Interviewees such as QW and TT were keen to keep in touch with general developments in computing. Yet, these boys realised that they were exceptions in their class, noting that most people did not have this kind of interest. Therefore, they talked about these things amongst themselves, as a smaller grouping. It is from this sub-group that I would like to briefly turn to one special identity which could be adopted in relation to computers: that of being a self-styled 'expert'.

QW, in particular, appeared to enjoy the role of being an expert. Years earlier, in his first year, he had been introduced to the schools terminal link to a mainframe. Even before buying a home machine, QW

had attended a summer computing camp which had been organised in the borough, and in subsequent years he had been hired as a technical assistant on such courses. When micros first came to the school, QW had used every opportunity to practise on them, and had really appreciated the fact that he knew more than the teachers. By the time he was in the upper school, QW had (unsuccessfully) tried to promote an alternative and informal school club to facilitate the exchange of software. By the time I was interviewing him, his latest project was a computerised newsletter which anyone in the computer club could access.

By virtue of his high degree of interest in computing, QW demonstrated a considerable knowledge of micros and their history. In small ways, he could even try to re-enact the original 'Hacker' identity, even though his circumstance as a school student in 1980s Britain were very different (11):

'*(...) I find it's more easy to program at night (...) so you get that sort of hacking sensation...computer buffs always program at night [QW laughed] (...)*'

QW could also create a new role, to some extent. In the late 1970s and early 80s, the term 'Hacker' took on another meaning: breaking into larger computer systems via telecommunications. Nowadays the term has acquired a third meaning: breaking into protected software. QW's main 'hobby' now consisted of being part of a circuit of male users who broke into software and then exchanged it by post. That involvement occupied the greater part of the time devoted to his computer-related activities, although he had little chance to actually use the software he collected. The challenge of acquisition and the size of the collection (600-700 items at the time of the research) were the goals (12).

These school age 'experts' occurred elsewhere in my interview sample (8) and in other research (13). Although atypical compared to most of their peers, such informed and keen users as QW promoted both events

and activities in the school. They introduced another dimension into 'computer talk'. For example, QW's Hacker role and stories of involvement with this circuit contributed a further exotic facet of computing which could become an object of class talk.

DISCUSSION OF GAMES

By the time of my research in the school club, there was usually some discussion about games in each session which I attended, despite the fact that the boys were supposed to be programming or working with software packages. However, in this context, games were rarely the dominant topic. In contrast, most interviewees indicated that talk about games was the main aspect of computing which was debated in the daytime classes. As QW noted (15):

'(...) Someone would talk about a game, then...everyone knew a little bit. Most of the time people would be talking about...what games they'd got, you know...how to play it...and how to get higher scores and general computer talk. But nothing on a high technical level (...) There was the odd discussion about programming...but...you couldn't really talk about that without actually using a computer to (demonstrate) what you're talking about...I suppose there was ...talking about the structure of programs...and occasionally (...) you'd discuss how to solve a problem and that (...) (But) the major talk is about, you know..."This game is out and..have you played it?"'

Those more enthusiastic boys, who wanted to talk about computers generally, lamented the fact that discussion was limited to games. That sentiment was conveyed by QW and is here touched on by TT (16):

'(...) The computer world in school is based around games...even if they had (...) bought the computers for a computer studies course...they'd spent a lot of time on games. Everyone had spent a lot of time on games (...) They didn't talk about latest developments (in micros), they

talked about the latest games. And that forced me to talk about the latest games ..."I want this game"..."This game's good"..."Copy me this game, please." (...)'

The qualification should be added that even for those with a wider interest, game-playing was still a major activity, and students such as QW did not seem to be averse to the occasional discussion of the latest games releases.

Nature of Games Talk

The boys also discussed product news. This included knowing what games were recently released and in vogue and being aware of what the games were like, what features they possessed. To have seen the game in action or to have tried it out was of particular value. Knowing what might be in the pipeline from the arcades or as a conversion from another machine format was also newsworthy. And in more general discussions of the merits of games, it was a bonus to be aware of the 'features' which appeared across a number of different pieces of software.

A second set of knowledges mobilised in games talk related to actual playing, and was very much the type of discussion material which might be expected at the arcade. This involved tips, such as how to get onto the next screen - that is to say, the next part of the game. Peers gave information about features would be encountered in that next stage. There was advice concerning what players needed to acquire or achieve early on in preparation for these later sections of a game. The boys traded suggestions about tactics, and offered warnings about manoeuvres which one could expect from electronic opponents, about hazards which could 'hurt' the side which the player controls and about aspects which were harmless.

Such conversations could also be competitive. As with talk about the hardware, there was also sometimes an element of rivalry between boys in the club. Furthermore, the above topics of discussion could equally be used to show off superior skills as to pass on comradely advice. To an extent, this paralleled some of the interaction in the hobbyist club. In addition to all these tips, the boys would argue over such matters as the relative size of their game collections, compare whether they had the latest games, and announce the scores which they had achieved.

Finally, there were occasional discussions about altering games, through discovering 'Pokes' to effect the program's structure. Some interviewees had altered their games (17), but most had not attempted this level of involvement. Nevertheless, such knowledge was generally deemed to be impressive. In fact, one 'event' at the club occurred when someone brought in a video of a game which he had played at home. NN had found a way by which the protagonist in the game could not be 'killed' - which the boy called 'cheat mode'. Although this did not in itself make the game interesting to play, it allowed observers to work through all the stages of the game in order to see what would be encountered later and to explore all the areas in which the action took place. This would have taken some time if the boys had been required to discover these features by playing. This demonstration attracted a good deal of attention, as everyone stopped work to comment on the developments on screen.

In sum, we see here how games as a cultural industry are experienced. One aspect, as with records, is the newsworthiness of game product developments and their acquisition. Another interest lies in the actual use of the product, and parallels discussion of arcade tactics. Thirdly, unlike the arcades, there is at least some interest in altering the product. If only in part, we could view this theme as being a residual strand from the hobbyist project of dabbling in the inner structure of such programs.

Sources of Knowledges

My last concern in this section is to characterise the sources of knowledge drawn upon in these discussions and banter. In the previous chapter, I indicated the role played by magazines as seen from a production viewpoint. Now, it is time to examine how this young, male audience used specialist magazines in relation to other sources of information concerning games and micros.

As might be expected, while books and TV provided some of the information and opinion used in the discussions of computer and games, magazines were the major source of product news. In fact, market research indicates that a majority of computer users read magazines (18). All my interviewees regularly got one or more of the monthly computer publications and reported that these journals were widely read in the school. QW commented (19):

'(...) Quite often they bring in magazines. I do remember one of my friends...bringing in a magazine every Wednesday morning and he'd pass it around. We'd sort of read it, and quite often read the reviews...I think virtually everyone bought a magazine...you know, most of them bought monthly magazines and...maybe the odd weekly magazine. The monthly magazines were better because they had more reviews in...'

Magazine reading seemed especially important for those boys who tried to maintain the role of 'expert', and to demonstrate a knowledge of the field in any form of discussion. The computer press were also the main source of the Pokes mentioned previously. QW described his involvement during in what he saw as the a peak of computer popularity, a few years ago (20):

'I mean, normally we'd have a form period just before we went to a lesson right...and quite often we'd talk about something (to do with computers). I mean, I kept up with all the magazines (...) Quite often I would get asked a lot of questions, mainly how to do certain things.

For instance, many people didn't know how to load up programs...and I'd read in the magazine how to do certain things, right...I mean, I knew a bit about every machine (...) Quite often, I could remember Pokes to give infinite lives, and things like that...and that was quite often exchanged...'

TV programmes appeared to come very much second to the magazines as a source of material. All my particular interviewees watched 'Microlive', the main computer programme showing at the time of the research. But at the club, recent episodes were not talked about very much. The interviewees said they would only refer to the programme occasionally. Books and newspapers seemed to be more of a source of information for the very enthusiastic, such as QW, who could refer to articles which he had read in the press and other publications.

The last, perhaps obvious, source of knowledge about both games and micros was experience of the products itself. Given that some of the boys could even quote the magazines ratings for 'playability' and 'graphics' by heart, it would be easy to assume that they relied heavily on what they have read, 'simply' repeating secondary sources. However, their playing experience gave the boys a further base for assessments. Their arguments, both in the club and in interviews, suggest that these players have partly discovered for themselves their preferences and dislikes, what they find 'realistic' and what 'features' are to be valued.

Yet, as David Skinner has pointed out, the computer press still seem to set many of the guidelines concerning how games are to be evaluated. He notes that in the amateur magazines - 'fanzines'- which some boys have produced, the underlying format and types of comment of the commercial magazine are reproduced, albeit in slightly altered form (21). The best characterisation of computer talk might be that not only is material drawn from the magazines but the latter structured many of the baselines according to which the boys could formulate their own evaluations.

ACTIVITIES

Playing and Exchanging within Schools

One regular activity which occurred within the school was organising the exchange of software. Virtually all my interviewees acquired software, even if only temporarily, through this means. In one case, a group possessing the same brand of machine had agreed not to buy the same games so that they could copy and swap (22). In effect, this system meant that the boys bought software collectively.

Exchange could be in the form of agreeing to swap original software for a fixed amount of time (or until both parties grew bored with the games). Alternatively, it could be in the form of arranging to have copies made. When games first used protection routines and copying was more difficult, the mutual lending seems to have been even more common, although this occurs less nowadays. With either type of exchange some effort is still required to find a trading partner with the same machine and desirable product. Informal guidelines then govern the negotiations - for example, some of the boys are unwilling to exchange more valuable for less valuable software. Organising the copying option provides further hassles, usually involving a third party with a double-deck cassette recorder. QW recalls how copying had initially been even more difficult (23):

'(...) I don't think it was very easy to swap (copies) initially ...because it was very hard to copy...because no-one had these ..er...twin decks (...) When I started copying (...) we spent about a day working out what volume setting would be right and just working out how to connect the leads up...and the problem was, it took a long time copying (...) about half hour to copy it, load it and then check that it was working (...) So copying only went on every so often..'

Eventually this form of exchange was made easier by 'copiers' - software which could be bought via classified ads and which broke the protection on games. Instead of re-recording the high-pitched data - bearing sounds from the cassette tape, the copiers enabled the user to load the program into memory and then simply transfer, or 'save', it onto a new tape. Later, the process became simpler still, with the return to acoustic copying through the double cassette recorder.

Occasional games-playing competitions within classes was yet another computer based activity which took place in the school, although one factor which inhibited these was the problem of arranging access to TV's. While participants may constitute only a small group within the class, such competitions counted as one more visible computer 'event'. QW describes one of those matches (24):

'(...) Last year we had...quite a regular thing going with one game...it was 'Chuckie Egg' (...) We had a sort of mini-competition ...and that was quite long (..) we had 6 people in it and to do all the finals and everything it went through about 12 hours over a period of 3 weeks (...) It was quite official-like (...)'

Some schools, or particular teachers, were more tolerant of the games than others. One interviewee described how a teacher in his junior school had allowed the children to bring in games at the end of the week if they had 'behaved themselves' over the previous few days (25). Another boy said that there had been no prohibition of games in his particular school club. Here, games-playing had become the chief activity from the moment it started. In his mixed school, with equal numbers of boys and girls taking computer science as a subject, the club remained entirely male (26).

In the case of the school which I was visiting, there seems to have been a little more policing of games. When the club first started up, QW described how it was packed by boys thinking they could play the latest games on the micros (27). However, the school's particular brand of micro - 'Research Machines' - was geared to the education sector and

so did not carry many games. Besides, the club was staffed by a teacher paid to be there as part of a flexible hours arrangement, and so the dominant activity deemed to be appropriate was programming or using software packages.

The teacher was so not strict about prohibiting the occasional game at the end of the session, especially once QW had designed a game for the Research Machine system. QW's creation proved to be very popular, particularly once the boys got tired of their projects. Once, I brought along my 'Spectrum' computer and some of the latest games. These immediately attracted a good deal of interest, leading me to suspect that games might have been even more popular in my school club if conditions had facilitated playing.

Visiting Friends at Home

If school provided only limited opportunities for playing games in company, meeting in the homes of friends or visiting relatives was one way to try out the latest games. In fact, this may well have been the most frequent means by which boys the experienced collective game-playing. Unfortunately, the very accounts given by my interviewees can be a little misleading as to the regularity of these events. For example, QW gave the following impression concerning the amount of visiting which occurred among those at school (28):

'(...) Quite a few people lived closely, so they did go around and swap software and...er...play two-player games and things like that. Personally, I went to a couple of people's houses just to...help out...play the odd game or two (...) I don't suspect many people would have gone just for the computers ... it's more of a social...like...going to listen to someone's records, or something like that (...)'

Yet, in an earlier interview, QW had referred to periods when he had visited a friend frequently for weeks at a time and spent many hours

competing on one particular game. His first copying attempts had also been joint efforts. Certainly, some of my interviewees had more specifically citing playing on the micro as the main reason for a visit (28). These boys described how they would soon show off their machines and games whenever anyone called round to their house (29).

Clubs

Playing and exchanging games took place in a range of 'public' locations outside of school. One of these was the computer clubs, which had arisen both during the late 1970s and with the first home machines of the 1980s. The boys' demand for a 'space' for games purposes sometimes transformed the clubs from their original function. Here MG, a computer hobbyist in his 50s, recalls what happened to the a computer club in East London, which had originally been founded by early enthusiasts (30):

'(...) Now at that time (in the late 1970s) it was perhaps about 17 members at the most...and two of those might be teenagers..boys invariably...the rest were chaps younger than me (...) As hobby computing in the 1980s became of much wider interest...the first impact was the number of youngsters who wanted to join the club. This caused some conflict...'cos on the one hand one recognised that there were 40 or 50 youngsters who wanted to join. But the direct impact of that was you drove away several of the established people (...)'

When the majority had decided to welcome these new applicants into the club, they had soon expressed some disappointment that the motivations of the boys was not the same as that of the older hobbyists:

'(...) We let youngsters in with a nice intention to educate them. But they weren't really that interested (...) We gradually started lowering the age (limit). That gave the problem you heard from various clubs...suddenly the club became a games-playing club. There was always

a conflict between recognising that there was a need to support that, encourage the kids. In the end the club became much more about providing an environment for youngsters than meeting technical computing requirements (...)'

A similar story occurred with a club in South London, whose origin had been slightly different. In this club, members did not possess the same degree of expertise as in the East London venue. The club had started later, in 1982, and at first consisted mainly of people with little knowledge of computing who tried to pool resources and to acquire some advice about their new machine. WD described the polarisation which eventually developed after the influx of a different type of member (31):

'(...) There was the group of people who had BBC's predominantly, and wanted to do something serious with their computers, and wanted to learn about programming (...) (aged about 13-60) Then there was a second group (aged about 10-16) who brought down their Ataris and their Spectrums and played games. They may as well have stayed home and played games...you know...sat there with their dual tape recorders and copied each other's games...'

In effect, both clubs experienced a similar process of the programming sub-group abandoning the site. Although the club in East London continues, most of the older members left after a few years. A small group of these continued to meet informally. In the case of the club in South London, the 'serious' clique switched to meeting at one of the member's houses. Just before the interview with its former secretary, the club was closed due to 'lack of interest'. Given the disdain which my particular interviewee showed for the game-players, it is difficult to ascertain whether closure was due to lack of numbers or the fact that games were not deemed to be an 'appropriate' activity once the hobbyist sub-group had departed (32).

Other Public Sites

Clubs were not the only public sites which offered the chance to play games collectively. There were also the arcades. Some of the boys still played in amusement parks to keep in touch with the latest games available on the coin-ops (34). Meanwhile, the shops or departments actually selling the micros and software became the home computer equivalent of these arcade sites. For example, DM regularly went with his friends to a main W.H.Smiths in Birmingham town centre - or else he was dropped off there by his mother during a shopping session (35). One purpose of such visits was simply to try out the latest releases. In addition, arcade practices of skill display were also carried over into this setting - for example, the ritual of typing one's initials into the computer's record if a high score had been achieved. These stores had yet another function, as NB related (36):

'(...) If you go into town on a Saturday...go to, say, Smiths, Hudsons..one of the computer shops...you usually see kids there with...teenagers, 14 or 15...with a box of disks and tapes. They sort of swap with other kids...and that's a meeting place to swap games (...) I mean, they can't do it out in the open, it has to be done on the quiet (...) (They meet there) because ...that's where you get the stuff...you get people interested in computers in computer shops...they won't exactly meet in a local library!'

Where possible, exchange was another facet of such public venues. Given that it was not always easy to find someone with whom to exchange, sites which brought together players with the same machine enabled the boys to find the appropriate computer users with whom to negotiate.

The other main public places for gaining contacts and for trying out new products were the computer shows. A majority of my interviewees went to these, although it is difficult to estimate the proportion of other users who would attend such events. Some went with their

families (37), but others went with friends from school (38). As with the shops, the shows could also act as a meeting place. For instance, it was at these shows that QW regularly met with his circuit of contacts who copied and circulated software (39).

In sum, these public settings had a number of functions. The venues provided both an opportunity to try out products, and to play in collective settings akin to the arcade. These sites also facilitated contact with those who shared an interest, which could mean a chance to exchange games and other software (40).

The desire for such collective occasions led boys to appropriate sites which were not intended originally for games purposes (41). We saw how the games-players 'took over' some of the clubs which had been founded as venues for learning about programming. While some shop managers seemed to regard playing as beneficial to sales (42), others have already started to adopt tactics to prevent the conversion of their areas into alternative arcades - for example, some staff periodically turned off the computers. We also saw how school clubs could easily be turned into games-playing locales. The corollary of this appropriation of space is that boys, albeit perhaps relatively few boys, had a high profile in relation to games-playing. They were more visible. It is little wonder that producers and other commentators could easily assume that games-playing was a totally male domain, and show surprise that girls demonstrate any interest at all.

PROGRAMMING AND OTHER INITIATIVES

While computer games were the main focus of young male attention, the micros were used for other purposes. Statistical Appendix S10 shows that after games the next most popular application of the home computer by boys was for programming. Arguably, this reflects a hobbyist undercurrent that was still present, despite the dominance of game-playing.

The fact that my small sample of interviewees may have been to some degree exceptional was indicated by the fact that they all attempted some programming. In contrast, they also commented that the majority of their classmates, as well as their brothers and sisters, mainly restricted their interest to playing games (43). Examples of projects which my contacts had attempted included designing a database (44), Christmas cards (45), a system for charting his father's milk round (46), advertisements (47), and a Football League table (48). Some of these initiatives remained private, in the sense that they were not displayed in class. Other projects were demonstrated to peers, some being clearly intended for a public audience, as in the case of QW's game and his computerised newsletter.

The most frequent type of programming involved either designing games or , more commonly, reproducing particular games effects - especially graphics. This is not too surprising in view of the fact that many introductory manuals and beginners' books showed how to program such effects. One rationale behind typing in listings was to understand the structures of games, even if this practice does not seem itself to constitute programming. Some interviewees later used knowledge gained from these listings to make alterations to games or to reproduce features in other programs.

Even for those who did not devise whole games, knowing of someone who did seemed to be of value, as was noted in David Skinner's research on computer users (49). Whenever a boy's game was recognised by a publisher, such as a magazine, this was an even higher honour. DM was pleased to talk about the success of a school friend (50):

DM: *'I've wrote about 5 games...um. My mate, he's got a Vic, and he's got someone to publish the game, and he's still getting money in.'*

LH: *'So did he send his game to a big software house?'*

DM: *'No, it's only a little one..don't do very good games (...)'*

LH: *'Did he put a lot of work into it then?'*

DM: *'Spent about 2 months on it. (Another mate) did the graphics. But he did the sound, it's really good.'*

LH: *'How does it compare to some of the other commercial software going (...)'*

DM: (pause) *'His games aren't that good...they're not as good as like "Ocean' games. But, it's good for him (...) he's wrote loads...everyone told him to send them off, but he says they were rubbish, but quite good games really.'*

It would seem that these initiatives from others at school are judged by a different standard from the slicker products with which the boys are more familiar. Many could still remember the days when there were reports of schoolboy success stories through games-writing. Even today some of the magazines hold games writing competitions, and give coverage to young writers, thereby offering the chance of a small amount of fame. Hence there was a basis for appreciating the efforts of peers.

Moreover, there was sometimes the possibility for others to participate in these efforts. DM mentioned the combined effort behind his friends' game and the encouraging role which was played by others in the class. When QW carried out endless modifications to his game, even those in the club who did not program had numerous suggestions about improvements which might be made. So, even if only a limited number of boys programmed, their efforts received attention from a wider audience and offered peers the chance of some form of participation in creating new software.

Lastly, I want to just briefly indicate the place of other non-game uses besides those associated with programming. By the time of my school club observation in 1986, some of the products which were available were obviously more sophisticated than those available during

the earlier years covered by the thesis. QW demonstrated one piece of software to capture video images and digitise them. He would freeze a frame from a TV programme such as 'Eastenders' and then display the image on the monitor, perhaps enhancing the detail with a graphics package. This type of activity once again aroused interest for weeks, initially bringing everything else in the club to a standstill as people crowded round to watch and to comment.

A similar, though more short-lived, occasion occurred when the school acquired a 'mouse' (a form of input which is an alternative to a keyboard). The general point which I would draw is that, whatever the particular soft- or hardware was, these new products, or new ideas generated by those attending, came to constitute 'events' amongst a more mundane routine. These infrequent, but regular, occasions when something special 'happened', or rather 'was created', seemed to be another way of re-generating some broad interest in computing.

GIRLS AND HOME COMPUTERS

In this final section, I aim to demonstrate that the shared interest in micros expressed at school and other sites was particular to boys. This is not to say that girls had no interest in computers, nor in game-playing - that they do has already been shown in the statistics. Nor were girls simply isolated users - for instance, they played with other family members and with friends who visited their homes. However, that was mainly the limit of their interest. The currency which computer talk and games play had among some young male peers appeared to be absent in the case of girls.

Although further details of my interviews with girls are contained in the methods chapter, it might be useful to add a few points concerning the nature of my sample. The majority of the girls followed the computer science course at school, and a few said they would consider working with computers at some later stage. In addition, some of the

girls attempted programming at home. They were not an homogenous group, but judging from the quantitative data, some of these girls were more interested than was generally the case amongst their peers. Therefore, I would have expected these interviewees to have been more willing than most girls to talk about home computers, and to join in computer-related activities.

Computer Talk

When I asked the girls how many people had micros in the school, it soon became clear that these machines were not an object of classroom talk in the same way as for the boys (51):

ML: *'I don't think a lot of people have them, do they?'* (she said to other girls in the room).

ZN: *'Well, some people have them, but they don't mention it.'*

BA: *'Yeah.'*

ZN: *'Don't make a big deal out of it.'*

My other interviewees confirmed that micros were not usually discussed. Even when they knew other girls with computers at home, the girls to whom I spoke said that they did not usually bother to talk about the machines. As a consequence of the lack of much computer talk, estimates varied considerably concerning the number of people in the school with machines. Two of my interviewees proposed a joint guess that about half the girls 'had' micros (52). OT and XD would only comment on the few people they knew (53)

OT: *'You never really bother to ask, do you...don't really talk about it at school (...)'*

XD: '*I only know around...well, I never knew you had one (to OT - both girls laugh)...Lindsey's got one (...) I know 3 people who've got computers and I had one. That's the amount of people I know who've got computers*'

This is not to say that the girls are never willing to talk about the games or about micros. In one interview, once I had raised the subject, the two girls were quite willing to discuss different aspects of micros and their preferences. This included joking about each other's competences and tastes (54). Yet, the occasions when such comments might arise seem to have been rare. CS said that from time to time girls had talked about home micros in computer science lessons. XD confirmed this while also drawing attention to the way that girls had their own topics of conversation (55):

'*People talk about what they did last night (both girls laughed) ...video, you know. They don't talk about computers...not unless, like, in computer studies...yes, that's when you talk about computers. Like, sometimes we're on a computer doing our work and we say, "Oh yeah, I've got this game"...you know...and all this. But apart from that we don't really talk about computers. Like someone might say to you out of the blue, "Have you got one?"...you say, "Yeah", and that's it.*'

Exchange, Media and Public Sites

Since computers were not talked about much, it is not very surprising that my sample of girls had never arranged for the exchange of software. Nor did my interviewees believe that much exchange occurred generally in the school. Even when they knew other girls with the same machines, most of my girls had not bothered to arrange a swap (56). Usually it was left to brothers to see to that side of things. BA had copied some computer tapes, but still relied on her brother to make most such arrangements, as did OT (57):

'My cousin (...) we swap...er...yeah, a few times. We taped some of his games. (But at school) I don't ask. My brothers and that do. Like, his mate across the road...they've got the same (machine) as us. Tape games from them.'

A number of the girls watched TV programmes such as 'Microlive'. Some either typed listings from library books or read them for clues about programming. But, what was a little different from the boys, as we might expect from the statistics, was that there was less reading of magazines. A few of the girls had read magazines from time to time, especially if bought by someone else in the house. More usually, the girls either 'just played' the games which had originally been packaged with the micro, or games which had been bought by parents. Alternatively, they relied on brothers to inform them about the latest game. BA was probably the most enthusiastic of my interviewees. Yet, even though she had occasionally read magazines, she usually allowed her brother to play a mediating role. He regularly read these journals and the informed her of events in the computer industry (58):

'Well, my brother used to tell us. We used...(laughs) to sort of take it in'

Few girls visited or played games in the various public sites which were geared to microcomputers - and when they did, attendance was not so much with peers as with family. One girl, BA, had played in shops and had even joined the computer club in the girls school while it had existed. CS had been tempted by the club, but had decided that if she stopped behind, she would gt home too late - a factor which I have already noted when discussing women's non-participation in clubs. While most girls did not go to arcades and computer shows, one girl, OT, used to visit both as part of family outings. She described how she regularly played in the arcades with her brothers when the family spent weekend holidays in Kent. This resembles the pattern whereby the few wives who ever came to computer clubs had done so with husbands as part of 'family leisure' (59).

Family and Visitors

As with the boys whom I interviewed, the girls referred to the moments when they used the computer alone - either programming, typing in listings or, most frequently, playing games. Sometimes, these activities had filled in time when the girls had been bored. At other times, there had a more positive reason for playing - for example, when some games have been seen as being particularly attractive. Therefore, while I have dwelt upon the more collective moments of microcomputing and games-playing, it is important to avoid creating the impression that computer is never used in isolation. For example, although brothers were usually described as the heaviest users, one interviewee had a 9-year-old sister whose enthusiasm for games had even drawn objections from her parents (60):

'(They) don't like us having (the TV) on all day. 'Cos my sister usually does that. She wakes up, goes to the sitting room, turns on the television (...) turns on the computer (...) and plays on it the whole day. And when something good comes on television, she watches it...and then when that's finished, she goes back to the computer'

The other form of home based game-playing involved competition with brothers and sisters. CS talked about how the the children in her family would play each other as teams at home and BA described how most playing nowadays was a family affair, usually at the instigation of her brother (61):

'We used to play it every day...but right now we don't. You know...it's usually my brother that gets it out and then we play it. And if my little brother doesn't get it out, we don't bother'

Several of the girls, recalled exactly the same complaint from parents as had been noted by some of the boys (62):

'(...) I used to play that game ("Roland on the Rocks") all the time. Every time I used to play it, my mum would say, "Don't you do anything else on the computer? Can't you learn to program it or nothing?". We just used to keep on playing it and then, when we'd got tired of that we went into "Oh, Mummy"...started playing that one again'

Competitive playing does not necessarily mean that only two-player games were used. Usually the procedure was to take turns, seeing who could get the highest score (63):

'(...) We're all playing the same games. Got this Kung Fu game. Everyone loves it. We all take turns. My dad plays it too.'

The fact that games-playing can be a family affair means that we must start to reconsider arguments which emphasise the role of particular games content in determining female interest - or lack of it. My small sample of girls played a variety of games. Although this included some adventures, a majority of games played were of the fast-action 'arcade' type, reflecting the predominance of this genre within overall sales. At the level of particular game scenarios, the range was very varied, from the classic Space Invader plot to maze games located in mysterious caverns.

From these and other interviews (64), it appears that the games which girls played were those that are available - and this was not necessarily within their control. Some played the games which came with the machine. Occasionally, fathers had taken the initiative in buying the games 'for the family'. More frequently, either brothers were left to decide games purchases, or there was some form of negotiation amongst all the children. And of course, we have already seen that many of the arrangements concerning swapping were conducted by the male children. Basically, the girls chose to play from whatever was available - playing some games more because everyone else in the family was playing them. Or, to give a slightly different emphasis to the point, the decision to play or not to play at all appeared to be more important than what to play (65).

Lastly, the way in which visitors were invited to try out the micros reflects the home-based nature of girls' experience of the machines. Given that they did not talk much about micros in school, it is understandable that the girls did not invite friends round particularly to use the machine - whereas they pointed out that their brothers did this. Those visiting girlfriends who had tried out my interviewees' micros had already been invited for more general reasons (66):

XD: '*(...) Once Lorraine came round to my house (...) I had the computer on at the time...and I just told her to play it if she wanted (...) And she played on it for a bit.*'

OT: 'Yeah, that's like me, they come round...but they don't come round (especially) to play the computer.'

XD: '*But they end up doing it.' (laughs).*

SUMMARY

The account outlined above can convey the impression of a good deal of talk and activity around micros. However, this picture is partly a product of the way in which interviewees selected and highlighted events in response to my questions. Similarly, the detail of processes which I observed in the club were condensed down from the hours which I spent 'hanging around'. In the course of most sessions, the bulk of the time was taken up by boys working alone on their machine. I was simply more attentive to occasional comments and discussions - to which those quietly working at their machines would also listen. 'Events' which had to be manufactured to create a bit of excitement, and appeared to be important in providing a break from routine were, by their nature, infrequent.

In the same vein, I am sure that the boys did not spend every spare moment in the school discussing micros. Home computing was simply one

topic amongst others. A point which further puts this 'interest' in perspective, is that even the most enthusiastic of my interviewees would say that sometimes they programmed the computer or played games simply because they were bored and had little else to interest them. Conversely, they all <u>became bored</u> with computing and games on occasion!

With those caveats, I would argue that the above account challenges any image of the 'isolated' use of computers. The time spent alone, working on the machine, can now be seen as being framed within a wider context which has previously been rendered absent by the form of available statistics. As noted in the introduction, the researchers in the Mass Communications project on micros have also outlined the importance of the fact that micros are a shared interest (67). These researchers talk in terms of a 'network of contacts' which help to sustain interest in computing. My research focuses on public sites outside the home - principally the school - and analyses the nature of that 'contact'.

In effect, the first part of the chapter indicated how a somewhat amorphous boys' 'culture' incorporated a new object of attention - home computing - into its repertoire. This was not a gradual, incremental process, in that interest in and the topicality of computing appears to have peaked a few years ago. While computing's profile may now be lower, its presence, especially within the relationships of a smaller core group of enthusiasts, has by no means faded away. That adoption of home computing led boys to develop practices which may be considered novel - such as games design. Yet, in many ways we could equally well say that computing related activities were superimposed on pre-existing practices and relationships. Rivalry and self-taught expertise are not new, and on a personal note, most of the points raised by my interviewees did not really surprise me, even though the phenomenon of home computing had not existed when I was that age.

While producers clearly had some bearing upon the ways in which boys experienced home computing and games playing, as exemplified through the role played by magazines, ultimately this male youth made creative use of this raw material. They <u>made</u> their own culture. Apart from

pointing to their various initiatives, and the way they used 'talk' about micros and about games, clearly the various producers involved had not intended that these boys should appropriate certain public sites nor establish software exchange and copying practices.

My argument is that we can only appreciate the greater popularity of micros and games amongst boys by taking this collective nature of interest into account. This is opposed to overstressing individual masculine motivations, identifications or attractions, as can be stressed by analyses of games or indeed micros as texts. Furthermore, this communal interest can be viewed as simply the sum of individual decisions and preferences. As computing and games-playing found their way into young male culture, fitting into relationships between peers, this provided a motivation for such practices as keeping in touch with computer and software developments. In other words, in a circular or iterative fashion, the role of computers as an object of discourse amongst boys contributed to the reproduction of interest in these machines.

Contrary to the views of some analysts, the above account implies that games are not just a residual activity, in the sense that individuals only play them when they are not capable of mastering other computer applications. The place of games in boys' school culture provides a more positive reason for taking a wider interest in the games field.

Although girls shared with boys the home-based, intra-familial experience of micros and games-playing, the former appear to have lacked the boys' collective basis for interest. This is shown not just in the cases of the particular girls in my sample, but also in the nature of the interaction in school which these girls reported.

PART THREE:

DISCUSSIONS

CHAPTER 9: THE FUTURE OF THE MICRO: THE CONTINUING DEBATE

So far, we have seen the early plans for an infrastructural micro, the appearance of the self-referential computer and the rise of the games machine. I now briefly consider developments between 1983 and the present day, as framed within producers' diverse hopes and fears concerning the future of the home micro. This is not intended to be an exercise in prediction, except insofar as noting that the tensions surrounding the home computer's identity which are discussed here seem likely to continue for some time.

As was mentioned at the start of this thesis, this up-date of developments has two functions. First, it shows not only the current state of play as regards home computers, but also how these derive from processes which were set in motion during the first years of this decade. Second, and more importantly, the present provides a further context for evaluating the past. Charting the various tensions and trends of later years underlines further the significance of those issues which first arose in the early life of microcomputer products.

In the introduction, we noted one view of the micro as having been a historical fluke which had sunk into obscurity once the bubble of popularity had burst. Before proceeding further, this widely held public perception that the home computer has somehow faded away needs to be challenged. The crisis which the industry went through at one point, coupled with its subsequent lower media profile, created a misleading impression.

Behind the 'Burst Bubble'

Even by 1983, the software industry was starting to be restructured. Some firms, including a number which had recently entered the market in order to cash in on the 'boom', either went bankrupt, amalgamated, of otherwise departed from this field. On the hardware side, the sudden entry of a range of new companies culminated in considerable competition, price cutting and a strain on the profitability of many firms (1). Texas Instruments left the home market in 1983 (2) and that year also saw several bankruptcies among small British manufacturers (3).

In 1984, retailers overstocked for the Christmas sales, creating a further crisis (4). Demand was still present, but retailer expectations had been too high. Price cutting in the New Year to clear stock and the consequent fall in retailer demand for fresh machines precipitated a number of company collapses (5). Atari and Commodore suffered losses, and a near-bankrupt Acorn had to be rescued twice by Olivetti - who became Acorn's parent company. By 1985, even Sinclair was facing financial difficulties (6). During this period, the only company to enter the market and steadily improve its market share was Amstrad.

Apart from the way in which media reporting of the crisis suggested that the 'bubble had burst', the positive coverage familiar from 1982 and 1983 also started to diminish. There were fewer success stories to be found, and there were no major new Government schemes to report. Press interest seems to have become more routinised, as measured by the emergence of regular computer columns. On the other hand, micros dropped out of news and feature articles, except for the occasional story of a 'Hacker' breaking into telecommunications systems.

However, any assumption that the home computer has disappeared is incorrect. Sales of hardware and software remain at a high enough

level generally to support the fewer software companies which still operate in the market (7). Many commentators simply say that the market has 'matured'. The temporary financial problems experienced by many firms have by now been resolved, as most companies have gradually moved into profit. There are slightly fewer magazines to be found. Nevertheless, the computer press has a firmly established section of newsagent shelf space. Finally, there remains a user base which is still predominantly geared to games. In sum, the 'burst bubble' perception reflects the nature of various market mechanisms, by which the 'latest' consumer electronic can come into the public eye and then apparently disappear. Behind this issue of visibility, the home micro is still with us at the moment, even if its future may be less clear.

Problems and Trajectories

The following sections of the chapter outline the general trajectories in which later development took place, using particular machines as illustrations. Obviously, it is not feasible to supply the same degree of detail as in my core historical period. Nor can I cover every possible line of innovation (8). The aim is to impose some broad interpretative framework upon the development of a mass of particular products and services which have appeared in recent years.

The chapter commences by examining the doubts about the future of the games machine identity. These worries continued to exist throughout the early and mid-1980s. Concerns that games might prove to be a fad did not come true in that period. Next, I outline the nature of innovation within games to see how these changes relate to on-going debates about the future of this type of software. The final part of this section on games indicates the attempts to move away from the micro's identity as a games machine. This includes briefly examining the way in which producers promoted other entertainment applications

of the micro and assessing the strategies which emphasised the educational identity of this machine.

The subsequent sections move away from games issues to consider a range of other producer initiatives and visions of the micro's future. One section deals with plans to make the home computer a cross-over product from the business world, while a another section charts the development of telecommunications and home control applications. The final section of the chapter contrasts two possible trajectories. General technological enhancements of the micro were seen as the first route to success. In the second, the home micro might ultimately disappear to be replaced by other product configurations.

THE GAMES, ENTERTAINMENT AND EDUCATIONAL MICRO

The Problem of Games

We can appreciate some of the problems entailed by the rise of games if we turn to the views of Commodore's advertising agency. Commodore's hidden market strategy of supporting games did not find unmitigated favour with its advisors. The accounts manager at the agency recalled (9):

'(...) We wanted always to see our product as a proper piece of technology...but fun technology. We didn't want to see it as a toy. For one reason, it would have relegated our product into toy departments, which would have made it a Christmas buy. I mean, it was a Christmas buy anyway. Like, 60% of the market was in 3 months before Christmas. But what we where always attempting to do was to flatten out this wave, or bulge, and if we'd been in the toy route, we would have had to be cheaper anyway. We would have been cornering ourselves right into the Christmas market (...)'

Consequently, when advising on how to pitch the manufacturers next machine, the 'Commodore 64', the agency gave the following advice:

'We said that to (sell micros as games machines) would cheapen this product. It will automatically mean that it will die sooner or later 'cos 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. And if you've got something like the Commodore 64, you've got enough to run a small business on a Commodore 64, so it would be silly to sell it only as a games machine because it can do all these other things (...)'

The marketing staff at Sinclair were sensitive to much the same considerations, as OC explained (10):

'A lot of work was done internally on trying to develop ways and means of expanding the base. I think it was accepted that if the machines became totally associated with the games fad, then you were possibly stuck with a fad.'

While games applications had helped to sell micros, an identity based on games seemed to foreclose a longer and potentially more lucrative future for the computer as a versatile machine. Apart from these concerns, there was the further question of the general corporate identity of producers. Beyond the immediate desire to make a profit, there was still the longer term issue of how computer manufacturers wanted to be perceived, and with what type of products they wanted to be associated. Clive Sinclair, despite having the most successful micro in the market on the basis of its games support did not wish to see the home computer develop solely as a games machine (11):

'(...) I was interested in computers as general purpose instruments, whereas the games market is specialist (...) I don't object at all, of course, to people playing games because I think that's great. But I think that what has happened in Britain is that we've been selling a lot of machines that people have been buying to play games on and

they haven't been using most of the machine. And that's a waste of money (...)'

Games Innovations

Fears that games would be a fad have certainly not been realised so far. Admittedly, computer games attained a lower media profile in terms of stories of successful young programmers, and by the mid-1980s the shelf space they commanded in high-street retailers had declined a little. However, following the reduction in the number of software houses, the games industry has achieved an overall degree of stability which has continued to the present day. The Spectrum family of micros and the 'Commodore 64', the successor to the Vic 20, became the chief *de facto* standard formats, although a smaller catalogue of conversions is also available for other brands of early micro. The two key machines from Sinclair and from Commodore achieved a far longer product life and profitability than had originally been expected even within the games industry itself.

We saw in the statistics for a later period, that games playing remained the main use of micros. While my own sample of young users conveyed the impression that perhaps the peak of interest in games had passed, games were still routinely played by many of the boys and girls which I, as well as other researchers, have interviewed (12). In addition to these British users, international sales have become increasingly important since the early 1980s. We saw how a British software industry was able to develop independently of larger American software producers. Since the British market evolved earlier than on the Continent, this country became a major exporter of games once micros achieved popularity in other European countries (13).

We might view the current attempts to reintroduce dedicated video games machines, as a measure of optimism about the permanency of this entertainment form (14). Even during the 'boom years' of the home

micro, the older Atari games consoles had continued to sell, although at very reduced prices (15). In the light of what appears to be a clear and established demand for games, the argument has emerged that machines which have design features geared to that application would now be more viable. The micro no longer needs to be vehicle for games, and the boundaries between this product and the video games machine can be re-assessed.

An opposite tendency is for games to expand from the early machine formats onto those micros which constitute on-going attempts to fulfil the original infrastructural plans for a home computer. We will be looking at these trajectories presently. But even at this stage, we can note that the cross-over products from business micros - mainly the Amstrad PCW series and the company's PC series of micros - are attracting games support. Some software producers even see these machines as constituting a major new sales base for games software (16). That optimism is even stronger as regards the other main trajectory towards technologically far more sophisticated 16-bit micros (17). While some commentators see in this line of development a move away from the image of the 'games computer', others argue that the future of games lies with this new hardware (18).

Nonetheless, there is still concern about a perceived failure of innovation within games, and claims about a lack of creativity in this field (19). In evaluating that concern, we first need to observe the qualification that certain types of innovation in games have been introduced since the early 1980s. These include new marketing strategies, such as the rise of budget software (20), giving old products a new life via compilations, and retailing software though a wide range of outlets. Game software now appears in garages and corner shops.

In terms of game content, apart from incremental improvements in such matter as enhanced graphics detail, there are always new arcade hits to convert and new items to license from the other cultural industries. Occasionally, a totally new sub-genres appears, such as

the Kung-Fu games (21). In fact, it appears that part of the worry about lack of 'real' innovation relates to the mechanism whereby successful new games are immediately followed by a spate of near copies. Yet, to put the matter in perspective, this process is not very different from the record and film industries, where producers seek successful formulae (22).

While these constant innovations have kept the games industry ticking over at the moment, there is still the worry about competition from the other cultural industries for the 'entertainment coin'. For example, some commentators have pointed to the way in which new lower priced videos and compact disc have taken shelf space from micros in many of the multiple-retailers' stores (23). In other words, is the nature of games innovation sufficient to keep up with that in other fields competing for the same proportion of consumers' disposable income? Do changes in scenario and slight changes in the playing skills required, provide enough sense of 'newness' about games?

Some analysts place their longer term hopes in the innovations which are being made possible by more advanced hardware such as the 16-bit chips (24). Others want to see more efforts to achieve a higher profile for the industry as a whole, in order to reach beyond its current base of users. This has already been made manifest in renewed attempts to gain prominence for programmers as media personalities (25) and through creating a trade association to promote the industry as a whole (26). Thus, while games software is too established really to be called a fad, there are nevertheless grounds for long term concern - which companies are continually trying to address.

Other Entertainment Uses of the Micro

Despite the early concerns about the micro becoming just a games machine, producers still maintained some emphasis on the 'fun' aspect

of computers. Ultimately, this dimension was seen as being vital in order to sell the machines as consumer electronics at all. Many within the industry thought that leisure/ entertainment uses might eventually be the most significant line of development. Hence, the aim was always to find a balance between fun and seriousness.

This balance can be observed in the way in which Sinclair Research's advertising copy had talked about the fun of programming. At the same time, the company had maintained an element of seriousness by relying on popular feelings about the necessity of learning computer skills. Other hardware producers stressed, instead, the balance between entertainment and serious software.

Thus, as games started to rise to prominence, companies not only searched for counterbalancing practical uses: they also looked towards forms of non-game entertainment. For example, Commodore's advertisers argued for the expansion of the company's software operation to maintain the other genres which were becoming increasingly neglected by software houses. Such genres included quiz games, in the spirit of 'Mastermind', as well as the 'lifestyle' software referred to earlier. The other main entertainment usage was provided by music and art packages. Eventually, Commodore moved towards developing and marketing the sound facilities of their hardware. This blurring of the boundaries between the micro and the music synthesiser has continued. Music reproduction capabilities are one selling platform for both the latest 16-bit machines from both Commodore and Atari.

The Educational Micro

The educational image of the micro itself contained a balance of fun and seriousness. Learning though the medium of software, as well as learning about computers themselves, was portrayed as being enjoyable (27). In relation to pre-existing educational media (mainly books),

the computer was presented as offering the user the chance of a potentially more (inter)active role in the learning process. Apart from arguments that this form of interaction was educationally a more sound way to learn, such an experience was also supposed to be intrinsically more interesting than that deriving from other educational media. In fact, in the American market, the recreational nature of eduction packages was captured in the new term - 'Edutainment' software.

The representation of the 'educational micro' was organised at a number of levels. On the one hand, we find specific software which was labelled as 'educational' - sometimes known as 'edsoft'. This included packages such as those promoting basic numeracy which were aimed at pre-school children. The term also referred to software orientated around the school curriculum, as well as to adult education programs. At another level, a whole range of activities on the computer were represented as being 'educational' in a broader sense. Learning to program and gaining familiarisation with business software could also be cast in this light.

The latter, more general image of the micro as educational seems to have played an important role in enabling sales of micros. Surveys of attitudes and motives behind buying decisions indicate that a majority of sample respondents were concerned about the literacy issue (28). In contrast, educational software was far less of a success.

In the midst of a variety of claims, it is a little difficult to disentangle what exactly happened in the case of edsoft - apart from the fact that the industry appears universally to have abandoned this field. Surveys of usage in the period 1983-5 consistently showed educational packages to be the second most common application after games, although these were second by a considerable margin (29). Some producers also found educational mail order products to be reasonably lucrative (30). Nevertheless, one common view is that overall demand was still insufficient to justify maintaining production in this field. A different view, which is very plausible when we consider how

retailers operate, is that the rate of sales was not fast enough compared to games to justify multiple stores providing shelf space for the educational products (31).

There were some later attempts to create an edsoft market. The magazine *'Good Housekeeping'*, the book publisher MacMillan and the Mirror Group's subsidiary Mirrorsoft produced a range of wares aimed at the home education market. A joint organisation, called 'BESA', was formed with the aim of co-ordinating efforts to establish this market. It was also hoped that a magazine geared to parents might be established to provide a counterpart to the computer magazines' support of games software (32). However, most producers have now written off this potential market and have preferred to drop the label 'education software' altogether (33).

THE MICRO AND BUSINESS SOFTWARE

The strategy of attempting to make the home micro into a cross-over product from the office provides another example of the efforts which were made to give the home computer a more serious identity. Although this tactic was not successful in the early years, some producers are once again optimistic that this approach will pave the way to an infrastructural machine. As with many of the strategies outlined in this chapter, there are a number of different strands that need to be distinguished when talking about micros as a cross-over product from business.

Three different emphases can be detected (34). The first marketing approach aimed to sell the same machine both to businesses and to the home based users. The second policy was to claim that the micro could be used for paid work that has been brought home or which is carried out in the home. The third tactic was to view a micro as capable of processing data from leisure activities and practices in the home just as other types of information are processed at work.

All three approaches have been followed since the late 1970s, and often two or more strands have co-existed in the target markets which producers have specified for their latest products. Arguably, the third strategy is most relevant to the notion of an infrastructural machine which could become commonplace in most people's lives.

The first of these approaches is simply producing a product to cater for two distinct markets. Obviously the picture blurred a little in the 1970s, where it was claimed that many small business and professional buyers were also hobbyists. In the British context, we saw how various producers originally envisaged that their micros, such a Camputer's Lynx and Sinclair's Spectrum, might pick up some sales from both markets - especially from small businesses. The BBC had the most success in this respect. Later, Sinclair Research's 'QL' machine also aimed to achieve this type of cross-over (35). The more recent Amstrad machines, which we shall be examining, have also adopted this approach.

As regards the second strategy, there has been a long history of targeting, mainly male, professionals who work partly or mainly from home. According to the vision of post-industrial society which often framed prophecies about the future of the micro, such users were going to increase in number. Many companies aspired to this form of cross-over product, including, once more, Sinclair Research's QL micro. However, commentaries on that particular machine themselves revealed some doubts about the existence of such a market. For example (36):

'The home professional user is a semi-mythical creature like the Loch Ness Monster or Big Foot - no one is sure if he exists or not and since there are no specimens in captivity, little if anything is known about his computer needs. Some independent observers claim that the home professional user is the creation of over-imaginative marketing executives, the product of wishful thinking from home computer manufacturers whose market has inconveniently stopped doubling once a fortnight...'

Many launch plans have continued to specify this character as one target audience, and this policy has been reflected in advertising imagery (37). Yet, a number of producers have shown increasing doubts about the existence of any sizable market which was geared to such users (38).

The third version of the micro as a cross-over product from business has been referred to in an earlier chapter. This involved the idea, which was also part of the post-industrial society scenario, that daily life could be radically changed by new technologies. Specifically, many home-based and other leisure activities could be organised in the same way as work (39). Thus, the technology of the office could be applied in a new setting. We can see one example of this in the (thwarted) aspirations which one of the Sinclair staff described (40):

'There's a vast swathe of very rich suburbia that never really got into home computers...where it would have been perfectly possible for...a semi-retired husband to be using it for his expansive garden...you know, controlling all the requirements for that and planning it, and so on and so forth...and to have had domestic applications in the home. That was always the grand theory (...) We never seemed able to convince the market. That was partly a function that software never really came into existence to cover those areas (...)'

QS, who was on Amstrad's technical staff, looked back on the plans behind the company's PCW 8256 combined word-processor and computer. He described how he had foreseen users whose 'leisure time' organisational work could find a use for the micro (41):

'I always saw the target market (...) apart from the corporates, (as being) the "self-employed" and the "would be self-employed", basically. And there are possibly just a many women, you know, writing parish magazines as men. Just as many women doing the leaflets to hand out at the play-group as there are men doing the leaflets to hand out at the golf club. It's for people who've got small documents to prepare,

most of what I call the "would be self-employed"...people who have a sort of independent bent to them, and find an outlet for that in being, you know, the secretary of the golf club or running a play-group or something (...)"

Many micro producers, such as the Elan firm we examined earlier, had hoped that this kind of application would develop. These companies had certainly suggested this possibility in their advertisements. Nor was it only hardware manufacturers who had tried to encourage this potential market. We saw how most software houses had continually experimented with products other than games. This frequently included home/personal finance programs and 'filing' systems (42). For some years, this personal productivity software had achieved little success beyond reaching a small market of users who wanted to explore the software (43).

However, the picture changed with the success of the recent Amstrad machines. The PCW series, launched in 1985, was primarily intended to be a family of word-processors (44), while an IBM-compatible PC series was inaugurated in 1986. These have been widely seen as at last finding a successful market niche as a business cross-over product, and generally opening up new possibilities for the future of micros. Since the new Amstrad micros are seen as giving the home computer new lease of life, it is worth spending a little time examining these specific machines.

Both series of computers certainly fall into the first category which I outlined - these micros were partly pitched at small businesses and corporate users (45), and appear to have successfully derived sales from these areas. However, distinguishing between the second and third variations is more difficult, considering that we have very little information concerning the patterns of use of domestic buyers. Certainly, there were hopes that the PC in particular would be the new infrastructural machine. At the time of its launch, QS described his hopes for the new micro (46):

'Well the PC is your ultimate computerised Lego. (Compared to other machines) there's more breadth of software and add-ons available for an IBM machine (...) Really the way I'd look at it is...as a general purpose computer engine (...) As far as the man-in-the-street is concerned, maybe it's your sort of...thinking man's BBC micro. A lot of people bought the BBC micro simply because of this sort of...nebulous ability to expand it in the future should you need it (...) It depends whether you believe that somebody buys a computer just to solve the problem they have today...or that they like to feel that should a new problem come along in two years time they could use the same machine to solve it (...) You know, somehow they're buying a sort of insurance against being able to solve future problems with the same machine'

Many other commentators agreed with these aspirations. The main feature of both the PCW and the PC was the low price in relation to the package offered. This had been partly enabled by the general fall in the costs of the parts making up the system, which was itself brought about by the increased production of micros for business (47). For the first time, machines similar to those used in work, (ie 'real micros'), could be brought into the price range of other consumer electronics. Yet more was involved in this innovation than just the pricing of the computers. Although there were doubts about the potential for success (48), Amstrad's active courting of software house support combined with the firm's previous good reputation from other fields, helped to create an expectation of success.

In particular, Amstrad lobbied for a reduction in the price of existing business software by promising greater software sales from a mass market. The company was successful, in that at the time of writing a whole structure of software and magazine support has grown up around these micros. Particularly in relation to the PC, other similarly priced and compatible machines, called 'IBM clones', have tried to benefit from what is known as the 'Amstrad Effect' (49). The key idea behind the PC machine is that the *de facto* business standard machine format can become the new home one, enabling a massive amount of existing sophisticated business software to become available to

domestic users at an accessible price (50). Once the price barrier for 'really useful' micros has been overcome, many commentators talked as if the floodgates would open for a true home micro, the machines of earlier years having been an aberration from the path of true micros (51).

That is one view. A different analysis could be that both series of machines have really found something like the home professional user niche: the person who processes data, especially words, as part of their work. If this were to be the case, then these micros will have found a very particular source of demand and the machine would not be the mass market computer that that would enter everyday life (52). It is now becoming acknowledged in the industry that although sales are reasonable, the anticipated boom in demand does not appear to have happened (53).

THE MICRO AND TELECOMMUNICATIONS

To describe all the developments in the field of telecommunications which have some connection with computers, would be too great an undertaking for this thesis. Therefore, this section of the chapter has to be a more abbreviated history compared to the summaries in other sections. The key point to draw attention to is that, through examining this area and that of home control, we can appreciate the way that those early visions of chip and computerised revolutions continued to be developed independently of home computers. These fields could utilise, but did not require, the presence of microcomputer products. In the next two sections of the chapter, I wish to examine how micro producers, and, those in the fields of telecommunications and control adapted to each others existence.

Most of the producers whom I interviewed had foreseen, often vaguely, telecommunications application for the micro as being feasible at some stage in the future. For many of these producers, this field could

well be the next major growth area. The modem, which connects the micro to phone systems, could become the next important peripheral. However, many of the smaller firms experienced shorter term pressures either to supply enough micros to meet demand or to avoid financial crises. Thus, telecoms remained only a the long term possibility. In addition, there were a number of the difficulties surrounding this use of the micro in the early 1980s which seemed to mitigate against this option in the shorter term. There were the technical problems involved in producing cheap modems - and some would say, the lack of initiative to do so (54). The price of telecom's services were thought by many to be still very high (55). And finally, there was the sheer unfamiliarity of and difficulty with using such new services (56).

A number of telecom facilities have only recently become available, and therefore were hardly considered by home computer manufacturers in the early years of the micro. For instance, it had long been prophecized that home shopping and on-line banking would be two telecommunications services which might be widely taken up - one day. During the earlier 1980s, these services were still undergoing trials (57), and so micro producers recognised that such applications were not immediate prospects.

The ability to search centralised databases from home provides another example of facilities which has been discussed for some years. In Britain, this already existed in one form, as 'Prestel'. This will be discussed presently. However, the more specialised commercial databases were based in the US (58), and only came online to Britain in the last few years. Hence, while micro producers in the US could make arrangements with database owning companies and offer this new micro application in the early 1980s (59), British counterparts have only more recently been in a position to contemplate this option.

Finally, home based electronic mail has been discussed for some years. This was originally geared to business clients, but has now been made more accessible to domestic user (60).

Having indicated the state of play of these other Telecom services, I now concentrate on those services which were developed in conjunction with the micro: the viewdata service Prestel, telesoftware, electronic publishing and on-line games playing facilities.

Telecommunications Development in the UK

In the early 1980s, the phone-based viewdata service Prestel and the broadcasting service Teletext constituted two of the the most visible manifestations of the telecommunications revolution for the British public. Therefore, it is perhaps not surprising that some microcomputer producers looked to connections with these videotex services as their first forays into the field of telecoms. For example, UD describes Acorn's facilities for the BBC (61):

'*(...) It was clear in those early days that Prestel, Viewdata, Teletext was the Information Technology standard and so, obviously, we put it on...and that was just a question of bolting the teletext generator around the outside of the video processor chip...which we did. Quite simply, we decided that an Information Technology mode had to be a feature of this machine...*'

This type of design adjustment was relatively straightforward in theory, even if there were still technical difficulties involved in implementing the change. The procedure involved reconfiguring equipment so that mechanisms previously contained within TV sets were instead located within the micro. However, any further involvement in telecoms required modems as peripherals and entailed meeting BT's charges for both phone use and for services such as Prestel. Some firms, such as Commodore, went as far as to set up their own telecom service because they felt that the BT charges were too high (62).

One particular development within the field of telecommunications was 'telesoftware'. This involved transmitting software down telephone

lines to end terminals or to micros. The idea had originally been discussed in ITV's teletext department, Oracle, from 1975, and there had been trial transmissions of educational software to schools since 1978 (63). The BBC were also interested in telesoftware and later offered this service as part of their Computer Literacy Campaign.

British Telecom had also been involved in discussions among the various interested parties for some time. What emerged from BT's interest and from the involvement of another computer publishing entrepreneur, Richard Hease, was the view that as well as transmitting any educational programs, telesoftware could be used to distribute games programs (64). In the light of the rising popularity of games in Britain at that time, they thought that there might be a market for this means of distribution. That idea was not entirely novel, in that video games companies, such as Atari, had promoted the same idea just beforehand in the US (65).

At this point, we have to make a connection with a third theme: experiments with electronic publishing. The publishing house EMAP had founded a subsidiary 'Telemap', whose function was to download magazine pages to micros using the phone system (66). Hease was invited in to assess the future of this subsidiary once Telemap proved to be a loss-maker. The result was a deal between EMAP and BT which lead to the setting up of the 'Micronet' service.

This package combined all the strands we have been examining. Users acquired access to parts of the Prestel database; they could receive some telesoftware free of charge and acquire games telesoftware for an extra cost; and the electronic magazine in the package was geared to a readership interested in developments around home computing. The strategy proved to be one of the more successful means of attracting new Prestel users, although Micronet itself has still remained a loss-making operation. Both BT and EMAP are willing to persevere with the system, seeing it as a long term investment (67).

In fact, what the Micronet policy implied was a perception that out of all possible domestic users of new telecom services, home computer users should be targeted as being a group most likely to adopt these innovations. CU, in charge of Prestel at British Telecom, explained the role which these users played in relation to the new service (68):

'*(...) They're not scared of technology, there's not technofear at all. They're straight into all these ideas (...) They've grown up with the technology and recognise some of the applications of that technology (...) So therefore they are the first to use them. So, I think that was really the driving force*'

This characterisation certainly applied to those hobbyists who were keen to explore the possibilities of the new system for its own sake. As with the original micro, it was users with this orientation who were some of the first to take up Micronet. They still constitute a core of users. Some of those enthusiasts whom I interviewed saw telecoms as the new way to develop their computing interest: this was the new technical challenge (69). The presence of hobbyists experimenting with the system was reflected at a number of levels. One of the most popular uses of Micronet/Prestel was the electronic bulletin boards. These boards provided a type of contact between users who never meet which is comparable to that between ham radio enthusiasts.

Certainly, it has been mentioned that the notices which people left on the boards convey the atmosphere of the hobbyist club. In addition, there also have been a series of initiatives, where users have set up their own boards (70), and even where they have dabbled in amateur versions of electronic publishing. These efforts required considerably more devotion than that which might be anticipated from the audience which EMAP and BT had envisaged. Both bodies recognised this early appropriation by hobbyists of what the companies had foreseen as being a more general service. As evidence of this, the firms pointed to the high proportion of BBC owners who use the system. Micronet is

still attempting to broaden its audience, and believes it is succeeding in this endeavour (71).

If a hobbyist interest represents one familiar pattern from the early history of micros, the games uses of telecoms provided the other echo of previous patterns of development. We have already noted the existence of telesoftware games. A further development is the growth of multi-user games in which many players can simultaneously participate in a real time adventure game via telephone connections to a central computer or system of computers. The first such game, called 'MUD' (Multi-User Dungeon) was developed on the mainframe at the University of Essex. British Telecom, again trying to profit from interest in games, took on MUD as one of its value added services. Subsequently, Micronet started to operate two multi-user games. Even the small software house Level 9 has set up such a system, using a bank of micros (72). Multi-user games are seen by companies such as this as being one possible line of innovation in the games field.

In sum, an earlier chapter examined the telecommunications options during the period when micro manufacturers were initially deciding how to pitch and develop their product. In this section, we have returned to telecoms, to see the socio-technical factors which continued to structure this trajectory of development. From this, we can now understand why this identity for the micro was only developed to a limited extent. A second point is that the use of micros in relation to telecommunications has itself been influenced by the way home computers are used generally. We see the familiar themes of hobbyist orientated interest and of producers taking opportunity from the popularity of games.

Thirdly, through noting the range of possible telecommunications innovations, we can perhaps appreciate why there is still some optimism that this field of use may yet provide a new future for the micro. If telecoms can provide a whole new role for micros, then the self-referential and games identities of the micro might eventually come to be seen as being very contingent and passing phases. On the

other hand, we must remember that many telecom developments are occurring, or can occur, independently of home computers. Some micro manufacturers have been willing to make the connection between their product and telecommunications, and BT has shown itself to be capable of utilising the existence of home micros in relation to its own ambitions - as demonstrated by Micronet. Yet, even if the development of telecoms requires some sort of terminal, with technical features similar to the home computer, that does not mean that telecom applications need hardware which is conceptualised and marketed as a microcomputer. This field of IT is fluid. Thus, telecoms cannot be automatically assumed to be a saviour of the home micro.

HOME CONTROL AND THE MICRO

Visions of the automated home have been available for some time (73). We saw in the chapter on pre-cursors to the micro how the semiconductor corporations had sought to bring a new form of control - programmability - to artefacts both inside and outside the home. Once the micro had appeared, some producers were willing to draw on these ideas about the automatic home - but locating the home computer at its centre. Manufacturers, such as Apple, picked up this theme of home control in their advertisements. Even Sinclair touched on the notion of control in the ZX80 advert when referring to how micros could control power stations. And Mattel, the toy company, was also later to refer to control functions as a possible selling pitch for its new micro (74). So throughout the early years of the home computer, companies occasionally gestured towards this application.

Yet in practice, there was little substantial development of control for a mass market. Certainly, Texas Instruments had foreseen a bright future in this field, and there had also been some R&D work at Atari. But these companies had the resources for such long term investment, whereas most of the smaller companies could not afford to place this control application on any immediate agenda (75). Besides, apart from

the sheer technical difficulties surrounding the development and installation of home control equipment (76), and the unfamiliarity of the area to a wider public (77), such control entailed a hardware emphasis from which companies were trying retreat. We can sense this wariness if we look at the BBC's view of home control in their Literacy project. DK recalled (78):

'(...) *There was hardly anyone on the production staff who understood control. And everyone was pretty worried about anything that looked as if it had a soldering iron near it...and control was felt to be in that area. So control didn't figure in the '81 stage of thinking of the uses of the new micros. However, by '82, '83 ...everyone outside was yelling...and (the BBC) were prepared to do a whole series on computers and control (...)*'

As a consequence, experimentation with control functions remained mainly a hobbyist niche in these early years. Projects to control lights and locks by micros were similar to ones carried out by electronics hobbyists when the first chips had become available. The result may have been 'useful', but the main reason behind constructing or buying such equipment was the interest in the technology. Some small firms catered for this market by offering various peripherals, and a few magazines existed to suggest hardware projects for computer enthusiasts (79).

While this may have been the state of play in the microcomputer industry, plans for the automated house continued among the giant semi-conductor firms. Throughout the 1980s, university and company research departments in Japan and in the US in particular, continued to work on the problems around home control technology (80). European interest was sparked off when the Japanese MSX home computer systems arrived in the early 1980s. Japanese electronics firms had tried to enter the home computer market in force only after the period I cover in the thesis. Their strength was that the different Japanese manufacturers agreed to the same MSX format and so their hardware was compatible - each brand of machine could run the other's software.

Unfortunately for these firms, by the time they entered the UK market, *de facto* standards for games had already been established and the Japanese products were unsuccessful. Nonetheless, other companies also saw in MSX the basis for a home control standard. In response, a collection of European companies has recently attempted to develop a control standard to match those in the US and Japan (81).

So once again, we have seen some of the factors which mitigated against the early development of control as a major application of micros. That state of affairs, as with telecoms, may prove to be contingent. In the US, Apple and IBM are both involved in the 'smart home' project (82), while the Europeans are considering making use of home computers, amongst other products, in their equivalent 'Interactive Home Systems. On the other hand, as in the case of telecommunications, there is no requirement to conceptualise part of the hardware as being a micro, or to totally centralise control functions around one particular core piece of equipment that even looks like a micro. Hence, developments around the idea of the automated home may simply ignore home computer products.

This examination of home control and telecommunications shows us how the continuing realisation of those earlier visions of the chip and the communications/computer revolutions related to microcomputer products. Many hobbyists, as well as some in the computer industry, attempted to re-orientate those early visions to make the micro the central object of attention. Home control and telecom uses were thought of as being some of the many possible applications of the computer. Indeed, there have been moments when chip producers and telecommunications agencies have accommodated to the existence of the home micro. In the case of games, telecom services have even been shaped by the trajectory of the home micro. Yet, these earlier visions have also remained in competition with future scenarios which have been orientated around the home machine. If product configurations which are not micro-centred eventually come to the fore, we may yet perceive the whole early history of the micro as constituting a brief aberration from wider dominant technological trajectories.

IMPROVED TECHNOLOGY OR THE DISSOLUTION OF THE MICRO

State-of-the-Art Technology

In the case of the BBC micro prototype, we saw how Acorn felt that the best way to make a more useful computer was to increase the general 'power' of machines. This was conceptualised in terms of devising computers whose processing speed was faster, giving micros more memory, adding better graphics and generally enhancing the range of facilities available on the machine. While this company has emphasised that path of development, the same general sentiment was broadly shared across the industry.

In later years, the design and marketing of Sinclair Research's QL micro largely focussed on the fact that it was the first micro to use the new 32-bit chip technology (83). Commodore also moved in the direction of stressing state-of-the-art technology with its family of 'Amiga' microcomputers. In 1984, the Warner Corporation sold the ailing Atari to ex-Commodore boss Tramiel. Since the new owner took many ex-Commodore staff with him, the two American companies adopted somewhat similar policies - as well becoming arch rivals (84). The new Tramiel firm has also chosen to compete on the grounds of technological excellence (modified by cost considerations) with its 'Atari ST' micros. Some new elements are included in the notions of power, and what counts as enhancement (85). But we can still detect an overall trend which focuses on and highlights the continued exploration of technological frontiers.

One addendum must be added to this, which involves a potential convergence with video technology. Videodisc machines were originally unsuccessful in their competition with video cassette recorders to achieve the status of the most popular form of video consumer electronic (86). The underlying disc technology nevertheless found one use in connection with micros as 'interactive video'. Here was a new

area of application, in which a micro controlled video images. Interactive video technology was initially used in arcade game and as equipment for training personnel (87). More recently, the BBC and Government effectively underwrote Acorn's further R&D in this area through their support for the 'Doomsday Project': an interactive video project aimed initially at the eduction sector (88).

Another product spin off from disc technology was the compact disc (CD): which was first used as a medium for audio recordings. More recently, that basic CD technology has found a function as storage medium for computer data: called CD-ROM (89). In this capacity, the disc's ability to enhance the memory of the original microcomputer product is very substantial. Many consider that this particular facet of improving the generalised power of micros marks something of a major breakthrough, giving a further lease of life to the home computer. CD-ROM certainly generates a good deal of enthusiasm in the computer trade press (90).

Having listed some of the possible directions in which the micro could develop, it is important to remember that the aim of this account is not to predict the details of the future. What is of interest is that considerable effort is still being devoted to the generalised up-grading of micros. This development is additional to the specific areas of application and computer identity which have been discussed throughout the chapter. For some analysts, up-grading remains the route to the infrastructural machine. It is a route which continues to emphasise the 'technology' of the computer (91).

Dissolution of the Home Micro

A somewhat contrasting scenario for the micro has already been glimpsed in the case of telecoms and control. This line of development entails the dissolution of a product called the home computer. As one recent academic commentator noted (92):

'It is quite possible that future home computers may be relatively "invisible". Not only will dedicated computers be built into appliances, but a device that is largely a computer may be thought of in other terms...'

Even by the early 1980s, we saw how the Commodore's advertising agency thought the home computer might 'die' as a product. The agency put the argument to their client, Commodore, that the computer manufacturer should reconsider its whole identity, its line of product development, and its conception the nature of the micro. KC explained (93):

'We ran two research studies for (Commodore)...substantial research studies... like £50,000 of research...that asked the question "What is Commodore?"..."What is happening in the world?" and "Where will Commodore slot into what the world's requirements will be? (It was like) the Shell "what if..?" scenario. "What if the oil well blows up in the North Sea and there's a revolution in Palestine...and this happens?" One of those kind of things, you know, "Where is the world going?" "How are people approaching technology?" "What is happening to lifestyles?" "How will technology impinge upon this lifestyle?" So Commodore could then say "We're not in the computer business...but look at the opportunities there...in technology" (...) What it means is changing from manufacturing keyboards to doing something else (...) What we were looking for were new product areas (...) I don't know what happened to that (research), because that happened right at the very end of the term that we had with them, but it doesn't look as though they've done everything with it (...) What we were looking for was new product areas...that's what the point of all that was...so that they weren't sticking with a keyboard business...'cos that's what they've got (...)'

The agency, in effect, was advocating a return to general chip based products. This did not refer solely to some smart home concept. For example, the advertisers suggested such products as computer controlled lawnmowers (94). Even within Acorn, whose identity has

been very firmly based around its ability to produce sophisticated microcomputer technology, some staff share a similar view about where the future lies. DC, who was on Acorn's marketing staff, commented (95):

'I can see a point where the micro as an object disappears completely and we start calling it something else...but in a different guise (...) I'm not sure we'll be selling micros as micro (...) New generations of micros will be tailored to do very specific things...'

These sentiments reveal the view that the whole area of electronics and communications technologies, which tends nowadays to be conceptualised in terms of 'Information Technology', can be configured in a number of forms both in terms of construction and marketing identity. Even CD ROM, which some see as opening a new era for the micro, could instead be presented as a totally new product form (96).

SUMMARY

Although this chapter has provided further historical detail, the aim has also been to initiate a first level of evaluation of the home computer product. I indicate the current status of this product, and how this relates to earlier developments. Subsequent chapters proceed to summarise issues concerning the gender identity of the micro and concerning implications for the analytical frameworks which have been utilised in this account.

While many of those outside the industry may have thought that the home computer had passed away as a fad, this chapter has attempted to show that a product by this name is alive and well. At the moment, there still remains a base of consumer interest in home computers and an industry structure which has built up some inertia, with producers who continue to fight for the existence of this product.

Yet, the home micro's immediate and long term future remain as problematic as ever. Its identity as a consumer electronic is unsettled and in-flux, as is reflected in the range of diverse producer initiative and prognoses.

Some of those in the industry believe that the dream of a 'real' home computer market, with a permanent, constantly used machine in most people's home, will not come to pass. They would argue that the home micro has become embedded in a different, narrower line of development once the product overlapped with another commodity: the video games machine. At worst, the home micro might eventually disappear if games failed to compete with other products from the cultural industries or if new microprocessor based products shun the label of micro. At best, more 'useful' micros, such as the latest Amstrad machines, may find a place only within restricted social circles. In contrast, those who are more optimistic, believe that by a variety of routes - such as business cross-over, or through technological enhancements - the home computer may yet realise some of its initial potential.

Thus, the key tensions revolve around the identity of games machine. On the positive side, games currently support sales of hardware, software and magazines. Yet, the emphasis on games undermines other possible identities for the micro. They have given rise to producer concerns that this lucrative market is nevertheless restricted, that there can be problems of seasonal sales, that the hardware products may be cheapened by association with toys, and that the product's life cycle may be limited, or its future always precarious, once it competes solely with other entertainment commodities.

All such evaluations are framed against a backdrop where producers feel that the home computer has more potential to overcome such problems if it could manage to achieve other identities. Although we have a number of specific suggestions concerning how this could be realised, these are often different guises for the broad notion of an infrastructural machines.

The point is, these concerns and debates are continuations of the themes noted in the earlier history. Some sociologists of technology have suggested a framework whereby technological commodities go through stages (97). Initially, there is some flexibility concerning how products might develop, and gradually 'closure mechanisms' operate to 'stabilise' the final product. If I had simply limited my sights up until the end of 1983, this characterisation of technological development would have appealed. The games micro seemed to have emerged as the most successful trajectory, while the infrastructural conception had been lost forever. This now appears to be considerably less clear-cut, given the on-going attempts of a number of producers to disrupt the games conception and realise the alternative which had apparently 'failed'.

In sum, this analysis of later trends indicates that we must return an open verdict on the long term future of the home micro. The games machines was only ever partially embraced. It has also been resisted. Thus, the existence and status of the home computer ultimately remains as controversial and problematic now as it did when the product first appeared.

CHAPTER 10: THE MASCULINE MICRO: ORIGINS AND POLICIES

In answering my general question concerning the origin and early development of the micro, I have emphasised the underlying conceptions of the microcomputer artefact. In particular, this approach provides a perspective through which to appreciate the role of producers' particular design practices and marketing policies.

It is through reconsidering these artefact conceptions in terms of gender that I now try to answer my more specific questions concerning the differential popularity of micros between males and females. Arguably, those differences in interest can be better understood by appreciating the overall history of these changing and contending conceptions, rather than through concentrating solely on the influence of particular advertisements, hardware design features or specificities of software. The latter may all be important elements, but they only constitute the parts of a the wider product ensemble.

Artefact Conceptions and Gender

The two key conceptions which in different ways have structured that differential interest are:

(1) The micro as self-referential machine. Here, the micro was represented and through design represented itself as being a technology to explore. While this conception was first developed by and represented to a particular community of male hobbyists, the hobbyist orientation to this product was then offered to a wider audience. In addition to considering the nuances of this technological identity in relation to gender, it is also important to note the ease or difficulty with which men and women could embrace computer hobbyism as an activity.

(2) The micro as a game machines. The gendered nature of this conception can only be appreciated through considering the earlier production and consumption of previous interactive games commodities. Here, the thesis has traced the changing nature of games texts, in relation to newly emerging conditions of production, and commented on the features associated with masculinity. More importantly, the history of consumption draws attention to the way in which young males developed a particular interest in games-playing as an activity.

The first part of this penultimate chapter provides a fuller overview of the history of the micro in relation to gender, expanding upon the above themes.

Gender in Producer Policies

The next sections examine the way in which hardware producers were conscious of gender in their overall planning of target audiences. Through this, we can then appreciate how these agencies translated this awareness into specific features of their marketing campaigns and of their products.

I examine these processes first through exploring the marketing strategies of hardware manufacturers. In particular, I examine how these polices were operationalised via advertising, where there appeared to be a more articulated and developed consideration of gender (1).

The second study examines the way in which software publishers handled the issue of gender in relation to computer games . This provides an opportunity to further illuminate those earlier critiques of arcade games with evidence drawn from the more recent history of the micro.

ORIGINS OF THE MASCULINE MICRO: A SUMMARY

The Hobby Micro

The first micro product appeared in hobbyist form among mainly male enthusiasts whose previous interests and experience lay in electronics and computer programming. Earlier chapters showed some of the efforts, especially in hobbyist magazines, to construct the micro as the new technical and programming challenge for these audiences. For these male enthusiasts, the microcomputer was simultaneously a technically difficult electronics project and means of access to the cutting edge of high technology. In appearance, in capabilities and in terms of the technical skills required to operate them, many of these early micro products reflected their status as hobbyist equipment. These computers constituted the earliest forms of self-referential machine and, as texts themselves, they appeared to anticipate a select male audience.

In addition to considering these representations of the hobby micro, the thesis has also employed a structural explanation to account partially for the fact that most of these users were male. That is to say, I discuss the conditions under which it was feasible for men and women to follow up such an activity and form of consumption as computer hobbyism. Arguably, gender relations structure leisure activities in such a way that it is likely to be a good deal easier for men to justify engaging in such hobbies as computing than women. It is this argument which also needs to be borne in mind after the early phase of hobby computing, when interest in exploring and keeping up to date with technology diffused to a wider audience.

The Home Micro as Self-Referential Machine

Once some hardware producers started to consider the possibility of a wider mass market for the computer as a consumer electronic, there was the chance to break away from an association with mainly male hobbyist users. A few of the larger manufacturers were still willing to cater for the existing market among enthusiasts. But at least one major player, Texas Instruments, favoured an infrastructural machine which was to be intentionally distanced from hobbyist products. In other words, a self-referential home micro was not an automatic progression.

In practice, when this 'home computer' finally made its appearance in Britain, the linkage with the hobbyist machine was not broken but instead confirmed. This was achieved mainly, but not exclusively, through the efforts of Sinclair Research. The company's self-referential machines invited buyers to explore the world of computing, while advertising stressed the need to keep up with developments in the technology. This policy of preserving much of the hobbyist orientation was reflected in the functional design of the machines, in their appearance and in Sinclair's marketing. It was this producer strategy which helped to preserve the continuity of a mainly male audience.

The BBC's Computer Literacy Campaign somewhat de-emphasised the hardware, while stressing that this new area needed to be the concern of everyone. Those efforts possibly contributed to certain manifestations of interest among a female audience, as exemplified by the attendance of classes on the new technology. This interest appears to have been greater than in the 1970s period, though it was still the case that very few women participated in hobbyist clubs. I attempted to account for this particular feature by reference to some of the specificities of club life.

That Literacy Campaign and the Government initiatives in schools to some extent reinforced the appeal of the self-referential machine generally, and by so doing also attracted a wider male interest. By now, most producers mentioned, or indeed stressed, the 'need' to keep up with technological developments. The self-referential conception of the micro was to remain an undercurrent, even when producers had started to promote a more infrastructural machine, and when male younger users had appropriated the micro predominantly for games-playing.

Aspirations for an Infrastructural Machine

Most manufacturers retained the longer term ideal of a infrastructural home micro which had multiple applications and was in regular and frequent use. They aspired to a computer which would find a permanent place in the home, slotted into the routines of everyday life. In practice, there were various difficulties with implementing telecommunications and control functions in the early years. Thus, a more restricted type of machine was initially promoted: the software player. As noted in the last chapter, the infrastructural machine currently remains the goal of many producers, although they have a variety of strategies for how best to achieve success with this conception.

In terms of gender, manufacturers usually envisaged such an infrastructural machine as being used by all the family, and not just by the males. My argument that the longer term identity of the micro remains unsettled implies that it is always possible that this conception may yet come to the fore. In which case, the association of home micros with male users must be seen as being open to change.

Interactive Games and Gender

So far, we have examined the artefact conceptions which were implicit in the policies of hardware companies. In addition to these, the home computer displaced another product: the video games console. In so doing, the micro realised yet another identity - that of games machines. Hardware manufacturers, on the whole, always have remained deeply ambivalent about this conception of the micro, although they have taken opportunity from its success. The second half of this thesis was largely devoted to tracing the origins of games and charting the development of these products, especially in relation to male audiences.

Electronic games have evolved through the multiple and interrelated lineages of the mini- and mainframe computer games, arcade operations and video game machines. It is important to appreciate the connections between these lines of development not only to see why games have taken the form which they have, but also to understand how games-playing as an activity has been structured in terms of gender.

The origin of these games lay in a particular male culture whose members, in many respects, shared the outlook of later computer hobbyists. The participants in this community took pleasure in exploring computers and other systems. That setting, and the other interests of early hackers, had shaped the genres of the very first games in terms of scenario and action. Both in those early days and later, the existence and diffusion of games was legitimated by their other roles as vehicles for developing new types of computing, for learning about these machines, for diagnostic purposes and for demonstrations. Through this computing route, playing and constructing games came to be an accepted dimension of male hobbyist activity.

The second lineage through which games emerged was in the arcades, as a replacement for pinball machines. Entry into this context, with its

pre-established participants and rituals, continued to establish the product as an object of mainly male interest. In this setting, the audience was predominantly young males. The association of the latter with these games was reflected in the way that fears about masculinity and male youth were displaced into concerns about the games themselves. Once again, the context had a bearing on game forms, in that the fast action style of games was promoted. This gave rise to an experience paralleling that of the pinball predecessor. The emergence of games as the object of a cultural industry reinforced the way in which knowledge of the latest releases, together with playing skills, provided a public currency among male participants in this arena of public life.

The third lineage, culminating in the programmable home video games console, provided the commodity which was the first implementation of the games machine conception. Yet, many of its manufacturers hoped that eventually this route could led to a wider ranging software-playing machine. In other words, these producers saw this product as way to realise the more infrastructural machine to which later home computer manufacturers were to aspire. While the early video games had a different origin from that of computer ones, the process of transferring hits from coin-operations ensured that the form of video games also became one which was identified with masculine preferences. When we look at the activity of video game playing, the argument of this thesis is that we find more interest among young males than females because of both the previous and on-going collective experience of young males on arcade machines.

The Micro as Games Machine

With the arrival of home computers, both hardware manufacturers and the hobbyists who were familiar with games were willing to supply computer games amongst other types of software. Once the extent of demand for games was appreciated, cheap and available cassette

technology enabled entry of many small producers. Eventually, a restructured and well established computer games cultural industry evolved which has constantly promoted games playing as a form of computing activity.

When we ask what created that degree of demand, the argument is essentially the same as that with video games. In fact, since the latter made far less impact in Britain than in the US, the home computer provided the first access to a games machine for many users (2). The arcade culture had set the scene for games, which were now additionally sanctioned by hobbyist legitimations. Meanwhile, the magazines which slotted into a male orientated press became an important part of the marketing mechanism for these games, and further supported the public currency of games amongst boys.

As a caveat to the main drift of the explanation, I have also demonstrated that some interest has been shown among girls and women in arcade, video and computer games. It was important to make this point. Female interest has been rendered invisible both in the views of some producers and in some textual based feminist critiques of games.

However, this female audience is usually not the definer of game purchases, and is generally less visible (3), being absent from the public sites which boys often appropriate in the pursuit of their games interests. The girls are often to be found playing in the private setting of the family, and they take little part in the magazine world which is so important in sustaining a public interest in this activity. That low key presence can be conceptualised as constituting a somewhat different experience of consumption compared to boys. This provides a basis for the claim that the ascendancy of the games machine conception continues to give masculine connotations to the home micro product.

GENDER IN THE POLICIES OF HARDWARE PRODUCERS

While this thesis has prioritised examination of the core conceptions of the home micro, these underlying models have throughout been related to the different specific features of the product ensemble. I have referred to the design of hardware, to its appearance, to adverts, and to the nature of software at various points in this account. However, while these features have performed a valuable illustrative function in this history, it is important to note that there is far more to be said about these various constituents of products than can be attempted in this project. I now wish to demonstrate this point by considering some of the factors which shaped the advertising of microcomputer hardware.

Such a focus has the merit of raising, for the first time, the question of how producers were conscious of gender. This section draws on the limited range of producers' comments concerning possible male and female users, roles and interests which arose during the course of my interviews. In particular, more attention is devoted to gender and the infrastructural machine precisely because it was this vision which some producers saw as challenging the masculinity of the micro.

Expected Users of the Self-Referential Machine

It is hardly surprising that the companies who produced early self-referential machines assumed that the hobbyist target audience would be male, given that this was a pre-defined market with practices which pre-dated the production of machines like the ZX80. The question arises as to why Sinclair Research and Acorn assumed that the new, wider market was also likely to be a mainly masculine one.

Part of the reason lay in the companies' previous experience of mass marketed electronic and chip based products. Clive Sinclair, and with him some of the Acorn staff, had previously sold commodities on the basis of being a novel technology for users to try out - the most successful example of which was the calculator. On the basis of this experience, Sinclair himself regarded men as being 'naturally' more interested in such a product (4).

Some staff anticipated a more specific male audience drawn from those people involved in maths, science or engineering fields (5). Acorn's Atom was only partially a self-referential micro, as it could also be used as a tool. UD described the potentially wider audience who might use their micro as a technical tool, where we can again detect echos of the personal calculator (6):

'(...) We were aiming more at the hobbyist or the sixth-form science schoolboy...or the technical person, the electrical engineer perhaps, who needed a computer all in one package and a bundled language ready to go which he could use as an introduction to computers for himself...(for) personal education, in order to complement perhaps new activities and things that were occurring in the workplace.'

Reflecting on the considerable sales of micros UD added:

'(...) You'll find that every sixth-form school boy in a science type subject has got a personal computer now and can write programs.'

Hence, these producers not only foresaw a male audience because they looked back directly to the hobby micro product. The anticipation of future male users in the circuit of production involved a process of looking further back to the patterns of consumption of earlier commodities with which the micro could be compared.

When we turn to the advertisements for these early machines, neither Acorn nor Sinclair Research visually represented users, thought Sinclair's constant reference to 'Everyman' signalled the male

autodidact who had been addressed a few decades ago by contemporary encyclopedias and D-I-Y books. As we might expect, the adverts which appeared in the computer press were geared more clearly to hobbyists as revealed by the codes of technical language with which readers were expected to be familiar.

Occasionally, that technical jargon even found its way into the national press ads which were aimed at a wider audience. In these cases, the technical detail was kept as a separate part of the advert. But mostly, the ad copy in the sunday supplements tried to explain computing terms without such esoteric codes. These adverts seem to imply a gendered reader only at the level of advocating the exploration of technology. It was the other aspects of marketing which more explicitly associated these early machines with males. Sinclair Research's very PR policy of using hobbyists to promote their product added to the public visibility of these male users.

Sinclair's first micros were very clear-cut examples of the self-referential machine, whereas the theme of computer literacy became only one part of the identity of later micros, just as it had always been in the case of Acorn's product. Without access to more detailed knowledge of advertising strategies, it is difficult for me to judge the influence of this self-referential conception. Yet, it would appear still to be present, even within advertisements depicting a more familial, infrastructural machine . For example, a key target audience for the later BBC machine was the 'Menopausal Man'. Acorn's advertising agency defined these users as 'married men, fathers between 30-45, who fear that there existing power and control over events is under threat because their knowledge is being outpaced by the new technology' (7). In other words, it was males who were seen as being under pressure to keep up with innovation. Thus, within adverts representing the whole family sitting around the micro, part of the rationale for the portrayal of fathers in a leading role derives from this self-referential undercurrent.

The Family Orientated Infrastructural Machine

At first sight, marketing a family-orientated infrastructural machine would seem to depart from hobbyism and the masculine self-referential micro. Advertising continued to acknowledge gender relations in the sense of anticipating that different familial members may have different preferences as regards usage and software. This parallels expectations within the television industry concerning a gender based diversity of taste in relation to choice of TV programmes. Thus, for example, Atari ads announced that 'Dad can play real or imaginary business games, Mum can swot up on her languages for the next holiday and the youngsters can play any amount of games or get help through the educational programs.' Obviously, this plays on gender stereotypes. But, at least these advertisements stress some equality of use, in that the micro was not the possession of only some family members.

If we draw on the analogy with TV programmes a little more, recent research has focussed on issues of power and control of the television and video (8). The work of Morley and of Gray has sought to demonstrate that apart from the way in which gender relations structure programme choices and viewing styles, it is the father who tends to control the programmes which the whole family watches. Males also exercise expertise over the features designated as technologically complex, such as the timing devices on videos. This does not mean that we can talk of the TV and of the video as simply being masculine technologies. But this research indicates we cannot hold assumptions about some simple balance of power shaping the experience of these consumer electronics.

Compared to the self-referential machine, the conception of the infrastructural machine resists any simple identification as masculine. Neither can it be designated as being somehow 'gender-neutral'. In practice, the issue is more complex, as will be indicated in this section. But, in contrast to the above consumption-based research on

TV and video, the production orientation of this thesis means that my approach to unpacking the various elements will be through questions about gender in marketing policies.

A preliminary point which needs to be made is that producers do not appear to view consumer electronics in general as solely an item of male interest. This was illustrated in a discussion where KC, of Commodore's advertising agency, was comparing their own strategies to that of Amstrad (9):

'*(...) If you take the front off an Amstrad hi-fi there's nothing behind it. It's just a couple of wires...and nothing. But it looks good, because it flashes and winks and blinks at you (...) and in the brown goods business it's known as a "mugs eyeful"...because the lady from Scunthorpe will buy that, put it is in her front room, buy 3 records at Christmas and invite her neighbours in to say "What do you think of my new hi-fi?" Doesn't matter what it sounds like 'cos the lady who's looking at it doesn't know (...) but it looks good, it looks expensive (...)*'

While women may be interested parties, in the context of a household and its attendant relationships there are still issues over who has power to determine the purchase of such electronic goods. KC, of Commodore, explained how it was the father who was a key definer of what consumer electronics were bought (10):

'*If you take the average home, the items in the kitchen, the "white goods", as they're generally referred to, tend to be the major purchasing decisions of the woman. The technology and the gadgets, the television, the video, the stereo...and the computer...in other words, in the living room, tend to be by the man. He makes the prime purchasing decision (...)*'

In CK's eyes, this adult male is a prime target for the whole category of 'brown goods'. A somewhat similar point was made by Acorn staff.

Apart for their notion of the menopausal man, fathers were important by virtue of their influence over of family finance. UD argued (11):

'(...) You've also got to bear in mind: at the end of the day it was always father who paid. So if you could attract a certain...um...there had to be something...something in there for him. I think we were conscious of that, yes.'

While it is beyond the scope of this thesis to assess any such claim about the actual role of adult male buyers, this perception of fathers' key role was certainly broadly shared throughout the industry and conveyed in market research (12). Of course, where companies also targeted adult males as being just the type of people who were feeling 'left behind' by the Information Technology revolution (13), there was a basis for coherent advertising strategy in which the father was addressed.

It was male children who constituted the other, and possibly more important, audience to be attracted. Both market research and the producers whom I interviewed referred to the 'nag factor'. This term reflected the view that children, especially boys, 'motivated demand' and pressed their parents to buy the micro (14). Taking this viewpoint, Atari saw their prime audience as families with two sons aged between 11 and 16 years old (15), while Commodore initially defined fathers and sons as the key figures behind the micro purchase (16).

So, we can see how gender had entered into marketing policy, and how producers felt that it was simply a commercial reality that some of the appeal had to be addressed to these male figures (17). However, the fact that the father and son were targets, in itself, does not determine just what the nature of the appeal should be, and how the male and female audiences should be represented. It is to these images, and to the ideas which informed their composition, that I now turn.

One of the more common representations in adverts was that of the family gathering around the micro. Even the advertisers acknowledged that this was a myth (18), in that for the majority of the time the computer was used by individuals without other people standing beside them, and the only time the whole family gathered might be when the new machine was first unpackaged. In these scenes, it is the male figures who mostly are in the key roles, with father or son operating the machine, while mother and daughter observe with interest, and perhaps with admiration. This is true whatever program is shown to be running on the screen.

When only one person is depicted, it is more likely to be the boy, and when two figures are shown, it is usually father and son. In fact, Dragon even ran the ad copy which read: 'like father, like son' (19). Thus we have not only a higher representation of males but males in a certain power relationship to other family members - that of demonstrating expertise. While this can work both ways between fathers and sons, with either taking a leading role, I have yet to encounter an advert in which a female figure demonstrates computer competence to a male one.

At one level, the appeal to males has been organised to play upon the theme of masculinity and expertise, where competence with technology is an enpowering force within the gender relationships of the home (20). In addition, arguments that masculine and feminine product identities are in opposition to each other seemed to have some currency within the industry. One piece of market research noted (21):

'Glen Smith, a child behaviour expert who advises advertisers on how children think, has observed that the computer industry dare not market to girls as well as to boys from the start, because if they did, boys wouldn't touch the product with a bargepole, they'd think it sissy'

The influence of this assumption was also mentioned in one producer interview (22). The argument is basically that if the micro has a

feminine identity, this would be a strong deterrence to boys. As we shall now see, some producers attempted to encourage female users. Presumably, this deterrent effect was not thought to operate so strongly in the other direction, whereby masculine micros would alienate girls.

Having noted the place of males in the ads, it is important to add that many producers were also concerned about female audiences and felt it important to represent them. Therefore, apart from the way female presence is structured in the 'family gathering' adverts, there were pictures of girls alone with the machine, and of daughters with mothers.

A first motivation that led to these representations was one of principle, of concern about sexism. The ads for the BBC micro were especially conscientious in this respect, reflecting discussions of the issues within the corporation (23). One qualification that has to be made is that publicly expressed concern about gender may turn mainly into a public relations exercise. For example, Acorn carried out some research on gender and use of micros and it was widely reported that the company was trying to tackle this issue (24). There may have been some further initiatives at Acorn, but that concern does not seem to have percolated very widely through the company. Both the R&D and Marketing staff to whom I talked did not recall that the question of gender had ever been raised in any of the management discussions which they had attended (25).

A second motive for representing women derived from a view that females had at least some role to play in the family purchase of brown goods. QX, of Atari's advertising agency, noted (26):

'Family finances being what they are...I think women tend to have rather more control over those than a lot of people would like to think (laughs) ...um...yes, I think there was an important job to be done against women (...)'

Thirdly, and perhaps most significantly, it was important for women to be represented if the infrastructural micro was supposed to be a familial machine. QX continued her point about having to persuade mothers in particular:

'I can't remember how much these things were in those days [£400]...Yes, I think women did have to be persuaded that this thing was not, you know, dad and the son just indulging themselves. I think there was sort of...family commitment, if you like, to them. If it was the family buying a computer ..I mean, if it was just a chap on his own, that's not a problem. But I think if you introduce it into a family (...)'

Commodore similarly felt that the male interest via computer literacy and games created a problem for the family image. They shifted policy in their ads to try to combat this. KC explained (27):

'The home computer was the family's present...and that's where the Atari ads come in and our later ads (...) We homed in more on the whole family in our later work. (The micro) was a present for the whole family. So you could spend £300 on it, but it was a good £300, because mum could do something with it, and so could dad, and so could sister (...) We said "of course boys will buy it...and we wouldn't want to stop boys buying it. But if there's an opportunity to take some business out of the female population, shouldn't we try that." And what was also happening was there was a lot of comment about the anti-social nature of computers at the time...that the boys and their dads were playing on them day-in, day-out...and the rest of the family never got to speak to them (...) And we said "Well...let's make it a family product so mum could get involved as well...and so could...little Ann, or whatever her name is (...)'

Thus, one general policy involved combatting any representations of isolated boy games-players or of Hacker characters. This was also part of the rationale for the 'family gathering' type of advertisement.

Finally, some adverts were planned which aimed specifically at women. For example, Atari's advertisers devised such an advertisement which was never released due to the fact that the American company cancelled its contract with the agency (28). More usually, the concern to attract a female audience, (or be seen to do so), was made manifest through the software which firms commissioned. Companies such as Acornsoft and Atari released 'home interest' software on themes such as weight-watching, gardening and recipes (29). Meanwhile, part of the motivation behind Commodore's art and music packages was that these were not only forms of non-game entertainment, but they were also entertainment applications which were seen as being more neutral in gender terms (30).

In interviews, producers normally explained differential interest amongst men and women in terms both of 'natural' roles and of socialisation. Often, these gender relations were treated as a simple reality to which producers felt they had to conform. Yet, while some felt that the micro was inevitably a masculine product, others made limited attempts to break away from these gender connotations. From the above examples, we can see that at the same time as some producers were trying to expand applications in order to counter the narrow image of computer as games machine, they were simultaneously attempting to expand away from a male user base.

GAMES AND GENDER: PRODUCER POLICIES

The other area which I have chosen to examine, as a means of investigating how producer awareness of gender issues entered policy, is the production of computer games. One justification for selecting this field as an illustration is that games-playing is still a very significant application of the micro and would appear to be a well established sector for at least the immediate future. In addition, games software continues to be the subject of the feminist critiques which were first outlined in the discussion of the arcades (31).

Most of these analyses lack the theoretical sophistication of current feminist critiques of other media (32), although they draw attention to the myriad ways in which a majority of products on release could be described as being orientated towards males. These critics note that the most common game forms such as war, sport, and science fiction can be seen as being masculine genres (33). On-screen, predominantly male protagonists enact stereotyped gender roles (34). Meanwhile, the written in-lays and instructions which frame the games, frequently address an explicitly male audience, in the same way as does the artwork of the cover and of advertisements (35).

However, it should be pointed out that there is at least some debate over these issues within the industry. A few producers are conscious of gender issues, and arguments within the trade press reflect many of the basic criticisms outlined above (36). Most of these trade debates are framed in terms of questioning the representations of masculinity and femininity which are portrayed to a male audience and which, by so doing, reinforce a 'sexist' world. An example of this is the questions raised about soft pornographic representations. As a form of politics, this is laudable in itself. But, while being relevant to the question of deterring or encouraging a female audience, the framework of these debates does not directly address this particular issue.

Certainly, some of the producers whom I interviewed would agree with the assumption that girls are deterred by such aspects as the scenarios and the forms of action in game products. In practice, the earlier chapter on youth and games endeavoured to show that this is too generalised a claim. We should also note the consequence of such a producer analysis. Because of this assumption, hardware producers in search of the family audience, seem to have virtually abandoned games as a potential means of encouraging female users. As we saw, they concentrate more on the promotion of other uses for the micro (37). Clearly, such a decision leaves intact the gender connotations of the games machine.

In contrast, a variety of software publishers, as well as some magazines, have adopted some more positive strategies to meet these criticisms of games and even to encourage female players. At this point, I wish briefly to point to some of the software initiatives that have been followed. This by no means entails an exhaustive list of approaches (38). Nor will I analyse particular games in anything like the depth given to film and TV productions, although such a form of research is desirable. The aim is rather simpler: to address the criticisms of games in their own terms, and to provide a small corrective to view that all games have been addressed uncritically to boys alone.

First, there have been a few examples of games explicitly aimed at a young female audience. Some were even entitled 'Games for Girls'. These have tended to be geared to stereotypes of girls interests, such as a show-jumping game. A number of those in the industry regard these as patronising (39). Since most producers still view males as definers of game purchases, this approach has not been widely adopted. Indeed, in terms of sales, such games have had little success. A broadly shared view of the current commercial viability of products is summed up by MB of Bubblebus Software (40):

'*The thing is...if you produce a game aimed directly at girls or women, how many would you sell? (...) You see, we're all into making money.*'

A second, and the most common, tactic involves no change in the main genres of game. The plots, the settings and the forms of game action (eg 'aggressive') remain 'masculine'. Instead, the surrounding texts are constructed so as to avoid specifying the gender of the audience or of the protagonists in the game. This is usually achieved at the level of the in-lay wording (41), but it can also be managed in the artwork, for example, where the sex of the protagonist is not depicted or is rendered visually unclear (42).

The third main strategy involves evoking themes and scenarios which are less easily attributed to masculinity. Alternatively, features of

game content may equally address girls as well as boys. A relatively rare example of the latter case is a game where the player was allowed to choose the sex of the protagonist at the start of play (43). Different plots and genres are the more frequently used devices, as FC explained about Imagine's games (44):

'We tried to bring out games that were more broadly acceptable to a wider audience. We deliberately aimed at the female audience with "pretty games". We did one called "Ah, Diddums" which is where you are a teddy bear in a toy box. And we did one called "Wacky Waiters", where you have to serve a customer in a restaurant, with lifts and things (...) Most of the Imagine product was non-aggressive, which is quite a lot when you consider that 95% of games software is aggressive (...) you know, in terms of shooting (...)'

Such humorous or 'novelty' games, many of which were not created with the debates about gender specifically in mind, have been noted as being a peculiarly British offshoot, in contrast to more uniformly heroic style of American software (45). In addition, the search for sources of innovation through licensing from other cultural industries has led to the adaptation of T.V. soap operas and quiz programmes to computer games (46). In the context of television, these types of programme have been cited as being women's genres. Yet so far, while we lack detailed information of the level of sales and about the playing of particular games, it would appear that there has been no substantial shift towards a different pattern of consumption. Even Imagine's games were still bought and played mainly by males (47).

The initiatives outlined above, as well as other tactics (48), are to be welcomed in terms of sometimes challenging more traditional representations of masculinity and femininity. They also help to broaden the medium generally. Policies which are conscious of gender may even constitute steps leading to further experimentation, enabling pleasures or raising issues which relate to women's and girls' experiences (49). However, in the light of my analysis of how games-playing as an activity developed, there must be doubts about the

degree to which changes in games as texts, by themselves, can alter the balance and form of interest among males and females in game-playing.

SUMMARY

This first section of this chapter brought together the points raised about gender and the micro that have extended over the thesis. These include production, textual and consumption based analyses. The complex structure of this narrative, both temporally and in terms of forms of explanation, warrant such a summary. Hopefully, the coherence that may be lost through the very act of employing multiple levels of analysis is compensated for by this more global picture of the micro product.

I reasserted how the gendered nature of artefact conception was central to my arguments concerning male and female interest in micros: with particularly important roles being played by the self-referential and games machines. One corollary follows from this emphasis. If it was felt to be desirable to change the current masculine identity of the home micro (50), we would need to adopt a policy on the product as a whole, and one which was sensitive to this history of production and consumption. This would be in contrast to devoting too much energy to what might be relatively more peripheral changes: for example, to simply changing representations of this commodity.

Remaining sections of the chapter highlighted producer consciousness of gender and how this entered into policies. First, we glimpsed some of the very specific theorisations about gender relations which structured the efforts of advertisers. One observation which emerges when we examine this layer of producer activity is that any representations of an infrastructural micro have to be analysed with care - in many cases, the primary purchaser and user was still seen as being male.

The main point of this section, and to some extent the one on games, is that it reveals some of the boundaries of even such a wide-ranging projects as this thesis. Here, we see how a adverts - a feature of the product ensemble - were clearly determined by yet a further range of considerations which must remain underdeveloped in my main analysis (51).

Finally, the discussion of gender policies relating to games returned to a key theme of this thesis: that the history of consumption has also played a part in determining differential gender interest as well as the nature of games texts. I have not been averse to employing textual forms of analysis, especially in the early discussions concerning representations of technology. Yet, particularly in the case of games, the evidence from the history of interactive games, from my discussion of youth and micros, and now from this later history of computer games suggests that on the issue of gender and interest, a focus on games-playing as an activity rather than games as texts has more explanatory power.

CHAPTER 11: CONCLUSION

Theme One - A History of the Home Micro

The first aim of this thesis was to produce a history of the development of the home computer. I originally asked why the home computer appeared as a consumer electronic in Britain and why, in terms of the whole product ensemble, this family of artefacts took on certain specific forms. To date, there has been no academic history of the home micro, nor of interactive games. This thesis aimed to fill those gaps.

However, the account was not intended to provide some simple overarching conclusion about whether the appearance of the home computer was desirable or not. The analysis is multi-layered and its analytic tools are borrowed from diverse sources. This approach attempted to capture the complexity of the processes at work, to achieve a rounded overview of this history, and to address the range of interrelated issues which were formulated in the introduction. Beyond my own questions, I hoped that this account might inform some of the other current debates which were outlined in the introduction but which are beyond the scope of this project.

Succinctly summarised, this history argues that:

> **The early development of the home computer as a consumer electronic in Britain can best be understood through appreciating the existence of different and contending conceptions of what what the micro could be. In addition, the historical relationship between the micro and electronic games helps to explain the increasingly dominant identity of micros as games machines. In contrast to views of the micro role as being that of a solely utilitarian tool, different producer conceptions of this consumer electronic saw a place for some leisure functions for this**

artefact. However, a tension has existed throughout between the more serious roles envisaged for the micro and its application for entertainment, chiefly games-playing, purposes.

The first task of this conclusion will be briefly to highlight some of the key points of the account, providing correctives to popular interpretations of the development of this product. This is additionally important since such misleading interpretations have informed more critical analyses.

Theme Two - Gender and the Home Computer

The second concern of this thesis was to explain differences in the apparent popularity of the micro amongst males and females. A number of analysts had characterised the computer as a masculine technology. Out of all the possible issues in relation to which the micro could be theoretically located, I focussed on this one in particular. Therefore, at various points in this account we have paused to consider what qualities of the home micro or what features of its introduction might have encouraged or enabled greater male interest. This concern about gender was important in prompting some examination of consumption, within an account mainly devoted to documenting the history of production. The last chapter summarised the account of gender and the micro, and so apart from a very general point later in the conclusion, this theme will not be dealt with here in this chapter.

To summarise the key themes relating to gender:

One conception of the micro, that of the self-referential machine, played a part in initially identifying the home computer as a 'masculine' machine. The role of the micro as a machine to explore computing, which was promoted by agents such a Sinclair, helped to maintain a continuity with a hobbyist orientated interest in microcomputing. Games provided the other, very

different, influence which structured differential gender interest in the home computer. In particular, the initial development of games within the arcade setting gave games-playing a currency among sections of male youth the continuation of which can still be found in contemporary experience of home computer games.

Theme Three - Frameworks for Analysing New Domestic Technologies

The absence of a history of the micro is symptomatic of a more general lack of analysis of recent domestic technologies. Even within the literature on innovation, the emphasis is on capital goods and there has been little work on consumer electronics. There has been some research on technologies and domestic labour in the past, and on major developments such as the telephone and broadcasting. But, there has been little work on more recent chip and communications based technologies apart from the exceptions noted in the introduction. Meanwhile, although analyses which could be located under the umbrella term 'cultural studies' provide some analytical frameworks which could be used to examine new technological products, there has so far been little attempt to actually apply those frameworks to this field.

The third, albeit subsidiary, aim of the thesis was to explore the way in which these analytical tools could be employed in formulating an account of domestic technology. The bulk of this chapter is concerned to evaluate such questions concerning theory and method. A summary will be provided at the end.

REFLECTIONS ON THE HOME COMPUTER HISTORY

Point 1: Non-corporate Origins

Many previous studies of innovation, such as the histories referred to in the introduction, have concerned products and services which originated from large corporations. Indeed, in the course of my research, I have encountered the view that home computers were simply the latest offering developed by big business.

This history shows how a potential consumer electronic could originate outside of large capitalist enterprises. The home computer was no natural progression from the existing products of either the semiconductor or computer industries. In fact, the home computer may be unusual even amongst domestic technological products to the extent that the micro was initially conceptualised by many as being an 'alternative technology' (1). However, several substantial corporations soon saw profitable possibilities in this hobbyist product, some believing that the microcomputer could be a lucrative mass market domestic electronic.

Point 2: Particularities of the British Context

This is not a comparative study, so there are limits to the analysis of the peculiarities of the British context. However, I have identified economic constraints which meant that popular versions of the micro in this country were often cheaper and had more limitations than some of their American counterparts. In this context, together with an understanding of Sinclair's corporate history, we can appreciate how the earliest form of the micro in this country sold on the basis of aiding computer literacy, and how this undercurrent

remained significant even in the later machines which had wider possible applications.

Point 3: 'Real' Computers versus 'Toys'

It is important to note that this self-referential machine constituted a different underlying conception to an infrastructural one. Critics of Sinclair, including some of his biographers, saw the products of Sinclair Research as setting low computing standards in Britain by virtue of being such basic machines (2). In contrast to this view, I argue that Sinclair machines were not just limited version of those 'real' microcomputers which did 'useful' things, such as making some labour processes easier. Instead, they were mainly geared to the different goal of allowing an exploration of programming.

Point 4: 'Useful' Micros

The more utilitarian forms of analysis which were noted in the introduction might well not appreciate the 'fun' of computing as being 'really useful'. However, the search by companies for more serious applications always sat in some uneasy balance with promoting the computer as a source of pleasures. From the start, the bigger companies in the field had intended to release some entertainment software. Promoting the fun of computing was the less serious counterpart to keeping up with the information revolution. Of course, games-playing eventually became the chief type of entertainment which the micro provided. Yet, that relation between serious and pleasurable uses contained a tension, with fears that the latter applications might become dominant, reducing the status of a micro to that of a children's toy.

Point 5: Games as an Aberration

Games were no sudden aberration from the 'real' destiny of the home computer, in the broad sense that there had always been some general entertainment role for the micro. In addition, the history of the various games machine lineages reveals more intimate connections with the microcomputer product.

In the mid-70's the programmable machines had also been seen as possible software players, just as micros were. By the 1980s, industry analysts and producers were very aware of a possible convergence of the products, and started to perceive the home computer and video games consoles as being in competition. And while software and magazine initiatives were clearly important in establishing computer games, games-playing had already achieved a role in the 'leisure' of many youths. Some commentaries suggest that games came to dominance not simply by default, because of a lack of more powerful machines or of really useful software. This is not so. There were more positive reasons for the emergence and popularity of this application.

Point 6: The Demise of the Home Computer

Lastly, this account has provided some qualification to the view that (a) the appearance and 'boom' of the home computer was unique and that (b) the product has now died away. The idea of a multipurpose machine existed earlier, in aspirations for the programmable games console, and even now remains a theme in some of the hopes for future products - whether they be called computers or not. Yet, the tensions which we have noted in the early history still continue.

FRAMEWORKS FOR ANALYSING TECHNOLOGICAL PRODUCTS

While the thesis has drawn on a range of analytical tools, the background methodological structure was derived from a particular overview of cultural studies approaches contained in Johnson's article. His circuit of production provides a fairly abstract model of how one might examine cultural objects. The first task of this section therefore is to elaborate that model in the light of the home computer history, with the further intention of drawing out the elements which might be used more generally in the analysis of technological products.

The approaches and concepts derived from other sources are also reconsidered for the contribution that they might make as tools and frameworks for understanding the the nature of these products. Through reviewing these tools and perspectives, I highlight where my own emphases lie, why certain paths were followed, what could be further developed. Ultimately, this puts into context the limits and partiality of my analysis.

a) The first section restates some of the propositions regarding the elements which constitute a product and production. This is coupled with examples from my history, illustrating the aspects of production which have been stressed in this account. Although this thesis does not take as its central reference the literature on technological innovation, the development of the micro could be considered in that light. Therefore, I briefly indicate some implications of my conceptualisation of products for analysis which is framed in terms of innovation. Lastly, there is a discussion of the interrelationship and interdependence of products. This justifies the focus on the hardware, software and magazine products covered in this history.

b) Second, I consider the relationship of different moments of the circuit of cultural production and of its cycles over time. This includes examining how producers read consumption, how producers refer

back to past products in their current production, and how we might look at consumption histories. Although some themes are only glimpsed in this thesis and are not fully developed, they can nevertheless stimulate further questions for research.

c) Third, I reconsider the use of the concept of technological paradigms and trajectories in the light of account of the micro. This entails specifying the status of my term 'artefact conceptions' which is derived from some of the literature on technology.

d) Fourth, the sub-section starts by noting the flexibility of both technological structures and of representations of technology. This has a bearing on how we approach histories of such products. Next, I consider how domestic technologies can be located within multiple sets of theoretical issues, especially when the artefacts have a variety of identities as in the case of the micro.

d) Fifth, we have one final point about gender and technological products. On the one hand, it is possible to position some of the arguments in the thesis in relation to literature on technological identity and gender. However, it is also important not to let a focus on technology totally dominate our approach to products. I indicate the role which other approaches to the micro have played in this history.

Products and Production

(1) Products

It was argued in the introduction that technological products consist of more than physical objects. This is a theme which would be recognisable to many producers involved in such areas as marketing. It is certainly a principle which we can derive from a range of

theoretical frameworks, including the cultural studies ones upon which the thesis draws. In particular, writings from the latter academic base have paid attention to the representational work involved in production. The thesis has drawn upon this approach in outlining how micros were represented as hobbyist machines and as consumer electronics.

Analysis of representation has involved more than just a consideration of advertising. Representational activities are entailed in a range of marketing practices, as we saw in the way Sinclair's PR made use of hobbyists. Arguably, we could also have examined the work of distributors and retailers in greater detail. Such aspects have not been developed here, apart from briefly mentioning the relationship of Sinclair to W.H.Smith. One point which derives from cultural studies, and which rarely occurs in analysis on product development, is to treat hardware artefacts themselves as texts, both through consideration of industrial design and of the functions offered by the products. This form of analysis was utilised to a limited extent in case of hobby products, the Apple micro, and the early Sinclair machines.

To recharacterise the above points, the dimension which is neglected by many discussions of products but which is emphasized in cultural studies analysis is the symbolic nature of these commodities. Beyond conceptualising products in terms of more narrowly conceived 'uses' of artefacts, we need to appreciate both the meanings and pleasures in relation to which these items are constructed. This includes specifying the particular technological identity of these goods.

In debates about particular products one can occasionally find critics arguing that a certain commodity is 'just' a gimmick, dismissing some product because it is bought on the basis of fashion or because of some status which possession confers on the owner. In the case of the micros, Sinclair's biographers and others complained that Sir Clive played unfairly upon a form of computer mystique instead of producing a 'really useful' machine. What these commentaries share in common is

a utilitarian baseline which demands that goods should be evaluated in terms of uses and benefits. The symbolic dimension is rendered secondary, or cast as a misleading guise to cover up inadequate wares.

In opposition to this standpoint, the analysis employed here assumes that even if we may wish to critically engage with the particular representations involved, we cannot dismiss these symbolic dimensions as simply peripheral to the product or exceptional. They are an integral part of commodities.

(2) Production

In this history, we have touched upon some of the economic considerations involved in production at a number of levels. I noted the effect of different national disposable incomes, of hardware 'learning curves', and of the way in which the history and structure of key firms favoured the production of certain commodity forms and not others. We have followed the emergence of general industry structures in Britain around both micro and games commodities. Although this is not intended to be an internationally comparative study, the thesis has also charted developments in the US in those instances which were of major significance to the purposes of this project.

In keeping with the overarching perspective on which this thesis draws, a greater part of the analysis has been devoted to the more 'cultural' conditions of production.

In this respect, we have observed the practices and values of communities which were strategic in the development of both microcomputers and types of games machines - 'hackers', hobbyists, and the corporate culture of a range of firms. Although the 'interests' of the latter were framed within economic considerations, they were also shaped by staff perceptions of the nature of the firm and of the type of good which it normally produced. Only through understanding

corporate histories can we appreciate the decisions of companies such as Tandy, Texas Instruments, Atari, Sinclair and Commodore.

> **A production history of goods such as the microcomputer hard- and software also has a technical side, which cultural studies analysis has tended to understress. On the whole, this thesis is no exception.**

I examine some general points about design priorities in hobbyist and Sinclair machines. I also outline the direction of innovation as regards business machines and discuss decisions about using cassette rather than cartridge or floppy disc technologies. Yet, the main emphasis has not been on the construction of technical decisions, practices, and knowledges.

While part of the decision not to develop these aspects follows from the theoretical traditions adopted, another factor was the focus on a specific national context. By concentrating on the UK, this account develops more detail on what might be thought of as the 'downstream' end of product formation. While there was an indigenous hardware industry in this country, many of the key microcomputer companies and virtually all of the video games ones were located abroad - which is where initial hardware R&D took place. Therefore, much of this technical detail is less accessible for a British based study and where it exists it does so predominantly in the form of secondary material (3).

(3) Innovation

'Successful innovation' in technological products has often been measured by criteria of profitability or popularity. This concept traditionally has not had a great deal of currency within cultural studies itself. Yet, when approaching the field of technological products, it soon becomes clear that 'innovation' is the focal concept

of a literature which has previously defined many of the key issues in this terrain. In addition, there has been at least some critical concern about what (new) commodities should be produced, usually formulated in discussions under the umbrella term 'socially useful production'. Thus, it seems worthwhile to indicate a corollary of the present analysis for studies which focus on innovation.

> **The most obvious point is that if a product is multifaceted, so therefore is the nature of innovation in relation to that product.**

In effect, this history has charted the range of innovations entailed in the process by which the microprocessor component, or its more elaborated form as an item of industrial testing equipment, became a hobbyist product. Later innovations were involved when a range of product features were transformed in order to turn micros firstly from hobbyist machines to business commodities and eventually to consumer electronics. These innovations embrace wider ranging changes than mere technical alterations, including industrial design and marketing changes. It is also important to appreciate the role of marketing initiatives in order to understand both the 'demand' for products and their patterns of 'diffusion'.

(4) Interrelationship of products

Johnson notes how, when we study an area, there are the issues of where to impose boundaries and what specific texts to prioritise (4). In his example of the Metro car, he points out how we can examine the hardware, the texts such as advertising which refer to the car, or even the public discourse on the future of the nation to which representations of the car refer. The choice is guided by the theoretical and political questions which the researcher wishes to address. Given that this thesis focussed on the vague notion of 'interest' in home computers, there were still a variety of directions

in which the research could have developed. For example, the thesis could have addressed the more general range of representations of Information Technology or specifically dealt with Government discourses concerning this notion. As it was, parts of the account have had to refer to the state and the BBC's role in order to render some company decisions understandable. However, the main emphasis here has not been on the work of these particular 'producers'.

The subset of producers which has been covered here is that of hardware, of software and of magazines. From the initial question, asking why the home computer appeared in the forms that it did and became consumed in particular ways, it soon became clear that I would have to give an account of these key agencies. More attention, admittedly, has been given to hardware since the microcomputer and video game producers took the earliest initiatives. A number of hardware producers also had the resources to continue to play a key role at later stages. Nonetheless, the rise of games and the identity of micro hardware as a games machine cannot be appreciated without seeing the interrelationship with software and magazine products.

> **Thus, the generalised diagram of a circuit of cultural production already starts to become more complex where several cultural products are closely interdependent.**

Cycles of Production and Consumption

5) Producers' Interpretation of Consumption

The use of the term 'consumption' in this thesis clearly indicates a more enriched concept than that of the orthodox economic category 'demand'. While the latter refers simply to a willingness to buy commodities, investigating consumption has entailed examining a variety of manifestations of 'interest' in the micro product and

practices relating to this artefact. This can most easily be seen in the chapter of youth and consumption.

In his discussion of the circuit of cultural production, Johnson notes how producers draw on and mobilise elements from lived culture (5). Some of the clearest examples of this might be in the way in which advertisements for the micro refer to experiences of family life.

> **However, there still remains the question of how producers initially derive their interpretations of lived culture, and in particular of how they 'read' consumption. In other words, how do they make sense of demand? Such a theme is not developed in this thesis, but there have been sufficient examples to form a basis for comment on this process.**

What some analysts may describe simply as a form of 'feedback' from consumers to producers actually involves producers actively perceiving the dynamics of demand and constructing meaning out of patterns of usage and measures of attitudes. This issue, which has received little academic attention, is important because it is central to any claims about how the 'wants' of consumers are taken into account. This would also be significant for any attempts at 'alternative' forms of production.

That producers can have different readings of consumption is shown by the way in which Sinclair and Commodore marketing staff differed in their evaluation of hobbyist forms of interest in Britain: for some we are nation of tinkers, for others, of gadget lovers. When we moved away from the main arguments of the thesis to the details of gender in advertising, we also glimpsed a variety of theories, sometimes contrasting, concerning how family buying decisions were reached.

Producers construct their conceptions and categories, as well as their analyses of motivations, partially on the basis of empirical testing - the key form of which is usually market research. Yet even producers recognise that the process of measurement and analysis of potential

interest is problematic. In the case of new products, producers such as Sinclair had grave doubts about the usefulness of the market research apparatus (6). We also saw how, when Commodore conducted initial market research, the manager responsible for the Vic machine felt at liberty to re-interpret the meaning of responses. In my own analysis of consumption statistics, I demonstrated that the figures arising from some questions might give a misleading picture in relation to gender. My concern was that girls' interest may be rendered less visible by some quantitative measures (7).

From these various glimpses, it is clear that further projects could examine more systematically this process by which producer theories of consumers emerge, and particularly how the results of Market Research are constructed (8), how they diffuse and how they are themselves read and utilised.

(6) Producers' Reference to Past Products

When we take a longer term view across cycles of the circuit of production, we find that one of the factors shaping producers' theories about their audience is the fate of past products.

Producers selectively refer back to and draw comparisons with the 'success' (or failure) of previous commodities. This is yet another way in which different products interrelate.

Producers learn different lessons from the same product. Texas Instruments saw home micros as another pervasive chip technology such as calculators. On the other hand, for Sinclair, computers were like calculators in that they could cross-over from hobbyists to a wider consumer market. We also saw how many producers cited the history of video games in their fears about what might happen to the home micro if it became seen as a games machine. In the case of software, a range of firms came to view games as being potentially

like other cultural industries, while some magazines looked back to the record press as models for possible computer journals (9). And in the last chapter, we saw how producers specifically looked to the history of brown goods in order to anticipate the role of gender in buying decisions about micros.

> **Thus we can see that another avenue of research which could be developed would be to explore the choice of 'lessons' which producers have learnt from their experience.**

This has been done to a limited extent here, but it would also be possible to consider a much wider range of products which have helped to construct producer (and more academic) models of innovation (10).

(7) Consumption Histories

The other form of history which might merit further attention would be one which examined consumption across the cycles of the circuit of production. To understand more fully interest in the micro, we would need to explore a range of wider social circumstances which have only been touched upon in this account. These includes such matters as the changing labour markets, developments in the nature of youth and of eduction and of parenting. Instead, I have focussed on a consumption history which outlines the experience and active role of particular groups of consumers - principally of hobbyists and games-players.

The boundaries which have been imposed on the thesis mean that it is still possible to ask, for example, about the longer history of hobbyism, or more specifically technological hobbyism (11). Or we could look towards a more wide-ranging account of the experience of consumer electronics to complement production histories such as that of Forty (12).

To characterise the point in terms which would be more recognisable to producers themselves, such accounts would contribute to our understanding of the formation of demand.

Artefact Conceptions

(8) Overarching Conceptions as Analytical Tools

Analysis involves formulating overarching characterisations which capture the interrelationships beneath the mass of detail generated by research. In the course of this particular project, there were various attempts to abstract out core, underlying forms which would cast light on the combination of features of different product ensembles. The end result of this research process was the discussion of self-referential, infrastructural and games machines.

In terms of theoretical support for this strategy, the literature on 'technological paradigms' offered some promise in that it referred to a concept which had the quality of being just such an overarching characterisation. However, some of the problems with this particular formulation were noted in the introduction, and on the whole I have preferred to use my own term of 'artefact conception' to mark my differences from that body of literature (13). Historical accounts which discussed the broad conceptions of telegraphy, telephony and broadcasting further illustrated how these overarching characterisations could operate.

These particular examples also illuminated the principle that products by the same name may have different conceptions guiding their development.

This helped to make some sense of the way in which different producers criticised each other's products, as in the case where those

who wanted to see the emergence of an infrastructural micro were critical of Sinclair's self-referential machines.

> **Conversely, the same underlying conceptions could be realised through more than one commodity.**

Such a principle is consistent with the notion of producers looking back to past products. But, in addition to finding parallels with previous successful innovation, producers can also resurrect older aspirations which have never yet been fulfilled. For example, an infrastructural micro has never yet achieved a mass market, but this underlying ideal has inspired hope among some producers as regards both video games machines and micros. There are those who would still like to see this vision realised through CD-I products.

Of course, one possible criticism from those involved in the microcomputer industry could well be that the artefact conceptions discussed in this thesis sound too planned and elaborate. In interviews, many producers felt that they barely had any overview, and were always more concerned with the day-to-day difficulties of the firm's operation. However, it is very difficult to make decisions on product features without some implicit background conceptions, and the quotations cited in this history have tried to highlight these underlying themes. Obviously, for some producers - especially the larger ones with time to plan, such as Texas Instruments - these conceptions were more worked out, detailed, and articulated than for other companies involved in the industry.

(9) Implications of these Conceptions

This thesis was never intended to be a Kuhnian endeavour to build a theoretically elaborated concept such as that of 'paradigm'. Instead, I stress a particular set of product histories, in which the idea of an artefact conception simply has been a useful tool. Nevertheless, since

one aim of this chapter is to indicate other possible areas of research or modes of analysis, it would seem worthwhile to bring to the fore the features of this conception which have been implicit in this account.

> **One theme, which is also exemplified in the historical studies to which I referred and in Ben Keen's work on Video, is the idea of contending conceptions. The microcomputer history has added to this two further principles: that undercurrents of one artefact conception might exist even where another is dominant, and that we might sometimes wish to talk of more limited versions of a conception, rather than introduce a new conception into the picture.**

The former theme is illustrated by the continuing significance of the self-referential idea even after the early Sinclair machines. The latter strategy was adopted to characterise the 'software player' as a more limited version of infrastructural machine.

Finally, although the idea of artefact conceptions has been employed mainly as a term for understanding production strategies and decisions, the 'games machine' characterisation refers in part to the way in which consumers have adopted, use and perceive the micro. No hardware producers wanted the micro to be simply a games machine, and indeed, they made great efforts to maintain a different 'preferred reading' of their product (14). However, a key notion behind the circuit of production is that producers are not all-powerful. The idea of 'appropriating' texts or products in ways which were not intended by producers is not unusual in cultural studies (15).

> **In this light, it may sometimes prove useful to refer to artefact conceptions, even when this approach shifts attention to the perceptions and practices of consumers.**

(10) The Flexibility of IT Technologies

The first point here concerns the degree of flexibility with which different artefact conceptions and even apparently similar products may be realised through different technological forms.

We have already seen that, earlier this century, broadcasting was attempted not only through 'wireless' technology, but also through the 'wire' technology of the telephone. In this thesis, we saw that interactive games could be achieved utilizing more than one circuit design, and even using different components - the biggest contrast being between games run on large computer technology and TV games achieved through a dedicated array of chips. Thus, if we wanted to examine a phenomenon such as these games, there is no one technological structure which is the constant factor, and instead we would have to consider a family of related technical forms.

The second type of flexibility relates to representations of technology.

A theme which has re-occurred throughout this account is that artefacts which have similar underlying technical structures can be represented very differently.

In the case of games, both video games machines and home computers eventually adopted microprocessor technology. The also had various other similarities as regards the functions which they could offer - eg running software - even if some technical differences existed between the products. Yet, the former hardware products were not represented specifically as computers, while the latter were identified with these larger machines. Now we have plans for an interactive compact disc technology which again has a similar underlying

technological form, but which may well drop the 'computer' reference. In contrast to the strategy mentioned above, if we choose to follow the development of a certain technological trajectory, we may therefore have to do so across different product formations.

(11) Multiple Issues

Cultural forms such as technological products can clearly be analysed within a range of debates. We can ask a variety of theoretical and political questions concerning these commodities, questions which themselves assume different wider theoretical frameworks or modes of analysis. For example, in the case of TV, there are a range of studies that ask how the representations in programmes 'work' and how the audience relates to those texts. We might be talking about construction of subject positions offered to the viewer (16), or referring back to older, but still popular, concerns about the 'effects' of media violence (17).

On the other hand, we have the research which examines the experience of TV within relations with the home. This includes the questions about the exercise of power in relation to control of the programmes watched (18) as well as studies which frame the TV within debates about the privatisation of everyday life (19). While some of these forms of analysis are in contention, the point remains that the basis for evaluating a product such as TV is going to be multifaceted because this cultural object can be framed in different ways.

We noted in the introduction some of the debates within which commentary on the micro had been located . In the main account, we also saw some of the different types of fears about arcade, and later computer, games. However, the task of deconstructing the frameworks within which the micro is analysed was not the main goal of this thesis. Hence, I have charted only to a limited extent the way in which this terrain has been conceptualised and researched.

The micro could not only be framed within all the debates derived from the study of media, but also representations of the home computer as a 'tool' could equally well place this artefact within debates about 'socially useful products' (20), about domestic labour processes with the home (21), and about the development of 'skills' in preparation for the labour market (22).

> **In particular, the quest for infrastructural machines or integrated systems, as manifest in the case of programmable video games, home computers, and potentially with interactive CD or smart homes, means that some IT products potentially can be slotted into an even wider range of issues than TV. These products therefore lend themselves to very varied analysis, rendering an overall evaluation very complex.**

Gender and Technological Products

(12) Technological Identities

In the course of this thesis, the literature on gender and technology has been one analytical resource. Themes from this sub-section of feminist research have sometimes been utilised only in passing, as in the discussion of technological expertise in computer clubs. More centrally, I have attempted to apply observations concerning gender and representations of technology. An example would be the gender identity of the self-referential machine.

> **The contrasting representations of the micro as a machine to explore for pleasure as opposed to being a functional appliance provides another set of bipolar categories with possible gender connotations which we might add to the list of dichotomies already noted by feminists.**

While the idea of exploring technology eventually may have enjoyed a wider appeal, the account attempted to go beyond talking about males-in-general. We explored the meaning of this artefact conception for a group of males who were particularly strategic to the micros early reception - electronic hobbyists (23), as well as specifying some of processes in hobbyist magazines which helped to construct this product as a technological challenge for this enthusiast audience.

(13) Non-Technological Forms of Analysis

In contrast to accounts which consistently frame their analysis in terms of technology, this history has also looked to other bodies of literature and to forms of explanation which do not have as a central point the 'technologiness' of computers or games. Such analyses formed vital parts of the argument about 'interest' in these products. This contrast between analysis which stresses technology and that which does not is clearest in the first chapter on consumption. The discussion of the technological challenge for hobbyists is counterbalanced by themes from gender and 'leisure'.

We move away from arguments about technology most clearly in case of games. Hobbyists may have adopted games to explore computer technologies, but it was the arcade history and the relation to pinball which established differences in interest among a wider male and female audience. The focus on games-playing as an activity not only leads us to reflect again on those analyses of games as texts which derive from work on media.

> **That focus also allows us to see that electronic or computer games can be framed in terms other than those of being 'technological products'.**

SUMMARY

First and foremost, the thesis represents an attempt to apply, elaborate and modify the model of the circuit of cultural production which was described by Johnson. Second, the thesis has attempted to critically build upon the theme of technological paradigms and trajectories, and related historical analyses - around the notion of artefact conceptions. Arguably, these provide the basis for a broader understanding of 'technological' artefacts than has been achieved by many previous analysis in the literature on innovation. This exploration of concepts and methods points to the form of possible future research.

FOOTNOTES

Chapter 1: Introduction

(1) A personal communication from the MA course at the Centre for Contemporary Cultural Studies, University of Birmingham.

(2) 'Bandwagon' seems an appropriate term according to Linn's outline of the uncritical acceptance of the microcomputer as a 'good thing' by the Government departments who funded the use of micros in education. See Linn, P. (1985), '*Microcomputers in Education: Living and Dead Labour*', in Solomonides, T. and Levidow, L.(eds.), '*Compulsive Technology: Computers as Culture*', Free Association Books, London.

(3) See Glass, F.(1985), '*Sign of the Times: The Computer as Character in "Tron", "War Games" and "Superman III"*', Film Quarterly, Winter 84-85, pp.16-27. For a discussion of the way in which computer graphics were already starting to Enter into films just prior to the advent of the micro, see Neale, S. (1980), '*Hollywood Strikes Back: Special Effects in Recent American Cinemas*', Screen, Vol.21, No.3, pp.101-5.

(4) Statistical Appendix S10 indicates how games-playing was the predominant use for all family members.

(5) Current discussions of new interactive media more generally lend particular interest to the development of these games. Because of these discussions, the journal Screen first published adapted chapters of this thesis in the article Haddon, L. (1988), '*Electronic and Computer Games: The History of an Interactive Medium*', Screen, Vol.29, No.2, Spring, pp.52-73.

(6) The more pessimistic commentaries came from industry analysts looking towards the US market, where firms had started to run into difficulties a little earlier than in the UK. This will be discussed later.

(7) Johnson, R.(1983), '*What is Cultural Studies Anyway?*', stencilled paper No.74, Centre for Contemporary Cultural Studies, University

of Birmingham, Birmingham.

(8) A version of this theme is argued in Golding, P. and Murdock, G.(1983), '*Privatising Pleasure*', Marxism Today, October, pp.32-6.

(9) See the introduction of Solomonides, T. and Levidow, L.(eds.) (1985), '*Compulsive Technology: Computers as Culture*', Free Association Books, London.

(10) See Statistical Appendices S3.

(11) Some dimensions which were in the original diagram, such as 'abstractness', have not been developed in this thesis. The diagram comes from Johnson, R.(1983), *op.cit.*, p.17.

(12) Johnson produced a shortened, but revised version of his original paper in Johnson, R.(1986), '*The Story so Far: And Further Transformations?*, in Punter, D.(ed.), '*Introduction to Contemporary Cultural Studies*', Longman, Harlow. In the first paper he referred to cultural products, in the second piece to cultural objects. Arguably we could make a case for using either term - cultural form being yet a further option. 'Object' is preferred here since product is already used to refer to a narrower concept of artefacts which are produced by commercial enterprises.

(13) Johnson, R.(1983), *op.cit.*, p.18.

(14) The term 'moment' is derived from the work of Hegel and Marx - it can be taken here to have connotations indicating both a temporal stage and a separate aspect or the circuit.

(15) Although Johnson refers mainly to 'reading texts', and to our consciousness of cultural forms, this project also is also interested in the 'use of artefacts' and how this usage structures practices. This latter emphasis is reflected in the general writings of Radical Science, and more specifically in Feminist analysis of domestic technology.

(16) 'Raw' material is always relative within this circuit, since these elements are already partially 'cooked' or structured. Nevertheless, these elements constitute new raw material relative to the next transformations which they undergo.

(17) I have taken the debates within cultural studies courses as a starting point, but it should be noted that 'cultural studies' is

itself an umbrella term, indicating a related set of concerns. Not all the writers referred to here would necessarily consider themselves as representing cultural studies.

(18) Thackara, J. and Braidwood, S.(1984), *'Advertising is the Product too'*, Design, January, pp.30-7.

(19) Relevant work on analysing industrial design includes Hebdige's discussion of streamlining in Hebdige, D.(1982), *'Towards a Cartography of Taste: 1935-1962'*, in Waites, B. et al (eds.), *'Popular Culture: Past and Present'*, Croom Helm, Beckenham; Fry on typewriter design and Goodall on kitchens and kitchen equipment in Fry, T.(1982), 'Unpacking the Typewriter', Block No.7 and Goodall, P.(1983), *'Design and Gender'*, Block No.9, both published by the Polytechnic of Central London, London; and Forty's overview of changing design in the home and at work in Forty, A.(1986), *'Objects of Desire: Design and Society 1750-1980'*, Thames and Hudson, London.

(20) This is a variant of the 'appendage to the machine' argument referred to earlier. In 'Compulsive Technology', the authors explain that one meaning of 'compulsive' refers to the 'constraint that the computer's design imposes' which 'limit what can be expressed and transmitted'(p.7). They continue to discuss the theme of how the computer may direct or narrow our thinking and our approaches to tasks: *'...so the day may come when the computer system will not need to warn "you can't say that" or even "that is not a valid inference", because the unsayable will have become unthinkable.'*(p.9) Solomonides, T. and Levidow, L.(eds.)(1985), *op. cit.*

(21) Ewen discusses how the emerging advertising industry has helped shape the role of consumers this century in Ewen, S.(1976), *'Captains of Consciousness'*, McGraw Hill, Berkeley. Meanwhile, Winship has focussed specifically on different and changing ways in which magazines construct women as consumers in Winship, J.(1981), *'Woman becomes an "Individual": Femininity and Consumption 1954-1969'*, stencilled paper No.65, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham and in Winship, J.(1983) *'"Options: For the Way you*

want to live now", or a Magazine for Superwoman', Theory, Culture and Society, Vol.1, No.3.

(22) There has been a debate for some time concerning the degree of autonomy which people experience in the face of those approaches emphasising how consciousness is structured by texts. See, for example, Corrigan, P. and Willis, P.(1980), '*Cultural Forms and Class Mediations*', Media, Culture and Society, No.2., pp.299-312. Arguably, a slightly different, but related, debate exists within sociology. This will not be covered here, since the thesis is not located in relation to sociological writings.

(23) Hall, S. and Jefferson, T.(eds.) (1976) , '*Resistance Through Rituals: Youth Subcultures in Post-War Britain*', Hutchinson, London; Willis, P.(1978), '*Profane Culture*', Routledge and Kegan Paul, London; Hebdige, D.(1979), *'Subculture: The Meaning of Style'*, Methuen, New York. Profane Culture is of particular interest here, since it includes an account of the meanings of motorbikes - a product widely seen as being 'technological' - within a biking group.

(24) McRobbie, A.(1978), '*Jackie: An ideology of Femininity*', stencilled paper No.53, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham; McRobbie, A.(1981), '*Working Class Girls and Femininity*', in CCCS Women's Studies Group (eds.) *'Women Take Issue'*, Hutchinson, London; Griffin, C.(1982), '*Cultures of Femininity: Romance Revisited*', stencilled paper No.69, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham.

(25) Brunsdon, C. and Morely, D.(1978), *'Everyday Television: "Nationwide"'*, BFI, London; Morely, D.(1980), '*The Nationwide Audience*', BFI, London.

(26) Keen, B.(1985) '*Theories of Technology: Some Critical Thoughts*', unpublished working paper, Imperial College, London, pp.2-3.

(27) Not all aspects of innovation are discussed here. For example, the chapter does not examine theories of product cycles, or of the diffusion of new products. The technology-push and demand-pull theories simply seemed to be a more useful starting point for the argument which I wanted to develop.

(28) Dosi, G.(1984), *'Technical Change and Industrial Transformation: The Theory and An Application to the Semiconductor Industry'*, Macmillan, London, p.10.

(29) The original formulation of this approach is in Dosi, G.(1982), *'Technological Paradigms and Technological Trajectories'*, Research Policy, No. 11. This was elaborated, and examined in relation to the semiconductor industry in Dosi, G.(1984), *op.cit.*, from which these quotes are drawn (p.15).

(30) Dosi, G.(1984), *op.cit.*,p.16.

(31) Keen, B.(1985), *op.cit.*, pp.14-7.

(32) Dosi does not provide any suggestions concerning other possible directions in which chips could have been developed.

(33) Dosi argues that the challenge of decreasing costs of production were not particularly prompted by factors such as rising labour costs. In other words, he is emphasising how this criterion of progress has inertia in its own right. Dosi, G.(1984), op.cit., p.69.

(34) Aronson, S.(1977), *'Bell's Electrical Toy: What's the Use? The Sociology of Early Telephone Usage'*; Briggs, A.(1977), *'The Pleasure Telephone: A Chapter in the Prehistory of the Media'*, and de Sola Pool, I. et.al.(1977), *'Foresight and Hindsight: The Case of the Telephone'*. All of these articles are in de Sola Pool, I.(ed.), *'The Social Impact of the Telephone'*, MIT Press, Cambridge.

(35) Briggs, A.(1977), *op.cit*, p.46.

(36) Keen, B.(1987), *'Play It Again Sony: The Origins and Double Life of Home Video Technology'*, Science as Culture, No.1, pp.7-42. Some of the points which I cover here concerning the video industry arise from personal communications, since there was very close cooperation between Ben Keen and myself as we covered our respective histories.

(37) Cockburn, C.(1985), *'Machinery of Dominance: Women, Men and Technical Know-How'*, Pluto Press, London, p.170.

(38) Zimmerman, J.(1986), *'Once Upon a Time: A Woman's Guide to Tomorrow's Technology'*, Pandora, New York, p.80.

(39) This theme was first developed using material from the thesis in the paper: Haddon, L. (1987) *'The Masculine Micro?'* given at the

conference of the British Sociological Association, Leeds, April.

(40) This observation arises from interviewing these staff on the premises where they work.

(41) See Statistical Appendices S3 and S7. This point is developed in a later chapter, referring to more detailed tables.

(42) See, for example, Schwartz Cowan, R.(1983), *'More Work for Mothers: Ironies of Household Technology from the Open Hearth to the Microwave'*, Basic Books, New York; and Arnold, E. and Burr, L. (1985), *'Housework and the Appliance of Science'*, in Faulkner, W. and Arnold, A.(eds.), *'Smothered by Invention'*, Pluto Press, London.

(43) Winship discusses the concept of 'consumption work' in Winship, J.(1981), *op.cit.*

(44) Zimmerman, J.(1986), *op.cit.*, p46.

(45) This was discussed in a previous essay for the Cultural Studies MA course: Haddon, L. (1984) *'Forming the World of the Hobbyist': A Case Study of a Home Computer Magazine'*, unpublished paper, Centre for Contemporary Cultural Studies, Birmingham.

(46) Murdock, G. et al. (forthcoming), *'Home Computers: The Social Construction of a Complex Commodity'*, International Review of Sociology, p.13; Hughs, M. et al.(1985), *'Are Computers only for Boys'*, New Society, 11th October, pp.75-76.

(47) Many of the post-1982 'corporate' advertisements from Sinclair Research provide particular good examples of this approach. (This phase in Sinclair policy will be discussed later).

(48) Henriques, N.(1984), *'Women in Computing; Escape from the Female Ghetto'*, New Scientist, 9th August, p18.

(49) Hughs, M. et al.(1985), *op.cit.*

(50) Markoff, J.(1983), *'Who's In Front'*, InfoWorld, Vol,5, No.44, 31st October, pp.32-6.

(51) Gribbin, M.(1984), *'Boys Muscle in on the Keyboard'*, New Scientist, 30th August, pp.16-17.

(52) For example, see London Borough of Croydon (1983), *'Information Technology in Schools'*, Equal Opportunities Commission, Manchester; and Equal Opportunities Commission (1985), *'Infotech and Gender: An Overview'*, Manchester.

(53) These researchers stress how their study showed that games-

playing was fairly universal on micros. However, they argue that it is access to social networks of people who perhaps used computers in work capacities and who could supply advice and support which enabled users to take on 'more creative' uses, such as programming. For these analysts, this is one way in which social class has a bearing on computer usage. These researchers appear to have framed their research to assess popular claims concerning the impact which the home computer would have on society. In contrast to this starting point, I later note that the usefulness of 'more creative' applications for future labour employment is problematic, and games-playing is itself dependent on social networks, and not some residual category of use. Personal communication and Murdock, G. et al (forthcoming), *op.cit.*

(54) Here, feminists have noted that defining some work as 'skilled' is itself a representation, and one which is often mobilised to justify either the exclusion of women or higher pay for men. See Phillips, A. and Taylor, B.(1980), *'Sex and Skill: Notes Towards a Feminist Economics'*, Feminist Review, No.6, pp.79-88.

(55) Atherton, R.(1981), *'Britain's School Teach the Wrong Computer Habits'*, New Scientist, 28th May, pp.568-70.

(56) See the introduction to Solomonides, T. and Levidow, L.(1985), *op.cit.*

(57) McNeil, M.(1987), *'It's a Man's World,'* in McNeil, M.(ed.), *'Gender and Expertise'*, Free Association Books, London, p.195.

(58) For example, see Cockburn, C.(1985), *op.cit.*,p.255.

(59) Cockburn, C.(1985), *op.cit.*,p.256.

(60) Cockburn, C.(1985), *op.cit.*,p.174.

(61) Cockburn, C.(1985), *op.cit.*,p.175.

(62) Linn, P.(1987), *'Gender Stereotypes, Technology Stereotypes'*, in McNeil, M.(ed.), *'Gender and Expertise'*, Free Association Books, London, p.134.

(63) Linn, P.(1987),*op.cit*, pp.140-51.

(64) Game, A. and Pringle, R.(1983), *'Gender at Work'*, Pluto Press, London, pp.28-29.

(65) Game, A. and Pringle, R.(1983), *op.cit.*,pp.32-7.

(66) Cockburn, C.(1985), *op.cit.*,p.190.

(67) Bereano, P. et al.(1985), *'Kitchen Technology and the Liberation of Women From Housework'*, in Faulkner, W. and Arnold, A.(eds.), *'Smothered by Invention'*, Pluto Press, London, p.179.

(68) Despite some of her criticisms, Cockburn still appears to hold the view that there remains a problem concerning gender and 'access' to technological knowledges. Cockburn. C.(1985), *op.cit.*

(69) Linn, P.(1987), *op.cit*, p.133-4; Haraway, D.(1985), *'A Manifesto for Cyborgs: Science, Technology and Socialist Feminism in the 1980s'*, Socialist Review 1985, No.80, p.72-4.

(70) Haraway would appear to be suggesting this, noting that in the past: *'only by being out of place (women) take intense pleasure in machines'*. Haraway, D.(1985), *op.cit.*, p.99. In fact, very few feminist debates on technology actually go as far as to talk about women finding any great pleasures in machines - more usually they are represented as finding possible 'satisfaction' in using these artefacts. This would appear to be the corollary of arguments emphasising male 'over-involvement' with machines, with 'things'. The danger with this approach can be that is misrepresents female pleasures, stressing women's more utilitarian relation to artefacts. In a different field, that of fashion, Wilson discusses how certain feminist emphases on utility denies the pleasures which women find in clothes, in 'things'. Wilson, E.(1985), *'Adorned in Dreams: Fashion and Modernity'*, Virago, London

(71) For example, see Henriques, N.(1984), *op cit.*; Kiesler, S. et al.(1983), *'Second-Class Citizens?'*, Psychology Today, March, p.48. This theme will be elaborated later.

(72) This concept is utilised in Miège, B.(1979), *'The Cultural Commodity'*, Media, Culture and Society, No.1, pp.297-311.

(73) For example, Morely, D.(1986), *'Family Television: Cultural Power and Domestic Leisure'*, Comedia, London.

(1) Johnson, R.(1986), *op.cit.*, p.283.

(2) Johnson, R.(1984), *op cit*, p.14.

(3) Zimmerman, J.(1986), *op.cit.*

(4) Johnson, R.(1984), *op cit*, p.48.

(5) Johnson, R.(1986), *op.cit.*, p.305.

(6) Johnson, R.(1986), *op.cit.*, p.292. Some of the earlier work from the Centre for Mass Communications Research on media production would provide examples of this 'economism'. For example, see Murdock, G. and Golding, P. (1974), *'For a Political Economy of Mass Communications'*, in Miliband R. and Saville, J. (eds.) 'The Socialist Register 1973', Merlin Press, London.

(7) Johnson, R.(1984) *op.cit.*, p.27.

(8) David Skinner's current project exemplifies the diversity of the cultural raw materials which can be analysed (see Footnote 9). He considers how a form of millinarianism, mediated through technology, constituted one element in the marketing of the home micro. He argues that existing discussions of technological futures were one raw material upon which producers could draw. To take another example, when looking at the 'users' represented in magazines and other press, one could ask about the cultural elements which writers drew upon and mobilised to construct characters such as the computer 'Hacker'. Clearly, home computing consists of arrange of interrelated cultural products and activities where a number of pre-cursors could conceivably become the object of analytical attention.

(9) These current programmes of research are discussed on pages 65-6 in the main thesis text.

(10) Seldon, A. and Pappworth, J.(1983), *'By Word of Mouth: Élite Oral History'*, Methuen, London, p.4.

(11) Seldon, A. and Pappworth, J.(1983), *op.cit.*, p.5.

(12) For example, Nye uses the picture archives of General Electric to chart the way in which the company represented itself to different internal and external audiences. Nye, D. (1985), *'Image*

Worlds: Corporate Identities at General Electric 1890-1930', MIT Press, Cambridge, Mass..

(13) For instance, the Moritz account of the microcomputer producer Apple appears to be based largely on interviews. Perhaps, more established multinationals such as Texas Instruments or Tandy would be more liable to have retained detailed written records. Moritz, M.(1984), *'The Little Kingdom: The Private Story of the Apple Computer'*, William Morrow and Company Inc., New York.

(14) This motive for taking part in interviews was also noted by Ben Keen in his research on the development of video. Sony had had good PR and existing histories and press reportage portrayed this company as the main innovator in the field of video. JVC wanted to use the opportunity of the Phd to show that their own role was of equal importance. Personal communication from Ben Keen.

(15) Seldon, A. and Pappworth, J.(1983), *op.cit.*, p.26.

(16) Seldon, A. and Pappworth, J.(1983), *op.cit.*, pp.17-25.

(17) Tomczyk, M.(1984), *'The Home Computer Wars: An Insider's Account of Commodore and Jack Tramiel'*, Compute!, Greensboro, USA, p.114.

(18) Carlton, D.(1985), *'Software People: An Insider's Look at the Personal Computer Software Industry'*, Simon and Schuster, New York.

(19) Moritz, M.(1984), *op.cit.*

(20) Dale, R.(1985), *'The Sinclair Story'*, Duckworth, London.

(21) Interview with OC.

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

(23) Levy, S. (1984), *'Hackers: Heros of the Revolution'*, Doubleday, Garden City.

(24) Freiberger, P. and Swaine, M.(1984), *'Fire in the Valley: the Making of the Personal Computer'*, Osborne/McGraw-Hill, Berkeley.

(25) For example, the current interest in interactive media prompted some demand for my earlier article on electronic games, since there had previously been no one account which drew this material together. Similarly, Ben Keen's article on the history of Video was welcomed as filling an important gap. Haddon, L. (1988a), *op.cit.*; Keen, B.(1987), *op.cit.*

(26) The term 'moral panic' was first coined by Cohen to draw attention to the nature of public concerns about some phenomenon. In his own study the moral panic related to Mods and Rockers. This approach made the construction of a 'problem' into an object of analytical attention in itself. It became clear in the course of the project that there was enough textual material available to produce another Phd devoted solely to analysing concerns about the effects of video games and computers. Cohen, S.(1973), *'Folk Devils and Moral Panics'*, Paladin, London.

(27) An example of tracing the work of such pressure groups who help shape a moral panic is Barker's publications examining how concern was organised as regards horror comics and video nasties. Barker, M.(1984), *'A Haunt of Fears: the strange history of the British Horror Comics Campaign'*, Pluto Press, London; and Barker, M.(ed.) (1984), *'The Video Nasties: Freedom and Censorship in the Media'*, Pluto Press, London.

(28) An example of an attempt to move beyond the press and particular definers in order to place a moral panic in a wider context is the work of the Centre for Contemporary Cultural Studies group on 'Mugging' in relation to race and law and order issues. Hall, S. et al.(1978), *'Policing the Crisis: Mugging, the State and Law and Order'*, Macmillan, London.

(29) The appearance of these particular histories at this point in time may well be related to the increase in the amount of general discussion about Information Technology which has occurred this decade. Writers also appear be capitalising on the greater familiarity of the general public with chip-based products and computers: especially in the form of micros themselves. In these historical accounts there is usually either an explicit view of some impending post-industrial society or an implicit assumption that the technologies concerned will bring about a watershed in our social existence. We might say that these accounts themselves, although 'looking back', nevertheless constitute part of the discourse about technological futures.

(30) While it would have been possible to have checked journals of

this period more systematically to the same extent as in the search for material on games and micros, the function of this section on pre-cursors in my project did not justify such an expenditure of time.

(31) The earliest of these is Martin, J. and Norman, A.(1973), '*The Computerised Society: An Appraisal of the Impact of Computers on Society over the Next 15 years*', Pelican, Harmondsworth.

(32) Freiberger, P. and Swaine, M.(1984), *op.cit.*

(33) Levy, S. (1984), *op.cit.*

(34) Generally, there seems to be little ethnographic work on the actual experience of organised 'leisure' such as club life. One early study which tried to provide some preliminary examples of how the experience of these types of leisure interests might be analysed was Critcher C. et al.(1980) '*Fads and Fashions*', Centre for Contemporary Cultural Studies stencilled paper, No. 63. However, as with number of later analyses, this paper provides a general 'reading' of social life, and is not an ethnography. Recently there has been one study which at least involved some interviewing and observation work in clubs. This was Bishop, J. and Hoggart, P.(1986), '*Organising around Enthusiasms*', Comedia, London. I could only discover one dissertation which had conducted any research into a British hobby computer club. This was Chapman, J.(1981-2), '*Consider and Examine the Importance and Effect of the Hobbyist in Computer Education: Explore and Investigate Clubs and User Groups*', unpublished dissertation, Dip. Comp. Ed., Westhill College of Education, Birmingham.

(35) The theme of the school as a social system was originally developed in several studies conducted at Manchester University, the most well known of which was Hargeaves' work. These studies focussed particularly on the orientation of school cultures towards school schooling. This theme was re-worked in studies of 'deviance' in schools. More recently, research by Willis and Griffin has examined the link between work and school and the general experience of being 'Youth' in educational institutions. All these studies touch upon events outside the main lessons, in contrast to the mainstream sociology of education literature. My

own particular interest is in the school as a form of club life, where I chart the range of topics discussed by students, and how activities and relations carry over into time spent outside school, and also into the home. See Hargeaves, D.(1967), *'Social Relations in a Secondary School'*, Routledge and Kegan Paul, London; Willis, P.(1980), *'Learning to Labour'*, Gower, Farnborough; and Griffin, C. (1985), *'Typical Girls: Young Women from School to the Job Market'*, Routledge and Kegan Paul, London.

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

(37) Another relevant piece of research was that conducted by Margaret Shotten at Loughborough University. She started her Phd project 6 months before my own, with the aim of comparing those people who had a very deep involvement with computers to a control group in order to address the issue of computer 'addiction'. From a basis in psychology, she asked whether 'addiction' exists, and if so what forms it takes, whom it affects, and what its consequences may be. While this approach bears little relation to my own and her test results were not really relevant to my concerns, she had done a range of interviews with hobbyists. We remained in contact and shared material throughout the research. See Shotten, M.(1986), *'Computer Dependency: A Survey'*, paper given at the Ergonomics Society, University of Durham, 8th-11th April.

(38) Dutton describes the key elements of US based empirical research on home computer consumption in Dutton, W. et al.(1987), *'Diffusion and Social Impact of Home Computers'*, Communications Research, Vol.14, No.2, April. pp.219-250.

(39) These issues are discussed in more detail in Haddon, L. (1988) *'The Use of Domestic and Communications Technologies: A Guide to Statistical Sources'*, unpublished paper, Science Policy Research Unit, University of Sussex.

(40) Apart from market research firms, the exercise also involved unsuccessfully approaching the US headquarters of such firms as Commodore and Atari.

(41) In a similar vein, papers by Jenkins and Willis discuss how early

experiences in research had a bearing on the direction of their projects. Jenkins, R. (1984), '*Bringing it all back Home: An Anthropologist in Belfast*', in Bell, C. and Roberts, H. (eds.) *op cit.*; Willis, P. (1975), '*The Main Reality*', stencilled paper, No. 38, Centre for Contemporary Cultural Studies, Birmingham.

(42) In the 1920s, the early radio industry was similar to the computer market which I describe here. Many radio hams set up as amateur stations and started broadcasting. While the existence of these firms are mentioned in later histories of radio, they are never examined in more detail, having long since gone out of existence. Hence, histories of radio become the histories of the large corporations, whose personnel and documents are still accessible. See, for example, Maclaurin, W.(1949), '*Invention and Innovation in the Radio Industry*', MacMillan, London.

(43) The significance of getting sponsorship is shown in the video research Ben Keen. Through his links with a reputable industry journal he was given considerable access by Japanese companies when other researchers in this field had had less success.

(44) It later emerged that many of the bigger firms acted as publishing houses for work sub-contracted to staff from some of the older, apparently defunct companies. However, it would still have proved time-consuming to have boosted my sample of smaller older firms, since there was no public list to help to identify and locate these older firms or staff from them.

(45) One strand of the debate about the politics of research concerns who has access to and makes use of research material - as can be noted in some of the articles of the Bell and Roberts collection on social researching. My particular concern in this respect prior to commencing producer interviews was that staff might want the interview to become a form of trade of 'information'. While in certain cases users might welcome the chance to provide feedback to producers, this was not always the case (eg as regards practices for obtaining free software). Besides, my 'consumers' had understood their participation to be on the basis that this was an academic project, not piece of

market research. In the event, producers asked neither about users nor about other companies. Bell, C. and Roberts, H. (eds.) (1984), '*Social Researching: Politics, Problems, Practice*', Routledge and Kegan Paul, London.

(46) Cicourel provides the classic sociological work discussing this issue of definitions of the interview situation and interviewees' presentation of themselves. Sheldon and Pappworth raise some similar points in relation to oral histories. Tunstall's study of advertisers and White's work on publishers raises issues which are of particular relevance to interviews with marketing staff. Both researchers discuss how these producers were anxious to present a favourable picture of their firms. Tunstall comments that as marketeers his interviewees were skilled at presenting themselves and were quick to spot the possible PR value of the interview. Cicourel, A.(1964), *'Method and Measurement in Sociology', Collier McMillan Canada, Don Mills ; Sheldon, A. and Pappworth, J.(1983), op.cit.*, p.22; Tunstall, J.(1964), '*The Advertising Man*', Chapman and Hall, London; and White, C.(1977), 'Royal Commission on the Press: *The Women's Press in Contemporary Britain 1946-76*', HMSO, London.

(47) A parallel example of how gender relations can operate between female researchers and researched is given by Woodward and Chisholm. They discuss how their own background, and perceptions of that background, in relation to that of female interviewees from different social circumstances structured the relationships and interaction between themselves and these other women.

(48) Only once did I join a male interviewee in the pub after work to conduct an interview over a few pints. The fact that we were both single males, heavy drinkers and could stay there for some hours provides an instance where gender was clearly more salient to our camaraderie. I saw several magazine staff over pub lunches, including two of my female interviewees. It appears that such staff often conduct their own interviews in pubs as a normal part of social and work routines.

(49) As an example of studies of family life through observation and interviews with different family members, see Morely, D.(1986),

op.cit.

(50) While the widespread concern about the isolated (and obsessional) nature of the game-playing and computing experience is discussed in later chapters, it should be noted that this fear also enters into the commentaries of left critics as in the introduction to Solomonides, T. and Levidow, L. (eds.)(1985), *op.cit.* Although there are 'isolated' moments with the machine, as there are with many other activities, this should not blind us to the fact that 'interest' has a collective dimension.

(51) For critical evaluations of the studies of subculture, see A. McRobbie (1980), '*Settling Accounts with Subcultures: a Feminist Critique*', Screen Education, No.34., pp.37-49; see also G. Clarke (1982), '*Defending Ski-Jumpers: A Critique of Theories of Youth Sub-Culture*', stencilled paper, No. 71, Centre for Contemporary Cultural Studies, Birmingham.

(52) As noted in the introduction, this is discussed in relation to technology in Cockburn, C.(1985), *op.cit.*

(53) Willis uses a similar approach in his study of a motorbike club. He describes his aim as getting 'general exposure to the culture'. Willis, P.(1978), *op cit., p.12.*

(54) Hobson's study of housewives provides an example of using public sites as a means to find interviewees. She was permitted to approach women who were waiting to see the doctor in a council 'Welfare Clinic'. Hobson, D.(1979), '*Housewives: Isolation as Oppression*', in CCCS Women's Group (eds.), 'Women Take Issue', Hutchinson, London.(55) A classic, albeit dated, typology of PO styles was that formulated by Gold. This piece at least shows how Participant Observation styles varied. Gold, R.(1977), '*Roles in Sociological Field Definitions*', in Denzin, N.(ed.),'Sociological Methods', Aldine, McGraw Hill, New York.

(56) Equal Opportunities commission (1985), *op.cit.*

(57) The 'invisibility' of women in many public settings is a general theme in feminist literature, as Pawling notes. Pawling, A.(1984), '*Invisible Girls: Girls and Sport at a Technical College*', unpublished M.A. dissertation, Centre for Contemporary Cultural Studies, Birmingham.

(58) Shotten also conducted a smaller project, which involved a survey of all computing teachers at secondary schools in Leicestershire, follow-up interviews with a sub-sample, and the issuing of questionnaires to all the pupils in 4 of these schools. Personal Communication from Margaret Shotten.

(59) I also investigated the history of computing in education at some length and conducted interviews with a number of teachers. These have not been documented here since I used little of this material in the final thesis.

(60) Jenkins provides a good description of how his own biography helped to shape his approach to research. In general, feminist discussions have drawn attention to the influence of the personal interest and background of the researcher. This is not automatically to be criticised - it is part of the research experience. However, McRobbie points to the way in which male researchers followed up their interests in the subculture studies. This resulted in the experiences of girls being omitted. Jenkins, R.(1984), *op.cit.*; McRobbie, A. (1980), *op. cit.*

(61) I had hoped to locate girls in school computing clubs, and had made some initial enquiries. However, time limitations did not allow me to further pursue this avenue.

(62) The article often cited on this theme is Labov, W.(1973), '*The Logic of Nonstandard English*', in N. Keddie (ed.), '*Tinker, Tailor...The Myth of Cultural Deprivation*', Penguin, Harmondsworth.

(63) I was aware of how certain 'insiders' helped make further contacts in previous studies, such as 'Doc' in Whyte's work and 'Tim' in Patrick's. It was very easy to fall into the trap of expecting the same pattern to follow once I had established a good relationship with one of the boys. However, most of QWs attempts to arrange interviews outside of the club proved to be futile. Whyte, W.(1943), '*Street Corner Society*', University of Chicago Press, Chicago; Patrick, H.(1973), '*Glasgow Gang Observed*', Eyre Methuen, London.

(1) Johnson, R.(1983), *op.cit*,.p.27.

(2) The focus on the microcomputer should not be taken to imply that chip and computer producers somehow abandoned the paradigms within which they were working, once the smaller computers came onto the scene. Microprocessors continued to appear in a range of goods. Development work on home control by chip products is being realised commercially at the current time. And Prestel would be an example of attempts to implement ideas that have a longer history in the computing industry. I shall be returning to consider these on-going developments at the end of the thesis. It is simply that the concern here is to show what bearing these ideas about future developments had on the micro.

(3) Siegel, L.(1986), *'Microcomputers: From Movement to Industry'*, Monthly Review, July-August, p.111.

(4) The first mainframe ENIAC was developed to calculate ballistic trajectory tables for the military as part of the war effort. This had some bearing on the size of machine which was required. However, Ben Keen has raised the question of whether an aspect of certain technological paradigms during this period and immediately afterwards was that large scale technologies were considered to be more 'impressive' - whereas miniutrisation has subsequently developed an appeal in its own right. Augarten, S.(1981), *'Bit by Bit: An Illustrated History of Computers'*, George, Allen and Unwin, London, pp.114-119. Personal communication from Ben Keen.

(5) Shurkin J.(1984) *'Engines of the Mind: A History of the Computer'*, W.W. Norton, New York pp.288-299.

(6) Siegel, L.(1986), *op.cit.*, p.111.

(7) Fishman, K.(1981), *'The Computer Establishment'*, Harper and Row, New York, p.210.

(8) Augarten, S.(1981), *op.cit.*, p.255.

(9) Fishman K.(1981), *op.cit.*, pp.211-216; Augarten, S.(1981), *op.cit.*, pp.256-9.

(10) Some of this detail came from interviews which I had conducted

with teachers who were involved in these early initiatives. One Cert.Ed. dissertation on computing in Birmingham noted that by 1975, 47 out of 117 local schools had computer terminals. Williamson, J.(1984), *'A Review of the Developments by the Birmingham ILEA of the Use of Computers in Secondary Education'*, Cert.Ed dissertation, Westhill College, Birmingham.

(11) Martin, J. and Norman, A.(1973), *op.cit.*, pp.149-65.

(12) Bell, D.(1973), *'The Coming of Post-Industrial Society'*, Basic Books, New York. More popular accounts of futurologists discussing the impact of technologies include Toffler, A.(1980), *'The Third Wave'*, Morrow, New York; Naisbitt, J.(1982), *'Megatrends'*, Warner Books, New York; Evans, C.(1979), *'The Mighty Micro: The Impact of the Microchip Revolution'*, Coronet Books, Sevenoaks; Marsh, P.(1981), *'The Silicon Chip Book'*, Abacus, London.

(13) Fedida, S. and Malik, R.(1979), *'The Viewdata Revolution'*, Associated Business Press, London.

(14) Reid, T.(1985) *'Micro-Chip: The Story of a Revolution and the Men who Made It'*, Pan Books, London, pp.118-122.

(15) Siegel, L.(1986), *op.cit.*, p.112.

(16) Reid, T.(1985), *op.cit.*, pp.117-118.

(17) In fact, IBM was a little slower than its competitors to change over to the new chips, whereas it had adapted more quickly to transistors when these components first appeared. Reid T.(1985), *op.cit.*, pp.126 and 132.

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

(19) See Reid, T.(1985), *op.cit.*, pp.117.

(20) For example, although it appeared after micros, Marsh's popular book still focuses mainly on the chip and mainframe revolution. Marsh, P.(1981), *op.cit.*

(21) The main criticisms argued that the semiconductor firms were not sensitive to facets of the consumer market such as fashion, advertising, retail distribution and seasonal fluctuations in demand. Hanson, D.(1982), *'The New Alchemists: Silicon Valley and the Microelectronics Revolution'*, Little, Brown and Co, Boston,

p.198.

(22) Interview with TJ of Texas Instruments.

(23) The quote from Haggerty came from a speech attended by Reid. This author uses interviews with other staff at Intel to provide the wider context of Haggerty's plans. Reid, T.(1985), *op.cit.*, p.132.

(24) Texas was also the first company to experiment with chip based educational aids, such as 'Speak and Spell'. In an interview, TJ described how Texas had been developing a range of consumer products for some time - such as cameras which made use of chip technology. The home computer constituted only one of the consumer electronics projects, albeit an important one, which TI considered.

(25) Reid, T.(1985), *op. cit.*, pp.132-137. This account is based on the author's interviews with a variety of staff of Texas who were working on these projects.

(26) Braun, E. and McDonald, S.(1978), *'Revolution in Miniature'*, Cambridge University Press, Cambridge, p.169.

(27) Braun, E. and McDonald, S.(1978), *op.cit.*, p.170.

(28) Braun, E. and McDonald, S.(1978), *op.cit.*, p.176.

(29) Braun, E. and McDonald, S.(1978), *op. cit.*, p.175.

(30) Interview with IS(1).

(31) Larsen, J. and Rogers, E.(1985), *op.cit.*, p.105; Reid, T.(1985), *op.cit.*, p.141.

(32) Augarten, S.(1981) *op.cit.*, p.264.

(33) Hoff discusses these reasons in an interview with Hanson. Hanson, D.(1982), *op.cit.*, p.120. See also Larsen, J. and Rogers, E.(1985) *op.cit.*, p.107.; Reid T.(1985), *op.cit.*, p.142; Augarten, S.(1981), *op.cit.*, p.265.

(34) Freiberger, P. and Swaine, M.(1984), *op. cit.*, p.14.

(35) Business Week (1973), *'Microcomputers Aim at a Huge New Market'*, May 12th, pp.180-2.

(36) Larsen, J. and Rogers, E.(1985), *op.cit.*, p.105.

(37) Interview with LH.

(38) Hanson, D.(1982), *op.cit.*, p.122.

(39) Hanson, D.(1982), *op.cit.*, pp.122-3. There had been attempts to

create these intelligent terminals in the late 1960s, even before the arrival of the microprocessor. Osborne, A.(1979), *'Running Wild: The Next Industrial Revolution'*, Osborne/McGraw-Hill,Berkeley, pp.23-4. The first order placed for Texas Instruments's microprocessor based products was for such a terminal. Also, the type of chip which was later used for the first microcomputer was intended for a terminal producing firm. In terms of functional design, these terminals could be considered to constitute the first 'microcomputers' although they were not conceived as such. A similar argument is made about the 'test equipment' produced by Intel - that this device was 'really' the first microcomputer. See Freiberger, P. and Swaine, M.(1984) *op.cit.*, p.14.

(40) Reid T.(1985), *op. cit.*, p.143; Hanson, D.(1982) *op.cit.*, p.126.

(41) The account of Xerox is based on Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.266-8.

(42) The account of DEC is based on Freiberger, P. and Swaine, M.(1984) *op.cit.*, pp.18-20 and Augarten, S.(1981), *op.cit.*, pp.266-8.

(43) Ben Keen observes that the micro offered no new use-values which were not alredy being met by existing products, or planned products. He also raises another point which canot easily be assessed within the terms of this thesis. Keen argues that video technology was regarded ambigously by producers in the film and TV industries because it reduced the control which these corporations had over the use of their products. Hence, they preferred and backed 'safer' technologies, such as cable and disc. The question is, could a similar point be made about the stand-alone micro compared, say, rented time on mainframes? For example, the industry now faces a software copying 'problem' in the same way as video software industry. The corrollary of this line of argument is that the computer industry producers may not have seen it as being in their interests to develop a micro. Keen, B.(1987), *op.cit.*, pp.35-8 and personal communication.

(44) On these grounds, hardware enthusiasts could more easily embrace the micro as a type of technological development than, say, video.

(45) Examples include Hanson, D.(1982), *op.cit*, p.206, and Kaplan A.

(1977), '*Home Computers versus Hobby Computers*', Datamation , 23 (7), pp.72-5. Douglas provides an account of earlier hobbyist enthusiasm for ham radio, and also notes the role played by the 'makeability' of this technology. Douglas, S.(1986), '*Amateur Operators and American Broadcasting: Shaping the Future of Radio*', in Corn, J.(ed.), 'Imagining Tomorrow: History, Technology, and the American Future', MIT Press, Cambridge, Mass., pp.34-57.

(46) Helmers, C.(1978), *'Apple Bytes Man'*, Wharton Magazine, Vol.3, No.3, pp.40-1.

(47) In one of my interviews, LH described how the Amateur Computing Club had earlier devised a specification for the 'Weeny-Bitter', the core central processor for a computer.

(48) In an interview, Alan Kay from PARC recalled someone who built a computer for hisself while at university. It was about the size of a filling cabinet. Jones, T.(1983), '*The Grand Old Man*', Psychology Today, 21 (3), p.56.

(49) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.32.

(50) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.28; Levy, S.(1984), *op.cit.*, p.183. Moorehouse describes the very proactive role taken by the leading hobbyist magazines in campaigning around issues in the field of Hot Rod racing. Such an active role, as with the initiatives of the electronics press, seems more possible when the area is still dominated by amateurs. Ben Keen has pointed out that the magazines seem to have had little influence in the case of video, where decisions about the form of technology in particular have been shaped by the trajectories of larger corporations. Moorehouse, H.(1984), '*Organising Enthusiasm: Specialist Magazines and Sub-cultures*', Paper given at the 'Leisure: Politics, planning and People Conference, University of Sussex, July; personal communication from Ben Keen.

(51) Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.28-36; Levy, S.(1984), *op.cit.*, pp. 181-9.

(52) According to the editor of the American journal 'Electronics Weekly', MITS had sold some 8,000 Altairs within the first 18 months, about 80% of them going to the hobby market. Woolnough, R.(1977), '*Computer Hobbies in the US*', Practical Electronics,

February, p.115. Many of these computers were ordered within a short time of the product being announced. Other companies, like Imsai, could arise because MITS basically could not supply enough machines to meet demand.

(53) Woolnough, R.(1977), *op.cit.*, p115. In 1978, Helmers estimated that the 'market' of hobbyists was 200,000. He arrived at this figure via multiplying the circulation of *Byte* magazine by estimated readers per copy. Helmers, C.(1978), *p.cit*,, p.38.

(54) One example of 'user-friendly' technology from PARC which was subsequntly put to use was the icon-driven menus used in the Lisa and later MacIntosh computers. The locations of the following articles discussing PARC ideas indicate how the ideas of this Centre were accessible to a wider audience than just hobbyists. Brand, S.(1972), *'Spacewar: Fanatic Life and Symbolic Death Among the Computer Bums'*, Rolling Stone, 7th December, pp.33-8; Kay, A.(1977), *'Microelectronics and the Personal Computer'*, Scientific America, September; Jones, T.(1983), *op.cit*, pp.231-44.

(55) Roszak, T.(1986), *'The Cult of Information: The Folklore of Computers and the True Art of Thinking'*, Lutterworth Press, Cambridge, p.141; Levy, S.(1984), *op.cit.*, p.148.

(56) Illich, I.(1973), *'Tools for Conviviality'*, Calder and Boyers, London.

(57) Hall discusses the place of technology amongst Hippies and more recently Roszak traces out sentiments concerning technology in relation to the music and drugs of the countercultural movement. Hall, S.(1969), *'The Hippies: An American Movement'*, in Nagel, J.(ed.), 'Student Power', Merlin Press, London, p.180; Roszak, T.(1986), *op.cit.*, p.150.

(58) Roszak, T.(1986), *op.cit.*, p.147.

(59) Levy, S.(1984), *op.cit.*, pp.156-7.

(60) For more details on Community Memory see Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.91-103; Levy, S.(1984), op.cit., p.147-94; Athanasiou, T. (1985) *'High-tech alternativism: the case of the Community Memory Project'*, in Radical Science Collective, (eds.), Making Waves: the Politics of Communication', Free

Association Books, London.

(61) The 'Tom Swift Terminal' was planned by Felsenstein, who was later to become chair of the Homebrew club. Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.103 and Levy, S.(1984), *op.cit.*, p.180. A few years before the Altair, another invention from an electronics enthusiast, the 'TV Typewriter', had sparked off discussion in the hobbyist press about the use of terminals for word-processing and for telecommunications. Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.27.

(62) Levy, S.(1984), *op.cit.*, p.190.

(63) Levy, S.(1984), *op.cit.*, p.191.

(64) Roszak, T.(1986), *op.cit.*, p.143.

(65) Several Homebrew members were active in draft resistance and protest against the Vietnam War. Other activites included organising free universities and 'travelling round India seeking universal truth'. Siegal points out that some last vestiges of counterculture still exist in the microcomputer industry today. Siegel, 1.(1986), *op. cit.*, p.113-4 and p.116. The point about 20 companies arising form Homebrew comes from Sobel, R.(1986), *'IBM vs. Japan: The Struggle for the Future'*, Stein and Day, New York, p.180.

(66) Levy, S.(1984), *op.cit.*, pp.234-8.

(67) Interview with LH.

(68) There was initally a problem of getting hold of components and chips from manufacturers used to dealing with bulk orders. As we shall see, this was also the case the British context. Those working in firms dealing with chips were able to try them out and even purchase the components at discounts. Moritz, M.(1984), *op.cit.*, p.42. and pp.123-4.

(69) Kaplan, A.(1977), *op.cit*, p.72.

(70) Moritz, M,(1984), *op.cit.*, pp.152; Levy, S.(1984), *op.cit.*, p.177.

(71) Even though their designs were not taken up by employers, enthusiasts such as the Apple founders were able to support their projects through developing their micros in company time, and through the occasional help of other staff. Companies which adopted and promoted hobbyist micros benefited, of course, from

the free creative labour which enthusiast had supplied. Moritz, M,(1984), *op.cit.*, pp.125; Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.216-7.

(72) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.211

(73) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.197-9.

(74) Holmen presents the findings of a survey conducted by the University of Southern Calafornia which was administered to visitors at two computer exhibitions in Los Angeles in 1978 (also reported by McGlynn). This research was conducted shortly after the period when the clubs were in their heyday. Hobbyists could now buy slightly more reliable machines from retail stores instead of being restricted to mail order. Hence, some of the recent hobbyist buyers may not have felt the need to attend clubs and public events such as these exhibitions in order to gain support and guidence. If so, we would expect an over-representation of older machines, and of earlier buyers and builders of micros. Bearing these qualifications in mind, the statistics regarding the brand of machines possessed by those surveyed might still provide some guidelines as to the overall configuration of the market. Imsai, Tandy and Apple were each used by about 12%, with PET next at 8% (sample size: 366). All other sources appear to regard Tandy as a slightly clearer market leader between 1977 and 1980. Holmen, M.(1980), '*Who is Using Personal Computers*', IEEE Transactions on Systems, Man and Cybernetics, Vol.SMC-10, N.8, August, pp.480-4; McGlynn, D.(1982), '*Personal Computing*', John Wiley and Sons, New York, p.32.

(75) Forty, A.(1986), *op.cit.*, pp.201-2.

(76) Siegel, l.(1986), *op. cit.*, p.113.

(77) Moritz, M.(1984), *op.cit.*, p.230.

(78) Kaplan cites a survey of over 1,500 hobbyists conducted in mid-1976. Nearly two-thirds were directly employed as programmers, technicians or engineers. Three-quarters of early computer owners used computers in their work. Turkle started her participation in clubs and interviews with 60 hobbyists in 1978. She also notes the technical background of these early enthusiasts. Kaplan A. (1977), *op.cit.*, pp.72-75; Turkle, S.(1984),

op.cit., p.188.

(79) In the computer exhibition survey noted by Holmen, 94% of those present were male. Accounts which discussed the clubs and the 'characters' attending them during this early period never mention female hobbyists. This is also suggested by a market research survey of 1,669 households conducted in 1980. In this survey, we are told that the question of ownership was determined during the interviewing process. The survey, reported by Danko and MacLachlan, found that women constituted only 5% of early owners. However, there are still some qualifications to add about this evidence. The first point concerns the invisibility of female hobbyists. This theme will be developed in the next chapter. In the exhibition survey, some women who may have been interested in micros may have been less likely to attend these particular public events. Second, the accounts given by male commentators looking back to this period may well be blind to the presence of females . In fact, it is possible to literally see a few women attending a Homebrew meeting in one of the photographs contained in the Freiberger and Swaine book: although these women are never mentioned in that text. Lastly, in relation to the market research survey, questions about ownership are problematic, as discussed in Statistical Appendix S5. Nevertheless, even though each particular source of evidence may under-represent women, it would still seem reasonable to assume that at least the majority of users in this period were male. Holmen, M.(1980), *op.cit.*, p.481; Danko, W. and MacLachlan, J.(1983), '*Research to Accelerate the Diffusion of a New Invention: The Case of Personal Computers*', Journal of Advertising Research, Vol.23, No.3, June, July, p.40; Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.92.

(80) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.59. Of all the elements described here, the only feature which did not really apply to British hobbyist firms was that the company names chosen in this country did not usually evoke that same sense of humour as in the US.

(81) Interview with RS.

(82) Interview with RS.

(83) Interview with RS and LH.

(84) Interview with LH.

(85) Interview with LH.

(86) Woolnough, R.(1977), *op.cit.*, pp.115-6.

(87) Kewney, G.(1978), *'Exploit or Cultivate'*, Personal Computer World, Vol.1., No.2, p.30.

(88) Pountain, D.(1985), *'Seventh Anniversary of Microcomputing'*, Byte, p.385; Tomczyk, M.(1984), *op.cit*, p.34.

(89) RS.

(90) NL.

(91) DK.

(92) Coles, R. (1977), *'SC/MP Reviewed'*, Practical Electronics, March, Vol.13, No.3, p196; Coles, R.(1978), *'KIM: Hobby Computer Review'*, Practical Electronics, February, Vol.14, No.6, p.408.

(93) News Brief (1977), Practical Electronic, August, Vol.13, No.8, p.588.

(94) Borland, K.(1978), *'Yours To Command. Britain's Own Microcomputer: The Nascom 1'*, Personal Computer World, Vol.1, No.1, p.20.

(95) Dennis, M.(1978), *'The Little Symposium that Grew'*, Personal Computer World, Vol.1, No.1, p.24.

(96) Borland, K. (1978), *op.cit.*, p.23.

(97) Floyd, K.(1979), *'The Revolution Started'*, Practical Computing, July, p.76.

(98) Interview with IS(2). Initial awareness of PCW was not made easier by the fact that most electronic hobbyist magazines would not carry ads for the newcomer on the grounds that it was a competitor. Editorial (1978), Personal Computer World, Vol.1., No.2., p.3.

(99) Lord, M.(1979a), *'PCW Open Page'*, Personal Computer World, Vol.2, No.2., p.49.

(100) This became clear when PCW first started its 'round-up' of clubs. For example, a club in the North West of England already had 100 members at that time. Lord, M.(1978a), *'PCW Open Page'*, Personal Computer World, Vol.1, No.6., pp.52-3.

(101) Part of the reason for the considerable interest which was shown in the Nascom may have been due to the coverage given by the

first issue of PCW to this machine, announcing that this micro constituted the British equivalent of the Altair. That first issue was also very enthusiastic about the possibility of forming Nascom Clubs based upon this machine. Borland, K. (1978), *op.cit.*, p.23. PCW later solicited the help of ACC spokespeople to describe how to set up and run such clubs.

(102) Although it was in the interest of clubs to contact PCW in order to advertise themselves, not all of them may have done so. In fact, although some 'requests' were later followed by notification that a club had been formed, in the majority of cases the magazine carried no such indication that this had occured. Thus, we can only say that the figures show the minimum number of clubs existing at this time.

(103) Exeter and District had 50 members - Lord, M.(1979b), '*PCW Open Page*', Personal Computer World, Vol.1, No.10., p.58. The North London groups size was reported in Lord, M.(1979b), '*PCW Open Page*', Personal Computer World, Vol.2, No.4., p.40.

(104) As in the section on hobbyists in the US, these figures are meant to convey some idea of the extent and contours of hobbyist interest. However, it is difficult to ascertain measures of this phenomenon. For example, attendence records at fairs were not kept until the first large scale hobbyist fair in 1982 at the Polytechnic of North London. There is also little data on which to build a user profile. Even at the 1982 fair, a voluntary survey conducted by the organisers met with virtually no response - few people filled in the forms. Therefore, I have to rely on more impressionistic accounts of interviewees such as TG (one of the organisers).

(105) Floyd, K.(1979), *op.cit.*, p.77.

(106) Adamson, I. and Kennedy, R.(1986), *op.cit.*, pp.68-82.

(107) Other products would include those consumer appliances discussed by Schwatz Cowan and Forty. Schwartz Cowan, R.(1983), *op.cit.*; Forty, A.(1986), *op.cit.*

(108) These early manifestations of counterculture, such as Resource One and Community Memory, disappeared after a few years. Yet, the sentiments lived on for a while with respect to micros.

Although Siegal notes that there are still some countercultural engineers who are optimistic about the possibilities of the micro, much of this motivation disappeared over the next few years as computers became big business. Siegel, L.(1986), *op.cit.*, pp.115-117.

(109) Ben Keen notes that video was also adopted as a 'revolutionary' alternative technology within these countercultural sentiments. Personal communication.

(110) Siegel, L.(1986), *op.cit.*, p.115

(111) Roszak, T.(1986), *op.cit.*, p.150.

(112) Zimmerman, J.(1986), *op.cit.*, p.38.

(113) Zimmerman, J.(1986), *op.cit.*, p.46. Arguably, Zimmerman presents her list of possible outcomes of micros so strongly at times that they look as inevitable as those of the counterculural analysts. She is as pessimistic as they are optimistic. Nevertheless, Zimmerman illustrates how the consequences of micros could be seen very differently, and in so doing she contributes to an agenda of questions we might ask. The possibilty that responsibility for new consumption work would fall disproportionally onto women is also discussed in Huws, U.(1985), '*Terminal Isolation*', in Radical Science Collective (eds.), 'Making Waves: The Politics of Communication', Free Association Books, London.

(114) Examples of this media optimism are elaborated in the next chapter.

(115) A similar concern is raised about the dangers of enthusiasm for 'High-Tech Alternativism' in Athanasiou, T.(1985), *op.cit.*, p.51.

Chapter 4: The Emergence of the Home Computer

(1) Consumer Electronics Monthly (1979a), '*Buyer Profile: It's still Hobbyists and Businessmen*', June, Vol.7, No.6, p.223. Also Consumer Electronics Monthly (1979b), '*Computer Future Hazy After Low-Key CES*', July, Vol.7, No.7, p.90.

(2) It must be remembered that a micro was not, by any means, an obvious candidate for the home. In particular, the widespread image of computers which existed at that time was of large machines, processing masses of numbers and attended by an army of staff.

(3) Of the major companies involved at this period, the main one which I do not cover in detail is Commodore. Although I have more reliable information regarding its later history, I did not think there was enough material publicly available to ascertain the intentions and outlook of Commodore during this earlier period. For example, one of my written sources, Tomczyk, only joined the company in 1980. I report the decisions in which he was directly involved, but his accounts appear to be less reliable on the period before he joined. Tomczyk, M.(1984), *op.cit.*

(4) The publicity clearly made some impression, since David Skinner's interviewees had usually seen and remembered these early Sinclair adverts - even where they did not buy a home micro until later. Personal communication. Arguably, Sinclair attracted considerable coverage from the early computer press as well as from other media because he came to be seen as representing the whole industry.

(5) Prior to the launch of the ZX 80, Nichols referred to estimates that 40,000 micros were in use in Britain. The ZX80 reached a total sales figure of 50,000 in the first year. Nichols, W.(1983), *'Educating the Market in New Concepts'*, Technical Documentation, p.16.

(6) For example, Harvey, D.(1981), *'Sinclair Research: Putting Technology in the Pocket'*, The Director, September, p.49; Lester, T. (1981), *'The Unsinkable Sinclair'*, Management Today, March; Magnet, M.(1982), *'Clive Sinclair's Little Computer That Could'*, Fortune, March 8th, pp.78-84.

(7) Johnson describes how early radio in Australia was also initially presented to consumer markets as a way 'to participate in the science of radio'. Magazines placed emphasis on the excitment of this new invention and 'the access it provided to the new world of science and modern technology'. Only later did the stress shift

to one focussing on the education and entertainment which could be provided. Johnson, L.(1983), '*Images of Radio: The Contruction of the Radio Audience by Popular Radio Magazines*', in Teese, P. and Wickham, G.(eds.) Melbourne Working Paper 4, Dept. of Education, University of Melbourne, esp. pp.34-7.

(8) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.60.

(9) The Imsai micro was the one used in 'War Games'.

(10) Moritz, M.(1984), *op.cit.*, p.153.

(11) Electric Pencil was actually developed by a hobbyist for his peers, although the software was then widely taken up for business purposes. Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.147-8.

(12) Other Apple initiatives included giving support to hobbyist dealers, by arranging computer demonstrations in stores and by helping to improve the image of stores carrying the Apple product. The company also made a special effort to develop a friendly relationship with the press. Such policies were not unique, but Apple introduced this approch earlier than many of its contemporaries. Moritz, M.(1984), *op.cit.*, pp.227-8.

(13) Moritz, M.(1984), *op.cit.*, p.186.

(14) Ciotti, P.(1982), *op.cit.*, p.130.

(15) Moritz, M.(1984), *op.cit.*, p.186.

(16) Ciotti, P.(1982), '*Revenge of the Nerds*', California (Magazine), July, p.77.

(17) Ciotti, P.(1982), *op.cit.*, p.130.

(18) Moritz, M.(1984), *op.cit.*, p.196.

(19) Moritz, M.(1984), *op.cit.*, pp.224-5.

(20) Moritz, M.(1984), *op.cit.*, p.226.

(21) Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.229-30; Moritz, M.(1984),*op.cit.*, p.235; Uttal, B.(1981), '*The Coming Struggle in Personal Computers*', Fortune, June 29th, p.88.

(22) Uttal, B.(1979), '*Texas Instruments Wrestles with the Consumer Market*', Fortune, December 3rd, p.54; Ross, I.(1979), '*Charles Tandy's Ghost Can Rest Easy*', Fortune, November 19th, p.115; Uttal, B.(1981), *op.cit*, p.90. There was some discussion of the difficulty involved in deriving figures for home and work use.

One article describing this 'lack of market knowledge argues that some buyers rationalised their purchase as a home or hobby computer - and presumably conveyed that impression to the salespeople. Subsequently, these purchasers may have found that the machine could be useful in work and so moved the micro to that context. Information Processing (1980), *'Discovering a Vast Potential Market'*, Business Week, December 1st, p.91.

(23) Interview with SU.

(24) Heymen, H. (1979), *'The Vegas Story: No Chips to Cash In'*, Consumer Electronics Monthly, Vol.7, No.12, p.26.

(25) Clearly, analysing business micros as cultural objects could merit a major project in its own right.

(26) Interview with TJ, European manager of Texas Instruments.

(27) Kaplan, A.(1977), *op.cit.*; Isaacson, P.(1979), *'1979-The Year of the Home Computer'*, Datamation, Vol.25, No.1, January, pp.217-8; Baker, R. et al.(1979), *'Personal Computers: Building Block of Jelly Bean?'*, Electronic News, April 2nd.

(28) The consulting firm, Arther D. Little, argued this view. See Heyman, H.(1979), *'Computers at CES: Dynamic, but still Confused'*, Consumer Electronics Monthly, Vol.2, No.7, February, pp.72-3. From the very titles of this trade press we can see how these commentators were anticipating a possible boom. For example, Consumer Electronics Monthly (1980), *'Finally, 1980 Looks Like Year of Personal Computer'*, Vol.8, No.3, March, p.112.

(29) The slowing down of home sales was noted in Uttal, B.(1981), *op.cit.*, p.90.

(30) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.196.

(31) Various public accounts point out how Tandy started with a small trial run of micros, just to see if the machines would sell. If the micros had not attratced any interest, then the company had intended to use the computers for stock control in its own shops. Thackray, J.(1984), *'How Tandy Shacks Up'*, Management Today, October. SU added that the initial consumer marketing in Britain was also low key. Interview with SU.

(32) Ross, I.(1979), *op.cit.*, p.114.

(33) Interviews that have been conducted with a variety of staff over

the years indicate that this view has existed continuously within Tandy from the 1970s to the present day. Baker, R. et al.(1979), *op.cit.*, p.48; Tittscher, R.(1984), *'The UK Microcomputer Market: Major Companies and Trends'*, Sector Investments Limited, London, p.84 ; Interview with SU.

(34) Larsen, J. and Rogers, E.(1985), *op.cit.*, pp.11-2.

(35) Interviews with ID and with IS(1). The projects included using micros as a sophisticated answer-phone system, work on micro controlled robotics and word-processing.

(36) Tomczyk relates the views of the contemporary Atari marketing vice-president and discusses the 'Electronic Bus' design of the companies home computers. Tomczyk, M.(1984), *op.cit.* p.12 and p.110.

(37) Interview with ID.

(38) Uttal, B.(1980), *'TI's Home Computer Can't Get in the Door'*, Fortune, June 16th, p. 139.

(39) Uttal, B.(1980), *op.cit.*, p.140.

(40) Uttal, B.(1982), *'Texas Instruments Regroups'*, Fortune, August 9th, p.44.

(41) Interview with TJ.

(42) Interview with TJ.

(43) Baker, R. et al.(1979), *op.cit.*, p.46.

(44) Texas adverts often stressed the voice synthesiser technology available with their micros - this had been developed for the 'Speak and Spell' machine.

(45) This was also felt to be the main failing according to TJ.

(46) Isaacson, P.(1979), *op.cit.*, p.218.

(47) Isaacson, P.(1979), *op.cit.*, p.218.

(48) Lipoff, S.(1979), *'Mass Market Potential for Home Terminals'*, IEEE Transactions on Consumer Electronics, Vol.CE-25, May, pp.169-84.

(49) Mini-Micro World (1980), *'Home Information Systems: The Big Push Begins'*, Mini/Micro Systems, Part 13, October.

(50) Baker, R. et al.(1979), *op.cit.*, pp.44-7. Tomczyk describes how he organised a telecommunications package for Commodore's Vic 20 in 1981. Tomczyk, M.(1984). *op.cit*, pp.220-4.

(51) RS discussed this issue even today. Interview with RS.

(52) This is against a background in Britain where rationalisation of middle management had led corporations encouraging some executives to leave and sub-contract work which could then be handled at home. Atkinson, J.(1984), *'Manpower Strategies for Flexible Organisations'*, Personnel Management, Vol.16, No.8. pp.28-31.

(53) Baker, R. et al.(1979), *op.cit.*, p.48.

(54) Baker, R. et al.(1979), *op.cit., p.48; Uttal, B.(1981), op.cit.*, p.90; Harris, M.(1983), *'Companies Help Schools - and Selves'*, Electronics, September 8th, pp.98-99.

(55) Interview with OC. Adamson and Kennedy also point to Sinclair's previous policy of producing goods which act as a 'bridge' between enthusiast and consumer electronic markets. These authors argue that his home computer fitted into this mould. The Prest team at Manchester University note that hi-fi would be another example of a product which crossed over from a hobbyist to a brown goods market. Adamson, I. and Kennedy, R.(1986), *op.cit*, p.88 and 97. Hartleg, J. et al.(1985), *'Public Acceptance of New Technologies: New Communications Technology and the Consumer'*, Prest, Manchester University, Sept., p.80.

(56) Interview with OC.

(57) Nichols refers to Sinclair sales figures which show that by August 1981, when production of the ZX81 ceased, 50,000 units had been sold in the UK, while 80,000 units were sold overseas. The equivalent figures for the ZX81 up to February 1983 were 300,000 for home sales and 550,000 units overseas. Lester notes that these overseas sales were mainly to the US, a point confirmed by Adamson and Kennedy. The latter add that at one point, before the larger firms reduced their prices, ZX81 sales were greater than the combined sales of Tandy, Apple and Commodore in the US. Nichols, W.(1983), *op.cit.*, p.13; Lester, T. (1981), *op.cit.*, p.63; Adamson, I. and Kennedy, R.(1986), *op.cit*, p.133.

(58) The Adamson and Kennedy book on Sinclair discusses the nature of this corporate image in some depth. In fact, their whole argument is an attempt to demystify the popular image of Clive

Sinclair as a technologist. They argue that the company's main strength and reason for success is its marketing strategies - a significant dimension of which was the firm's tactics in representing Clive Sinclair himself. Adamson, I. and Kennedy, R.(1986), *op.cit*, pp.233-41.

(59) Adamson, I. and Kennedy, R.(1986), *op.cit*, p.81 and p.83.

(60) Dale, R.(1985), *op.cit.*,, p.85.

(61) Nichols, W.(1983), *op.cit.*, p.15.

(62) Interview with Sinclair. There is one qualification which we need to bear in mind as regards interviews with Sinclair. Sinclair has been interviewed so much that it soon became clear that he has far more experience in managing self-presentation than other staff with whom I spoke.

(63) Interview with OC.

(64) Nicols, W.(1983), *op.cit.*, p.17.

(65) Interview with OC.

(66) Sinclair Research was not totally alone in making use of hobbyists. Commodore, who were not specifically orienting their products to these enthusiasts, nevertheless supported the clubs who used its computer and benefited from this hobbyist feedback. Interview with CK.

(67) Adamson, I. and Kennedy, R.(1986), *op.cit*, p.89 and p.92.

(68) As shown in the early chapters of Dale, R.(1985), *op.cit.*

(69) Interview with KQ.

(70) For example, KQ argued this point. Atari staff took the same view. Interviews with KQ and IS(1).

(71) Interview with Sinclair.

(72) Interview with Sinclair.

(73) Interview with Sinclair.

(74) Adamson, I. and Kennedy, R.(1986), *op.cit*, pp.122-3.

(75) Nichols, W.(1983), *op.cit.*, p.15.

(76) The fact that kit-sales were greater than ready assembled sales was seen as by Sinclair Research staff as constituting evidence of this point. Nichols, W.(1983), *op.cit.*, p.16.

(77) Interview with OC.

(78) Interview with OC. Part of the motivation for this attempt to

create a generally professional image was that it was seen as a laying the groundwork for a subsequent move into the business market.

(79) Interview with OC.

(80) Adamson, I. and Kennedy, R.(1986), *op.cit*, p.86 and pp.109-11.

(81) Interview with OC.

(82) This was the general position taken in the Adamson and Kennedy book. These authors note the same view was held by the producer of the BBC 'Computer Programme'. Adamson, I. and Kennedy, R.(1986), *op.cit*, p.118. and see p.89-91.

(83) Tomczyk, M.(1984), *op.cit.*, p.125. Interview with IS(1).

(84) Interview with DC.

(85) Acornsoft was set up as a semi-independent operation shortly after the launch of the Atom. The subsidiary was intended to follow the lead of hardware innovation in a supporting role. This shows that Acorn were unusual amongst the early British firms in their appreciation of the role of software.

(86) Interview with UD. An example of Acorn's self-presentation can be found in the way in which one of the founders, Hermann Hauser, stressed the company's strengths in a press interview. According to Hauser, Acorn had a higher proportion of R&D than its competitors to keep the company at the technological frontier. Jivani, A.(1983), *'Branching Out at Acorn'*, Marketing, December, p.22.

(87) Interview with KE(1).

(88) Interviews with UD and with KE(1).

(89) The machine was itself designed to facilitate the writing of assembly code. Most users would not want to use such technical codes unless they were very enthusiastic about programming!

(90) Dennis, M.(1980), *'Acorn Atom'*, Personal Computer World, July, p.52. This article refers to various ways in which the micro was still geared to hobbyists rather than beginners.

(91) Interview with UD.

(92) Interview with UD.

(93) Interviews with UD and with KE(1).

(94) Interview with UD.

(95) John Radcliffe was the driving force behind the BBC Campaign and acknowledges the role of the Horizon programme in Marles, V. and Radcliffe, J.(1982), *'The Role of Research in the Production Process: "The Computer Programme"'*, in *'Annual Review of BBC Broadcasting Research Findings 1981/2'*, BBC, london, p.49. That understanding was confirmed by the interview with DK and is also discussed in Maddison, J.(1983), *'Education in the Microelectronics Era'*, Open University Press, Milton Keynes, p.62.

(96) Linn, P.(1985), *op.cit.*, pp.72-4.

(97) Marles, V. and Radcliffe, J.(1982), *op.cit.*, p.49.

(98) Marles, V. and Radcliffe, J.(1982), *op.cit.*, p.50. For a more detailed list of all the elements of wjich the Literacy Campaign included, see Maddison, J. (1983), *op.cit.*, pp.79-83.

(99) Interview with DK.

(100) Interview with DK.

(101) We can get some idea of the concern shown in the BBC if we consider the IBA's plans. The IBA had also considered sponsoring a microcomputer, but abandoned their plans, deciding that this would be far too commercial an operation to allowed under their charter. Interview with DK.

(102) Acorn was actually second choice. The BBC first chose the 'Newbrain' machine, from Newbury Laboratories. This company was run by the National Enterprise Board. However, Newbury could not deliver the micro in the required time period. Bradbeer, R.(1981), *'Auntie's Micro'*, Personal Computer World, December, p.99. This article, and the news editorial of the issue, convey some of the controversy involved.

(103) Interview with DK.

(104) Marles, V. and Radcliffe, J.(1982), *op.cit.*, pp. 44-52.

(105) The specific dialect of Basic had facilities which encouraged structured programming. Using machine code was also easier than with many other machines - an innovation which seems to be geared, once again, to hobbyists.

(106) Interview with UD.

(107) When the BBC was eventually advertised, this facility enabled the company to run a very large number of different press ads emphasising different uses, and multiple-identities, of the machine.

(108) Linn, P.(1985), *op.cit.*, pp.72-8. For a more detailed, but less critical, account, see Maddison, J.(1983), *op.cit.*, pp.62-78.

(109) The other micro sponsored was that from Research Machines, a microcomputer producer which had specialised in the education sector for some years. Later, machines such as Sinclair's Spectrum joined the list of approved micros. But by this time, Acorn had become the most well known home computer manufacturer associated with education, and the company continues to foster that relationship and reputation.

(110) Even form the BBC's perspective, one important audience was also the 'interested hobbyist'. Interview with DK.

(111) A little to their surprise, the BBC micro was at one time found to be the most popular machine in businesses. This encouraged Acorn to aim at this market as well. Interview with KE(1).

(112) The Model A was a cheaper version which had less memory and was less expandable. Acorn thought it might turn out to be a better seller because of the lower price. This particular way of 'watering down' the main machine was moderately successful, but never caught on as much as the Model B.

(113) This policy was followed in the case of both calculators and micros. Tomczyk, M.(1984), *op.cit.*, p.103 and p.44 respectively.

(114) Tomczyk, M.(1984), *op.cit.*, pp.40-46. This conflict was sufficiently serious that it caused Commodore's chief engineer to leave the company for a while. The Vic 20 had to be built by a separate design team, who were more receptive to the idea.

(115) Interview with KC. An early example of this corporate autonomy occurred when the German subsidiary initially sold the PET as an industrial tool, whereas the British company had quickly turned to business and education markets. Tomczyk, M.(1984), *op.cit.*, p.38

(116) The Vic marketing manager, CK, have previously worked for Whitbread's soft drinks division. Once appointed, he assembled

staff in his division who had a similar outlook and appointed an advertising agency which had very varied contracts. The only other company to follow a very similar route were Atari - some years later. Interviews with KC and CK of Commodore, and QX of the advertising agency for Atari.

(117) Interview with KC.

(118) Tomczyk, M.(1984), *op.cit.*, p.124.

(119) Interview with KC.

(120) Personal communication from Ben Keen.

(121) Interview with CK.

(122) Interview with CK.

(123) Interview with KC.

(124) Interview with KC. QX, of Atari's advertising firm, made similar points. Interview with QX.

(125) Adamson and Kennedy indicate the significance of programming in Britain by pointing to the mass of successful books introducing computers, programming and the more technically detailed aspects such as machine code. Such publications were never mass marketed in the US. Adamson, I. and Kennedy, R.(1986), *op.cit.*, 136.

Chapter 5: Microcomputing as a Male Hobby

(1) In an earlier chapter, I indicated how difficult it was to gauge the extent of hobbyists' interest. Despite any difficulties of representativeness, Margaret Shotten's sample of hobbyists is the best available guide to the different periods when hobbyists became involved with computing. Of those who completed the course of interviews, the distribution of the duration of interest among her sample of hobbyists was a follows:

TABLE 5.1: YEAR IN WHICH SELF-IDENTIFIED HOBBYISTS FIRST OWNED A MICROCOMPUTER

Year in which first owned a Microcomputer	Number of Hobbyists
Pre 1975	1
1975-79	13
1980	8
1981	17
1982	22
1983	11
1984	2

Personal Communication

In this chapter, I will focus mainly on hobbyists who became involved before and just after 1980 - the year the first home computers weremarketed in the UK. Unfortunately, in the case of women, I could only locate those who first became acquainted with micros in a later period.

(2) We have already seen how some hobbyists in the US were able to develop their hobbyist interest at work. NL and others in the club which I attended were also able to follow up their interests using company equipment. This situation is not taken into account in the literature on leisure, which assumes that such activities take place outside of the workplace.

(3) Both in Margaret Shotten's main sample of those who said they were 'hooked' on computers and in a matched sample of computer owners, everyone read computer magazines.

(4) These examples were taken from various 1977 issues of 'Practical Electronics'. Further products and projects included tools such as a digital voltmeter ;battery voltage and exhaust monitors for cars; burglar alarms, smoke detectors, intercom, programmed bedside lights, and dimmer, solar heating and thermostat controls for the

home; microphone mixers, tuning aids and electronic organ parts in the music field; and TV games, reaction timers and one arm bandits for amusement purposes.

(5) Interview with QX.

(6) Interview with MG.

(7) PE Editorial (1977), Practical Electronics, March, Vol.13, No.3, p.177.

(8) PE Editorial (1977), *op.cit*, p.177.

(9) PE Editorial (1977), *op.cit*, p.177.

(10) Interview with TG.

(11) PCW Editorial (1978a) Personal Computer World, Vol.1, No.2., p.3.

(12) Interview with LH.

(13) PCW Editorial (1978b), Personal Computer World, Vol.1, No.1, p.13.

(14) Ringer, W.(1978), '*Power to the People*', Vol. 1, No.2, p.8.

(15) PCW Editorial (1978b), p.13.

(16) LH, who spent some time moving in American hobbyist circles as well as British ones, felt that UK hobbyism was far 'less intellectualised' and instead involved much more 'tinkering and experimenting'. From my interviews and observations, there seemed to be virtually no discussion of countercultural themes.

(17) Interview with LH.

(18) Hayer, G. (1978), '*Personal Experience*', Personal Computer World, Vol.1, No.7, pp.57-8. PCW ran a whole series of such autobiographical articles in the first year, describing the pleasures of computer hobbyism. I examine the process by which these construct the hobbyist role in Haddon, L.(1984), *op.cit.*

(19) Interviews with MG and TG. This was also true of Margaret Shotten's interviewees.

(20) For example, Kidder, T.(1981), '*Soul of a New Machine*', Penguin, Harmondsworth.

(21) Turkle notes the non-technical background of 1980s American hobbyists. Turkle, S.(1984), *op.cit.*, p.188.

(22) Some teachers have also tried to challenge the representation of computers and IT as being in the domain of maths and science. Such representations were felt to exclude women and girls in various ways. See Equal Opportunities Commission (1985), *op.cit.*,

p.6.

(23) See Morely, D.(1986), *op.cit.*

(24) Kennedy, M.(1987), *op.cit.*, p.115.

(25) Griffin, C. et al.(1982), *'Women and Leisure'*, in Hargeaves, J.(ed.) *'Sport, Culture and Ideology'*, Routledge and Kegan Paul, London, p.88 and p.99.

(26) Deem, R.(1986), *'All Work and No Play: The Sociology of Women and Leisure'*, Open University Press, Milton Keynes, p.119. Smith makes the point that the presence of small children makes a difference to the leisure of both parents, although the effect is far greater for women. In relation to this point, TG noted that there few males who had such young children attended hobby clubs. Smith, J.(1987), *'Men and Women at Play: Gender, Life Cycle and Leisure'*, in Horne, J. et al. (eds.), *'Sport, Leisure and Social Relations'*,Routledge and Kegan Paul, London, p.75; Interview with TG.

(27) Deem, R.(1987). *'The Politics of Women's Leisure'*, in Horne, J. et al.(eds.), *'Sport, Leisure and Social Relations'*, Routledge and Kegan Paul, London, pp.215-6.

(28) Griffin, C. et al.(1982), *op.cit.*, p.102.

(29) Deem, R.(1987), *op.cit.*, p.213.

(30) Deem, R.(1986), *op.cit.*, p.51; Clarke, J. and Critcher, C. (1985), *'The Devil Makes Work: Leisure in Capitalist Britain'*, MacMillan, London, p.159.

(31) Deem, R.(1986), *op.cit.*, p.96

(32) Griffin et al.make one point about boys and girls that is worth bearing in mind in the later section on youth. Although much of the leisure literature is on adult males and women, these authors note that even boys seem to be entitled to more leisure than girls. Griffin, C. et al.(1982), *op.cit.*, p.104.

(33) Interview with TG.

(34) For example, in the interview with MG.

(35) Deem, R.(1986), *op.cit.*, p.51 and p.81. One manifestation of this time pressure faced by women can be seen in TV viewing styles. Morely's research shows how women were more inclined to watch television while performing other tasks, whereas men were more

inclined to devote their sole attention to the TV without interruption. Morely, D.(1986), *op.cit.*, p.150.

(36) Clarke, J. and Critcher, C.(1985), *op.cit.*, p.160; Griffin, C. et al.(1982), *op.cit.*, p.114.

(37) Clarke, J. and Critcher, C.(1985), *op.cit.*, p.160.

(38) Cockburn points to the background support of wives' labour in Tracy Kidder's account of engineers who were deeply involved in their computer project at work. Cockburn, C.(1985), *op.cit.*, p.174; Kidder, T.(1982), *op.cit., pp.172-4.*

(39) Although figures concerning the amount of time spent using computers are available (see Statistical Appendix 8), it is not possible to disentangle the activities on which those hours are spent. For example, the time might all be taken up by game-playing in the case of some users. This is not the main focus in this chapter, even if some of the 'hobbyist' to whom I refer play games in addition to other activities.

(40) Interview with TG. Many of those in Margaret Shotten's sample spent far more time than this using their machines.

(41) Interview with MG.

(42) Interview with TG, MG and others (who do not appear in my list of interviewees).

(43) Personal communication from Margaret Shotten.

(44) Interview with FT.

(45) Interview with LK. NM also first became interested through playing in the arcades when her family went on holiday (which fits in with the pattern which we shall see in the later chapter dealing with girls). While working a a secretary, she had the opportunity to play the games available on the computer at work. Interview with NM.

(46) Interviews with DC and with DN.

(47) Although I have very little detail on this issue, educational dimensions of computing may be a significant justification for women's interest in the field. MG and WD noted that in their respective clubs, the few women who were present, often teachers, were specifically interested in educational applications.

(48) Deem, R.(1986), *op.cit.*, p.81 and p.95.

(49) Interview with LK.

(50) Interview with TG.

(51) Deem, R.(1986), *op.cit.*, p.92.

(52) Woolnough, R.(1977), *op.cit.*, p.116. Kaplan calculates from one survey of early American Hobbyists that more than one third of these enthusiasts spent 10% of their annual income on computing, while 20% spent 20% of their annual income on their hobby. Kaplan, A.(1977), *op.cit*, p.74.

(53) Interview with TG.

(54) Interview with MG.

(55) Adamson and Kennedy refer to surveys showing that most early purchasers of the ZX80 were professional males aged 25 to 40. Despite the problems with data on purchasing and ownership, since these early machines were not pitched in familial terms but were presented as 'individual' purchases, it seems reasonable to assume that purchasers were identical to users in this case. Adamson, I. and Kennedy, R.(1986), *op.cit.*, p.89.

(56) Deem, R.(1986), *op.cit.*, p.106.

(57) Interview with FT. NM was in the process of considering whether to buy a computer for the games and to do a little programming. The only way she could justify such a decision to herself was if there were other benefits - for example, if she could use a machine to word-process at home in order to earn a little extra money. Interview with NM.

(58) Deem, R.(1986), *op.cit.*, p.49.

(59) Interview with KE(2).

(60) Interview with MG and with QS.

(61) Interview with LH.

(62) For example, Illich, I.(1973), *'Deschooling Society'*, Penguin, Harmondsworth.

(63) This argument frequently arose in the hobbyist club in which I participated and in interviews.

(64) Gray approaches this issue of justification in terms of discussing the guilt felt by women interviewees when following up their own TV and film interests by watching video - while domestic chores remained to be done. In relation to computing,

David Skinner noted that all his women interviewees who had some interest in computing and spent time using the machine justified that interest in solely utilitarian terms - whereas this was by no means true of all the men. Some males referred simply to the pleasures of the activity. Gray, A.(1987), *'Behind Closed Doors: Video Recorders in the Home'*, in Baehr, H. and Dyer, G.(eds.), Boxed In: Women and Television, Pandora, London, p.48; Personal communication from David Skinner.

(65) Interview with LK.

(66) David Skinner provided this anecdote from one of his interviews. Personal communication.

(67) In Margaret Shotten's sample of users, 35 out of the 106 initial interviewees were club members. Obviously, as a self-selecting group who perceived themselves as being 'hooked' on computers, there would be questions about the representativeness of such a sample - assuming that we could even theoretically demarcate a population of hobbyists.

(68) TG, MG could think of only a few women in the East London Club, where in the 1980s core membership alone was 40 to 50, and attendance was often between 60 and 70; MG only remembered one women in the clubs pre-1980 days. Interviews with MG and TG. The same type of picture emerged from both my participation and questions about the North London Club, and in the interview with WD about the later West London club. David Skinner conducted a sub-study of two West London clubs with the same conclusions.

(69) TG had been responsible for organising the London fairs between 1981 and 1983. He estimated that about 5% of those attending were women. These London fairs were not the same as the current industry high points such as the 'Personal Computer World Show'. The fairs to which he refers were strictly for enthusiasts, with hobbyist-orientated equipment and software on sale. TG argues that, to an extent, the surviving representative of this tradition would be 'ZX Microfair' for Sinclair machines. Having attended one of these events, I can add that the proportion of women was still about 5% in 1984.

(70) Cockburn, C.(1985), *op.cit.*, p.169.

(71) Deem, R.(1986), *op.cit.*, p.59.

(72) MG, TG and WD all mentioned this in relation to their clubs.

(73) Deem, R.(1986), *op.cit.*, p.49.

(74) Deem, R.(1986), *op.cit.*, p.58.

(75) Smith, J.(1987), *op.cit*, p.58.

(76) Interview with LK.

(77) Cockburn first refers to 'gendered terrain', and Kennedy takes up the point about feeling out of place. Cockburn, C.(1985), *op.cit.* p.203; Kennedy, M.(1987), *'Labouring to Learn: Women in Adult Education'*, in McNeil, M.(ed.) *'Gender and Expertise'*, Free Association Books, London, p.117.

(78) This was mentioned by one member of the club in which I participated.

(79) Interview with MG.

(80) Personal communication for Iggy Mascarenhas at the Mary Ward Centre.

(81) Deem, R.(1986), *op.cit.*, p.55. In support of this, Kennedy cites the following table:

TABLE 5.2: GENDER AND ADULT EDUCATION

Adults in Continuing Non-Examination Education
England and Wales, 1980
(as a Percentage of Population)

Age	Men %	Women %
17-24	20	22
25-44	14	13
45-64	5	10
65-75	4	9
All	11	13

Source: ACACE, cited in Kennedy, M.(1987), *op.cit.*, p106.

(82) Interview with NL.

(83) This was the case with TG's project, for example. That type of project appears to be common from my general discussion with club members.

(84) One contribution of the subculture literature was that it discussed the process of becoming a member of such a collectivity. Although the notion of 'role' employed by these writers is now seen as problematic in the light of work on 'subjectivities', this subculture literature nevertheless made useful points about the way in which values and norms were learnt and were not facets which members brought automatically to the group. This might be a useful way of considering how newcomers adopted some of the features of club interaction which I have noted.

(85) Felsenstein, quote in Moritz, M.(1984), *op.cit.*, p.110.

(86) Interview with TG.

(87) Interview with TG.

(88) Kennedy, M.(1987), *op.cit.*, p.117.

(89) Cockburn, C.(1985), *op.cit.*, p.176.

(90) Cockburn, C.(1985), *op.cit.*, pp.171-4.

(91) There are other aspects of the early computing press which could be explored for their role in 'gendering' this sphere of activity. For example, these computer magazines are slotted into a male press by being physically located among journals which are fairly well dichotomised by gender. The very form of the micro magazines - in layout, appearance, and style - bear some resemblance to the other specialist press. And, of course, the hobbyist is often referred to as 'he', while many of the projects relate to activities which have male connotations - including programs to improve your darts score and ones to practise landing a spacecraft. This ensemble of codes signify that one is entering a male world, publicly demarcating the genderedness of the micro field. To the extent that there is a degree of browsing across journals in similar categories, partly because of shared codes and structures, the microcomputing press was always

more liable to expand its audience to other male readers.

(92) See Douglas, M.(1986), *op.cit.* Some of the older members who came to club had once been involved radio hobbyism, and many hobbyists compared computing to this other field.

Chapter 6: The History of Electronic Games

(1) Levy, S.(1984), *op.cit.*, p. 11 discusses the first course; p.54 discusses the formation of an AI department.

(2) Levy, S.(1984), *op.cit.*, p.56; Brand, S.(1972), *op.cit.*, p.35.

(3) Levy, S.(1984), *op.cit.*, p.143; Brand, S.(1972), *op.cit.*, p.35.

(4) Augarten, S.(1984), *op.cit.*, pp.255-7; Shurkin, J.(1984), *op.cit.*, pp.278-9.

(5) Levy, S.(1984), *op.cit.*, p.77.

(6) Levy, S.(1984), *op.cit.*, p.39, p.41, p.43, p.47, p.67; Brand, S.(1972), *op.cit.*, p.34.

(7) Levy, S.(1984), *op.cit.*, p.8 and p.38.

(8) Levy, S.(1984), *op.cit.*, pp.82-4.

(9) Levy, S.(1984), *op.cit.*, p.112.

(10) Levy, S.(1984), *op.cit.* pp.8-10.

(11) Levy, S.(1984), *op.cit.*, p.34; Turkle, S.(1984), *op.cit.*, pp. 247-48.

(12) Levy, S.(1984), *op.cit.*, p.20.

(13) Levy, S.(1984), *op.cit.*, p.43.

(14) Levy, S.(1984), *op.cit.*, p.64.

(15) Levy, S.(1984), *op.cit.*, p.103.

(16) Levy, S.(1984), *op.cit.*, p.20.

(17) Levy, S.(1984), *op.cit.*, p.34.

(18) Levy, S.(1984), *op.cit.*, p.34.

(19) Writers such as Levy are in effect arguing the merits of the treating technology as an object of play. His account stresses that the same underlying spirit shared by early Hackers and and later microcomputer hobbyists - whom he refers to as 'Hardware Hackers'.

(20) Levy, S.(1984), *op.cit.*, p.12.

(21) Machover, C.(1978), '*A Brief, Personal History of Computer Graphics*',Computer, November; Brand, S.(1972), *op.cit.*, p.34.

(22) Levy, S. (1984), *op.cit.*, pp.45-6.

(23) Both Levy and Brand interviewed Russell. The quotes were Russell's verbatim comments cited by Brand. Levy, S.(1984), *op.cit.*, p.46; Brand, S.(1972) *op.cit.*, p.34.

(24) Levy, S.(1984), *op.cit.*, pp.51-2; Brand, S.(1972), *op.cit.*, p.35.

(25) Levy, S.(1984), *op.cit.*, p. 53.

(26) Brand, S.(1972), *op.cit.*, p.35. - cites Albert Kuhfield's article in 'Analogue Magazine', July 1971.

(27) Brand, S.(1972), *op.cit.*, p.35.

(28) Brand, S.(1972), *op.cit.*, p.38.

(29) Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.132-3.

(30) Personal communication from personnel involved in these exercises in Britain.

(31) Levy, S.(1984), *op.cit.*, p.136.

(32) Levy, S.(1984), *op.cit.*, p.133; Freiberger, P. and Swaine, M.(1984) *op.cit.*, p.135.

(33) Levy, S.(1984), *op.cit.*, p.132-3; Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.133.

(34) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.133.

(35) Levy, S.(1984), *op.cit.*, p.52.

(36) Kidder discusses the way in which 'Adventure' was also used as a diagnostic program. Kidder, T (1981), *op.cit.*, pp.82-4.

(37) Brand, S.(1972), *op.cit.*, p.53.

(38) This can be observed in the computer sections of large stores - especially in the case of home computers which are renowned for their graphics, such as the Atari ST and Amiga machines.

(39) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.130.

(40) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.133.

(41) Freiberger, P. and Swaine, M.(1984), *op.cit.*, pp.132-135.

(42) Freiberger, P. and Swaine, M.(1984), *op.cit.*, p.132.

(43) Dennis discusses how the 'Game of Life' was used at a symposium to mark the launch of a new machine in the UK. Dennis, M.(1978), *op.cit.*, p.25.

(44) Interview with LH. Borland provides an example of a magazine

writer who was advocating the use of games for learning to program. Borland, K.(1978), *op.cit.*, p.22.

(45) Interview with KE(2).

(46) Interview with MG.

(47) Interview with QS.

(48) From contacting the various relevant trade associations and major companies, there appears to be no available data concerning the use of arcade machine during this period. In 1987, whem Carrick James first supplied me with data concerning the earlier use of home video games machines, the market research company had recently been commissioned for the first time to gather data on the use of coin-op machines. (I was asked to explain some of the differences in machines and terminology in return for the firm's assistance.)

(49) There is some disagreement concerning the details of the first games between the various second hand accounts which are available. Although my version is a composite one, it draws to a greater degree on the history described by Perry et al, since this account was based on interviews with Alcorn and Bushnall and provided a more detailed description than some of the other articles. Perry, T. et al. (1982), *'Video Games: the Electronic Big Bang'*, IEEE Spectrum, December, Vol.19, No.12, p.23.

(50) Busnall is quoted in Kubey, C.(1982), *'The Winners Book of Video Games'*, W.H.Allen, London, p.250.

(51) Kubey, C.(1982), *op.cit.*, p.250.

(52) Price, J.(1985), *'Social Science Research on Video Games'*, Journal of Popular Culture, Spring, Vol.18, No.4. p.114.

(53) Bernstein, P.(1981), *'Atari and the Video Games Explosion'*, Fortune, July, Vol.104, No.2, p.42.

(54) Larsen, J. and Rogers, E. (1984), *'Silicon Valley Fever: Growth of High Technology Culture'*, Unwin, London, p.261; Bernstein, P.(1981), *op.cit.*, p.46.

(55) Egli, E. and Meyers, L.(1984), *'The Role of Video Game Playing in Adolescent Life: Is there Reason to be Concerned?'*, Bulletin of the Psychonomic Society, Vol.22, No.4, p.309.

(56) Condry, J. and Keith, D.(1983), *'Educational and Recreational Uses*

of Computer Technology: Computer Instruction and Video Games', Youth and Society, September, Vol.15, No.1, p.103; Larsen, J. and Rogers, E. (1984), *op.cit.*, p.263.

(57) Bing, J.(1982), *'The Electronic Games Gambit'*, Impact of Science on Society, Oct/Dec, Vol.37, No.4, p.36.

(58) Kaplan, S.(1982), *'The Image of Amusement Arcades and the Differences in Male and Female Video Game Playing'*, Paper presented at the North Central Sociological Association annual meeting, Detroit, Michigan, May.

(59) Screen Digest (1977), *'Video games'*, July, p.127.

(60) Kaplan, S.(1983), *op. cit.*, p.93.

(61) EL News (1982), *'Anti-Video Game Movement Gathering Momentum'*, Electronic Learning, Vol.1, No.3, pp.12-13 ; Needham, N. (1983), *'Thirty Billion Quarters Can't Be Wrong: Or Can They? A Look at the Impact of Video Games on American Youth'*, Today's Education 1982-3 Annual, p.55; Toles, T.(1985), *'Video games and American military Ideology'*, in Mosco, V. and Wasko, J. *'The Critical Communications Review, Vol.III: Popular Culture and Media Events'*, Ablex, Norwood, pp.209-10; Price, J.(1985), *op.cit.*, pp.119-20.

(62) Toles, T.(1985), *op.cit.*, p.210.

(63) Frude, N.(1983), *'The Intimate Machine: Close Encounters with New Computers'*, Century, London, p68. Long and Long also mention that in the UK Gamblers Anonymous were setting up a network to deal with this 'addiction' - Long, S. and Long, W.(1984), *'Rethinking Video Games: A New Challenge'*, Futurist, December, Vol.18, No.6, p. 35.

(64) Discussed in Turkle, *S.(1984), op.cit.* The most frequently and influential work expressing concern about compulsive programming is Weizenbaum, J.(1976), *'Computing Power and Human Reason: From Judgement to Calculation'*, W.H.Freeman, San Francisco.

(65) Egli, E. and Meyers, L.(1984), *op.cit.*, p.309.

(66) Toles, T.(1985), *op.cit.*, p.217.

(67) Panelas, T.(1983), *'Adolescents and Video Games: Consumption of Leisure and the Social Construction of the Peer Group'*, Youth and Society, September, Vol.15, No.1, p.63; Price, J.(1985), *op.cit.*, p.119.

(68) Ellis, D.(1984), '*Video Arcades, Youth and Trouble*', Youth and Society, September, Vol.16, No.1, pp.47-8.

(69) Ellis, D.(1984), *op.cit.*, p.59.

(70) Panelas describes the arcade as an establishment like pool halls and soda shops, where teenagers can achieve a 'modicum of autonomous social space'. More empirically, Smith's observations in an arcade estimated that about 80% of those present were adolescents. Panelas, T.(1983), op.cit., p.52 and p.62; Smith, S.(1983), '*"Coin Detected in Pocket": Videogames as Icons*', in Geist, C. and Nachbar, S. (eds.) '*The Popular Culture Reader*', Bowling Green University Popular Press, Bowling Green, p.147.

(71) Virtually all the writers encountered are willing to claim that arcades are mostly male. The specific figure usually claimed (with no source given) is that 90% of those in the arcades are male (e.g. Toles, Larsen and Rogers). In the absence of market research, by looking at the psychology studies and others involving observation we can at least get some idea of the variation in proportions of males and females in these sites. Of course, this does not measure game-playing itself, nor encountering games in non-arcade locations. Below are the percentages of females in different arcade studies.

TABLE 6.1: GENDER AND ARCADES

Source	No.of arcades	% Female
Egli and Meyers	4	6%
Smith	1	10%
A study in Pittsburg	Several	15%
Kaplan	2	20%
Trinkaus	1	25% (at the time when Pac Man was dominant)

Kiesler et al.	1	17%
Leigh and Jordan	2	30%

In the Pittsburg study (cited in Loftus and Loftus) the researcher noted that while a few groups of girls played together, most girls were with boys, and even then their main role was to admire the performance of their boyfriends. Loftus and Loftus also refer to a survey in Minneapolis which, from 2000 video game players, found that the heaviest players were mostly teenage boys. Egli, E. and Meyers, L. (1984), *op.cit.*, p.309; Kaplan, S.(1983), *op.cit.*, p.94; Larsen, J. and Rogers, E. (1984), *op.cit.*, p.263; Leigh, J. and Jordan, K.(1984), '*Race and Sex Differences of Children in Satisfaction and Other Factors Associated with Video Games*', Advances in Consumer Research, Vol.11, p.95; Loftus, G. and Loftus, E.(1983), '*Mind at Play: The Psychology of Video Games*', Basic Books, New York, p.106; Smith, S.(1983), *op.cit.*, p.147; Toles, T.(1985), *op.cit., p.214; Trinkaus, J.(1983), 'Arcade Video Games: An Informal Look*', Psychological Reports, No.52, p.586; Kiesler S. et al.(1983), '*Second-Class Citizens?*', Psychology Today, March, p.43.

(72) Ellis, D.(1984), *op.cit.*, pp.56-8.

(73) Price cites a study by Brooks, which looked at 900 youths who played in the arcades. Price, J.(1985), *op.cit.*, p.120.

(74) Smith, S.(1983), *op.cit.*, p.150.

(75) Kubey, C.(1982), *op.cit.*, pp.252-9. One article in Playboy also mentions that Atari itself set up a division for making electronic pinball machines. Playboy,(1982), '*What Sort of Man Invents Defender?*', March, Vol.29, No.3, p.230.

(76) Panelas, T.(1983), *op.cit.*, p.62; Price, J.(1985), *op.cit.*, p.120.

(77) Panelas, T.(1983), *op.cit.*, p.52; Loftus, G. and Loftus, E.(1983), *op. cit.*, p.85.

(78) Schofield, J.(1985), '*The Guardian Guide to Home Computing*', Basil Blackwell, Oxford, p.102.

(79) Trapanski, E.(1979), '*Special when Lit: A Visual History of the Pinball*', Dolphin Books, New York.

(80) London Industrial Strategy (1985), 'The Cultural Industries',

Greater London Council, London.

(81) Kreinberg N. and Stage, E.(1983), *'EQUALS in Computer Technology'*, in Zimmerman, J. (ed.), *'The Technological Woman: Interfacing with Tomorrow'*, Praeger, New York, p.255; Kunkin Heller, D.(1982), *'Computer Games for Women Stress Cooperation, Humor and Whimsy'*, Infoworld, April 12th, pp.17-18.

(82) Needham, N. (1983), *op.cit.*, p.54.

(83) Toles, T.(1985), *op.cit.*, p.214.

(84) Perry, T. et al.(1982), *op.cit.*, p.26; Price, J.(1985), *op.cit*, p.122.

(85) This study by Mallone is cited in Kreinberg. Kreinberg N. and Stage, E.(1983), *op.cit*, p.225.

(86) Talbot, D.(1983), *'Pac-Man Kills Kids: Video Horrors'*, Mother Jones, April. The game was withdrawn after a campaign by Women Against Pornography.

(87) Kreinberg N. and Stage, E.(1983), *op.cit* p.225. Perry et al. estimated that there were about 100 video game designers in the US when they were writing - about 4 or 5 of these were women, mostly designing home video games. Perry, T. et al.(1982), *op.cit.*, pp.28-9.

(88) Bushnall himself would be one example. An article in 'Playboy' describes the designer of the game 'defender' as having a similar background. In Perry et al., the women arcade game designer said that when she joined Atari, the only theme which her contemporaries worked on were variations on Spacewar type games. Playboy (1982), *op.cit.*, p.230; Perry, T. et al.(1982), *op.cit.*, pp.26.

(89) Smith, S.(1983), *op.cit.*, p.150.

(90) Larsen, J. and Rogers, E.(1984), *op.cit.*, p.264.

(91) Three of the women designers put this argument. Perry, T. et al. (1982), *op.cit.*, p.31.

(92) Price, J.(1985), *op.cit.*, p.121.

(93) Trapanski, E.(1979), *op.cit.*, p.147.

(94) Price, J.(1985), *op.cit.*, p.113.

(95) R. Baer (1977), *'Television Games: Their Past, Present, and Future'*, IEEE Transactions on Consumer Electronics, Vol. CE-23, No.4, November, p.496.

(96) Baer, R.(1977), *op.cit.*, p.498.

(97) Baer, R.(1977), *op.cit.*, p.498.

(98) Jones, M.(1984), *'Video Games as Psychological Tests'*, Simulations and Games, Vol.15, No.2, June, p.133.

(99) Baer, R.(1977), *op.cit.*, p.499.

(100) Screen Digest (1977), *op.cit.*, p.127; Baer, R.(1977), *op.cit.*, p.127.

(101) Price, J.(1985), *op.cit.*, p.113.

(102) Baer, R.(1977), *op.cit.*, p.499; Kubey, C.(1982), *op.cit.*, p.263.

(103) Bernstein, P.(1981), *op.cit.*, p.42.

(104) Screen Digest (1977), *op.cit.*, p.127.

(105) Smith, S.(1983), *op.cit.*, p.146.

(106) Bristow, S.(1977) *op.cit.*, p.59.

(107) Jones, M.(1984), *op.cit.*, p.133.

(108) Murrey, T.(1976), *'The Boom in Video Games'*, Dun's Review, Vol.108, No.3, September, p.54.

(109) Screen Digest (1977), *op.cit.*, p.127.; Kubey, C.(1982) *op.cit.*, p.263.

(110) Murrey, T.(1976), *op.cit.*, p.54.

(111) Screen Digest (1977), *op.cit.*, p.128.

(112) Price, J.(1985), *op.cit.*, p.115.

(113) Interview with CH; also the view in Bernstein, P.(1981), *op.cit.*, p.46.

(114) Kubey, C.(1982) *op.cit*,. p.263.

(115) Price, J.(1985), *op.cit.*, p.115.

(116) Perry, T. et al.(1982) *op.cit.*, p.20; Panelas, T.(1983), *op.cit.*, p.58.

(117) Price, J.(1985), *op.cit.*, p.117; Leisure Electronic Traders (1983), *'LET USA'*, October, p.14.

(118) Leisure Electronics Traders (1983), *'LET USA'*, May, p.14.

(119) Alexander argues that in addition to the competition from home computers, the video games market was simply suffering from oversupply and losses caused by so many new firms entering the field - in a way which was later to parallel the situation with computer games. Alexander, C.(1983), *'Video Games Go Crunch!'*, Time, October 17th, pp.38-9.

(120) Interview with IS(1).

(121) Murrey, T.(1976), *op.cit.* p.55.

(122) Slovick, M.(1976), '*Suppliers Set to Score with Programmable Games*', Audiovideo International, October, pp.28-33; Knudsen, B.(1977), '"*Happy Days are Here Again": For Video Games*', AudioVideo International, December, pp.40-2; Knudsen, B.(1978), '*Video Games - Caught in an Identity Crisis*', AudioVideo International, December, pp.40-1 and p.48. There were only a few features on the American Video Games in the trade press available in Britain - they are all referred to here.

(123) Knudsen, B.(1978), *op.cit.*, p.41.

(124) Knudsen, B.(1977), *op.cit.*, p.42.

(125) Knudsen, B.(1977), *op.cit.*, p.42.

(126) Slovick, M.(1976), *op.cit.*, p.29. Murrey is an example of a financial analyst outside the trade press who also discusses the link to computers. Murrey, T.(1976), *op.cit.*, p.55.

(127) Slovick, M.(1976), *op.cit.*, p.29.

(128) Knudsen, B.(1977), *op.cit.*, p.48.

(129) Slovick, M.(1976), *op.cit.*, p.29.

(130) Knudsen, B.(1977), *op.cit.*, p.42.

(131) Slovick, M.(1976), *op.cit.*, p.29; Knudsen, B.(1977), *op.cit.*, p.41. Another example of this concern about identity occurred when Fairchild's Vice President for Video products argued that a 'games machine' was now a misnomer for programmable products - in Knudsen, B.(1977), *op.cit.*, p.42.

(132) Glapa, A.(1976), '*A Big Play in Video Games*', AudioVideo International, October, p.33.

(133) Nulty, P. (1982), '*Why the Craze Won't Quit*', Fortune, November 15th, *op.cit.*, p.120.

(134) Perry et al.(1983), *op.cit.*, p.51.

(135) Murrey, T.(1976), *op.cit.*, p.54.

(136) Perry et al.(1983), '*Design Case History: The Atari Video Computer System*', IEEE Spectrum, March, p.45.

(137) Screen Digest (1977), *op.cit.*, p.128.

(138) Bristow, S.(1977) *op.cit.*, p.59; Perry et al.(1983), *op.cit.*, p.45.

(139) Bernstein, P.(1981), *op.cit.*, p.46; Nulty, P. (1982), *op.cit.*, p.116.

(140) Panelas, T.(1983), *op.cit.*, p.58.

(141) I wrote to the American headquarters of Atari and Mattel, as

well to some US based Market Research firms, asking if they would be willing to pass on certain figures from their old research. I received no replies.

(142) Interview with ID. Nulty viewed US firms as mainly targeting boys - Nulty, P. (1982), *op.cit.*, p.124.

(143) Marketing(1981), '*Ingersoll Rejects TV Games Pessimism*', 29th April, p.3.

(144) Leisure Electronics Trader (1983), '*Leader of the Pack*', February, p.14.

(145) Marketing (1983) '*Atari Bets on Video Games Explosion*', 8th February; Leisure Electronics Trader (1983), *op.cit.* p.14. The same percentages for the UK and US are cited in in the Prest paper: Hartley, J. et al.(1985), *op.cit.*, p.77.

(146) Keynotes (1981), '*Toys and Games*', Key Note Publications, London, p.8.

(147) Marketing (1982b), '*Atari Invades UK Space*', 26th August, p.22.

(148) Marketing (1982b) *op.cit.*, p.22.

(149) Marketing (1982c) '*Toy Firms up Xmas Ad Spend by £3m: Traditional Manufacturers Rush into Space-Age Video Games Market*', 18th November, p.12

(150) Jivani, A.(1983) '*Philips Pursues More Video Games Success*', Marketing, March, p.6.

(151) Toles, T.(1985), *op.cit.*, p.217.

(152) Price, J.(1985), *op.cit.*, p.122.

(153) This is not to deny the possibility of following' the latest game developments without interaction with peers. One sociologist, Sudnow, became fascinated and proficient in isolation, and attempted to explain his 'experience' of games to outsiders. Many people, especially older players, may have experienced games in these terms. However, to account for the different patterns of consumption between males and females, I would argue that a form of explanation which refers to shared experiences and interaction amongst peers would be more persuasive. Sudnow, D.(1978), '*Pilgrim in a Microworld: Eye, Mind and the Essence of Video Skill*', Heinemann, London.

(1) See Statistical Appendices S1 and S2.

(2) Chanan points out that in the early days of a variety of products and services, it was by no means unusual for hardware companies to be producers of 'software'. The early manufacturers of cinematograph equipment, recording devices and radios also made films, phonographs and organised radio station broadcasting. Chanan, M.(1985), *The Reuters Factor. Myths and realities of Communicology: A Scenario'* in Radical Science Collective (eds.) *'Making Waves: the Politics of Communications'*, Free Association Books, London, p.126.

(3) Interview with SU, British manager for Tandy.

(4) Interview with JT, European manager for Texas Instruments.

(5) All these firms have at various times announced that they were not in the same market as firms such as Sinclair Research. The implication was that the ZX machines were almost a different category of product due to the combination of price and facilities. In practice, the type of product which Sinclair and others produced was to become what constituted a 'home computer' in the British market.

(6) Unfortunately, all my interviewees at Atari were employed by the firm after the machines had been developed. Therefore, their views concerning the computers' origins were formed afterwards. My overall impression is that, as with Sinclair, slightly different accounts may indeed reflect different visions within the firm.

(7) This view was represented from within the company in my interview with ID. Examples of industry analysts who expressed the same ideas can be found in Industry Report (1981) *'Winning with Video Games'*, Institutional Investor, Vol.15, No.9.

(8) Interview with ID.

(9) Interview with IS(1).

(10) Interview with IS(1).

(11) Interview with IS(1).

(12) Interviews with ID and QX.

(13) We must also bear in mind that although they carried the 'software' - conceptualised as media content - the cartridges were themselves a form of hardware. Texas had more interest in cartridges since it felt this medium was a more sophisticated technology, from which they could obtain more profit than in the case of cassettes. In the price wars of the early '80s, Texas Instruments were even willing to make a loss on the home computer itself - if they could sell 6 cartridges for each machine they would still make a profit (Interview with TJ).

(14) Tomczyk, M.(1984), *op.cit.*, p.114.

(15) Perry, T. and Wallich, P.(1985), '*Design Case History: the Commodore 64*', IEEE Spectrum, Vol.22, No.3, March, p.48.

(16) Tomczyk, M.(1984), *op.cit.*, p.108 and p.179.

(17) Leisure Electronics Weekly (1983), '*LET USA*', May, p.14.

(18) Interview with CK.

(19) The following market share figures include all the products of the companies concerned:

TABLE 7.1: THE MARKET SHARE OF THE MAIN HOME COMPUTER PRODUCERS

Manufacturer	1st Jan.83	1st Jan.84	1st Jan.85
Sinclair	57%	49%	43%
Commodore	12%	22%	23%
Acorn	5%	11%	14%
TOTAL	74%	82%	80%

Gowling Marketing Services (1985), '*Microcomputer End-User Research*', Liverpool, p.10.

(20) Interview with Clive Sinclair.

(21) Taylor, G.(1986), '*Sir Clive: Life After Death?*', Sinclair User, p.54.

(22) Interview with WT.

(23) Interview with WT.

(24) Interviews with WT and OC.

(25) Interview with OC.

(26) Taylor, G.(1986), *op.cit.*, p.54.

(27) Interview with OC.

(28) Interview with KE(1), formally at Acornsoft.

(29) Interviews with KE(1) and UD.

(30) Interview with DK, who played a major role on the committee drawing up the specifications for the hardware and software sought by the BBC.

(31) BBC Continuing Education Television, (1981a), *'Hands On Micro-electronics: Applications Programs and the General Problem of Software Support'*, unpublished internal memo of the Computer Literacy Project, p.5

(32) BBC Continuing Education Television, (1981b), *'Needs and Possibilities for Software Development'*, unpublished internal memo of the Computer Literacy Project, p.2; BBC Continuing Education Television, (1981a), *op.cit.*, p.6.

(33) Interview with DC.

(34) Interview with UD.

(35) Interview with KE(1).

(36) Tittscher, R. and Tittscher, I.(1984), *'The UK Microcomputer Market: Major Companies and Trends'*, Sector Investments Ltd., London, p.193.

(37) Tittscher, R. and Tittscher, I.(1984), *op.cit.*, p.162.

(38) Interview with WT.

(39) In 1983, Camputers were thought to hold a market share of 3%. Mintel Leisure Electronics Special Report (1983), *'Home Computers'*, London, October. From a 1985 Gowling consumer survey, it would appear that Elan was amongst the firms which attained less than 1% of the market. Gowling Market Services (1985), *'Microcomputers: End User Research'*, Liverpool, p.11.

(40) Interview with KE(2). Most of the detail about this firm comes from this interview, although where possible, the points which were raised here were checked against coverge in periodicals

such as *Personal Computer World.*

(41) Tittscher, R. and Tittscher, I.(1984), *op.cit.*, p.84.

(42) Interview with KE(2)

(43) Interview with IH. Most of the detail of this firm comes from this interview, although where possible, the points which were raised here were checked against other sources, such as *PCW* and *Design.*

(44) Interview with IH.

(45) Interview with MB of the company Bubble Bus, which was one of the software houses approached by Elan.

(46) Interview with FC.

(47) For example, Leisure Electronics Trader (1984a), *'The New Mogul Invasion'*, June, p.24; Leisure Electronics Trader (1983), *'Just Imagine'*, July, p.18.

(48) Interview with HK at Oasis. All subsequent references to the company in this section are drawn from the interview.

(49) Interview with BQ at Level 9. All subsequent references to the company in this section are drawn from the interview.

(50) Bourne, C.(1985a), *'The Hewson Express'*, Sinclair User, October, pp.106-8.

(51) Leisure Electronics Trader (1983), *'Bugged by Software'*, March, pp.34-5; Bourne, C.(1984a) *'Flying Low'*, Sinclair User, November, pp.138-9; Games Computer and Video Games (1983), *'Designer of the Month'*, December, p.13.

(52) Bourne, C.(1984b) *'Matthew Uncaged'*, Sinclair User, December, pp.88-90.

(53) Interview with MB of Bubble Bus.

(54) Bourne, C.(1985b), *'Legend of the Haunted House'*, Sinclair User, August, pp.96-8; Bourne, C.(1985c), *'The Gargoyle Speaks'*, Sinclair User, November, pp.112-5.

(55) Levy, S.(1984), *op.cit.* As a parallel, video tapes were also originally sold by male order, prior to the emergence of video stores. Personal communication from Ben Keen.

(56) Bourne, C. (1984c), *'American Sellout'*, Sinclair User, November, pp.67-72.

(57) Interview with FC.

(58) For example, Leisure Electronics Trader (1984b), *'Artic Roll'*, January, p.40.

(59) Bourne, C.(1985a), *op. cit.*, p.106; some of those who later went on to establish their own software houses started out by arranging for other firms to publish their programs - e.g. Bourne, C.(1984a) *op.cit.*, p.138.

(60) Oasis had, for example, received card game software from one woman - the only female programmer of whom staff knew; the examples of 'Mastermind' and board games came from Bourne, C.(1984) *op.cit.*, p.138.

(61) For example, Bourne, C.(1984a) *op.cit. p.138; Computer and Video Games (1983) op.cit.*, p.3.

(62) For example, Mintel (1983), *'Home Computers'*, London.

(63) The 1980 and 1981 figures, from a Gowling market research report, seem very low compared to the widespread perception that mail order was so central during this period. It is unclear how Gowling derive their figures. Even during the early period, the other main distribution channels would have been through specialist computer stores and sales at computer fairs. Gowling Marketing Services (1983), *'The UK Home Computer Market'*, Liverpool, p. 15.

(64) Financial Times Business Information (1985), *'UK Market for Home Computers'*,London, p.18.

(65) Interview with XE at Domark.

(66) Interviews with CD and CQ at Beyond and Mirrorsoft respectively. All subsequent references to these companies are drawn from interviews.

(67) Interview with FC.

(68) The market research was Financial Times Business Information (1984), *'Home Computers in the UK and USA'*, London, p.23. Virgin and K-Tel perceptions were expressed in: Marketing (1983) *'Virgin Throws Down the Video Games Gauntlet'*, 24th February, p.4 and Oliver, B.(1983), *'K-Tel Pins Hopes on Video Games'*, Marketing, 16th June, p.2. The growing significance of software when recorded music sales were declining slightly can be seen in the estimates which I have compiled from market reports:

TABLE 7.2: COMPARISON OF THE HOME COMPUTER SOFTWARE AND RECORDED MUSIC MARKETS

£ Million Retail Sales Price

	1980	1981	1982	1983	1984
Recorded music	439	424	415	426	469
Home Computer Software			25	60	110

Sources for these figures are Keynote Report (1985), *'Homecompter Software'*, London, p.11 and Keynote Report (1986), *'Records and Tapes'*, London, p.1.

(69) Leisure Electronics Trader (1983), *"Virgin is Emergin'"*, November, p.40.

(70) Leisure Electronics Trader (1984a), *'The New Mogul Invasion'*, June, p.24; one of the many articles referring to a natural progression to games was: Leisure Electronics Trader (1983) *'Wynd-Up'*, September, p.63.

(71) Leisure Electronics Trader (1984), *'Microdealer'*, February, pp.51-2; Leisure Electronics Trader (1983), *'Masters of the Trade'*, April, pp.12-3.

(72) Market research showed that by 1984 over 70% of software houses had planned a programme of regular product launches - Gowling Marketing Services (1984), *'The UK Home Computer Software Industry'*, Liverpool, p.18

(73) Market Research in 1984 found that for every full-time programmer there were approximately three part-time or contract programmers - Gowling Marketing Services (1984), *op.cit.*, p.13. Certainly, in the case of Mirrorsoft, Beyond and Domark, most work was sub-contracted out.

(74) Gowling Marketing Services (1984), *op.cit.*, pp.14-5.

(75) Interviews with staff at Mirrorsoft and Domark.

(76) Gowling Marketing Services (1984), *op.cit.*, pp.16-7.

(77) Jivani, Q.(1983), *'Micromega Moves into Games'*, Marketing, 5th May,

p.6.

(78) Lyall, S. (1983), *'Micro Mags Boom'*, New Society, Vol.66, No.1090, 6th October, p.19.

(79) Abbot, D. (1983), 'Micro Mags Boom', The Listener, 7th July, p.38. The estimates below compare categories of the consumer electronic hardware market:

TABLE 7.3: COMPARISON OF HOME COMPUTER HARDWARE MARKET WITH THOSE FOR OTHER CONSUMER ELECTRONICS

	£million rsp				
	1981	1982	1983	1984	1985
Audio products	830	770	815	815	780
Video Cameras and Recorders	561	992	1004	558	732
Photographic Equipment	205	210	230	250	275
Home computer models and peripherals	115	313	300	295	

Sources are Euromonitor (1986), *'The Consumer Electronics Report'*, London, pp.72, 80 and 94, Euromonitor (1986), *'The Photography Report'*, London, p.34.

(80) Interview with IS(2).

(81) As an example of the scope for an entrepreneur in an emerging field, IS(2) also set up a distribution company and was involved in the development of 'Micronet' - a telecommunications arm of computing.

(82) Moorehouse, H.(1984), *op.cit.*, p.27.

(83) Abbot, D. (1983), *op.cit.*, p.38.

(84) Hayman, M. (1984), *'What Micro Makers Make of Micro Mags'*, Marketing Week, 29th June, p.31.

(85) Geron, A. and Brown, G.(1984), *'Is there a Way Out of this*

Computer Titles Maze', Campaign, 22nd June, p.59.

(86) Although at one time there were over 20 magazines in this video market - Business Brief (1982), *op.cit.*, p.76.

(87) Interview with IS(2).

(88) Business Brief (1982) *'A New Leaf for British Magazines'*, The Economist, 10th July, p.76; Earnshaw, S.(1984), *'Advertising and the Media: The Case of Women's Magazines'*, Media, Culture and Society, No.6.

(89) Mintel (1983), *'Magazine Industry'*, London, p.138.

(90) Interview with NM; discussed also in the trade press by Ingham, G. (1987), *'Read All About It', Computer Trade Weekly, 6th April, p.15.*

(91) Interview with MB at Bubble Bus.

(92) The market research firm Gowling gave the following figures on where adverts were placed from its survey of software firms:

TABLE 7.4: THE LOCATION OF HOME COMPUTER SOFTWARE ADVERTS

Where home computer software advertisements where placed in the 3 months

Computer Magazines	90%
Local/Regional Press	13%
Television	4%
Radio	4%
National Sundays	4%
National Dailies	3%
Other (mainly exhibitions)	9%

Gowling Marketing Services (1984), *op.cit.*, p.23.

(93) Interviews with all magazine staff.

(94) Interview with NU.

(95) Interview with CQ at Mirrorsoft.

(96) Interview with LH.

(97) Interview with LE.

(98) Interview with IS(2).

(99) Interview with NL, who was the freelancer who used to write these features.

(100) Interview with NU.

(101) 'Sinclair User' comes from the same publishing house as 'Computer and Video Games'. The outline of the different emphases between the two publications came from the interview with TC.

(102) This was a conscious policy at Sinclair User. Interview with TC.

Chapter 8: Youth, Gender and Interest in Home Computers

(1) This issue was certainly significant for the first two studies. Brunel's key issues are not yet fully clear.

(2) Frith's study of rock music is an example of another study which examines how the products of a cultural industry are consumed. Frith, S.(1978), *'The Sociology of Rock'*, Constable, London.

(3) These statistics are taken from the December 1983 survey by the Market Research firm, Carrick James. On this occasion, the firm examined a wider age band than its normal youth market. The figures come from a set of questions asking about how TV sets are used. See Statistical Appendix S11 for details of this research.

(4) See discussion of this point in Statistical Appendix S5.

(5) For example, a section entitled 'television-related talk' appears in Morely, D.(1986), *op.cit.*, pp.155-8.

(6) In this section, I have chosen to cite QW more frequently because he was one of the more articulate interviewees. With other boys, the same points often emerged over the course of a number of questions. Whenever I drew on one of the several interviews which I conducted with QW, I checked his impressions against that of the other boys and mentioned the fact that his analysis was one which was shared.

(7) Interview with QW.

(8) Interview with TT.

(9) Interview with KL and MM. This rivalry was also noted in David Skinner's research. Personal Communication

(10) Interview with TT.

(11) Interview with QW.

(12) WD's 'serious group' in a south London club also spent a good deal of time breaking protection and amassing software which was subsequently not used.

(13) KL and MM had played this role within their school, as had WD in the past.

(14) The samples of both David Skinner and the Mass Communications researchers included boys who could be considered as playing this role of experts.

(15) Interview with QW.

(16) Interview with TT.

(17) Interview with ID.

(18) In 1983, the Market Research firm Gowling collected statistics on magazine reading. Gowling asked which specialist magazines had been seen or read in the last 7 days by anyone in household's which possessed home computers. The research firm then provided a list of titles, plus an option for respondents to supply a name not on that list. The particular press which respondents read is not relevant here. The point is that 63% of this sample named a particular publication. However, this question only measures recent reading. Since the vast majority of magazines are monthly, we might assume that an even higher proportion of households would have answered positively had the time period given in the question been longer. Source: Gowling Marketing Services (1983), *'The UK Home Computer Market'*, Liverpool, p.16. All the boys in David Skinner' sample also read magazines. Personal Communication.

(19) Interview with QW.

(20) Interview with QW.

(21) David Skinner noted this point about fanzines from his research, which included interviews with fanzine producers.

(22) Interview with BB.

(23) Interview with QW.

(24) Interview with QW.

(25) Interview with DM.

(26) Interview with NB.

(27) Interview with QW.

(28) Interview with QW.

(29) Interviews with NH and BB.

(30) Interviews with KL and MM, and BB.

(31) Interview with MG.

(32) Interview with WD.

(33) The influx of younger games-players was an experience which was broadly shared by a range of clubs, according to MG. Since he had at least some contact with other groups by virtue of being on the committee of the ALCC (Association of London Computer Clubs), I think we can assume that claim has some truth in in. Unfortunately, it was not possible to find interviewees representing the perspective of the newcomers, because the spokespeople for the clubs are drawn from the more 'serious' users. David Skinner problematises this games-players versus serious users dichotomy, by noting that although the boys he interviewed were willing to refer to this polarisation within the clubs which they had joined, all these boys attempted some programming, especially at home. Personal Communication.

(34) Interview with BB, for example.

(35) Interview with DM, the main points of which were confirmed in an interview with his mother. The manager of one computer shop, also described how he had as regular Saturday visitors some groups of boys who appeared to spend the afternoon playing in the various shops in the West End of London.

(36) Interview with NB.

(37) Interviews with NH and TT.

(38) Interviews with NN and BB.

(39) Interview with QW.

(40) Unfortunately, it is difficult to ascertain the degree to which different users partake in such public occasions. Such figures

are not available, and I have already noted that my sample of interviewees had a particularly strong interest.

(41) Willis discusses how male youth appropriate space in his example of how unemployed teenagers turned shopping malls into meeting places, with no intention to buy the goods on show there. Willis, P.(1983), *'Thinking the Unthinkable'*, Report on Unemployed Youth to Northampton Council.

(42) In David Skinner's research, one computer shop had its own club in the evenings where visiting boys could freely use the software, even if they were not allowed to copy it. Personal Communication.

(43) One problem here, as David Skinner points out, is that what counts as programming can vary. For example, should slight alterations to listings be seen as programming? As in my sample, all of his interviewees 'said' that they programmed.

(44) Interview with QW.

(45) Interview with QW.

(46) Interview with NH.

(47) Interview with JJ and KK.

(48) Interview with BB.

(49) David Skinner drew attention to the apparent importance of schoolboy 'success stories' from his research.

(50) Interview with DM.

(51) Interview with ZN, ML and BA.

(52) Interview with CS and ST.

(53) Interview with OT and XD.

(54) Interview with OT and XD.

(55) XD's comment in the interview with OT and XD.

(56) For example, ZN and XD.

(57) OT's comment in the interview with OT and XD.

(58) BA's comment in the interview with ZN, ML and BA.

(59) Interviews with MG and WD.

(60) XD's comment in the interview with OT and XD.

(61) BA's comment in the interview with ZN, ML and BA.

(62) XD's comment in the interview with OT and XD.

(63) OT's comment in the interview with OT and XD.

(64) QW described the way in which the girls at the summer camp (who were in a majority because of the borough's equality policies) played, and seemed to enjoy, exactly the same range of games as the boys.

(65) An equivalent point is made by Stossl when discussing Channel 4's research on TV viewing: 'The decision to watch television at all is only affected to a small degree by what is on the screen. Probably 90% of viewing would happen regardless of what is shown. Only 10% of additional viewing comes for the audience of particular programming.' Stossl is referring to all viewers here. While the point may be to some extent true for all computer use, appears to characterise particularly well the use by girls. Stossl, S.(1987), *op.cit.*, p.110.

(66) Interview with OT and XD

(67) Murdock et al.(forthcoming), *op.cit.*, p.4.

Chapter 9: The Future of the Micro: The Continuing Debate

(1) De Jonquires, G. and Kehoe, L.(1983) *'The Big Battalions Take Over'*, Financial Times, September 12th, p.16.

(2) It must be remembered that while the British market is the centre of attention in this thesis, developments in the American market constituted a major factor shaping the decisions of the multinational manufacturers. It was mainly the competition in the US market, and price cutting there, which forced Texas Instruments to abandon home computers. Brooks, R. and Kay, W.(1983), *'Program for Destruction'*, Sunday Times, November 6th, p.63.

(3) Of the hardware companies which have been referred to in passing, Jupiter Cantab is an example of one bankruptcy which occurred at this stage.

(4) This factor was frequently explained in interviews, and is also noted in Adamson, I. and Kennedy, R.(1986), *op.cit.*, p.204.

(5) Dragon Data, Oric, and Camputers are examples of firms closing down in this period.

(6) Sinclair Research eventually ran into financial difficulties in 1985, when his later QL micro and other non-computer products failed to raise expected new revenue. The first rescue deal from Robert Maxwell of Pergamon Press fell through. However, Sinclair's creditors, led by the retail multiple chain Dixons, provided support to keep the firm in operation. Although he could have continued with the company, Clive Sinclair decided to sell the Sinclair Research brand name and many of its products to Amstrad in 1986. Adamson, I. and Kennedy, R.(1986), *op.cit.*, pp.203-23.

(7) This is not meant to imply that every firm survive nowadays. There was simply far less sudden change in the market structure after this period.

(8) For example, one line of development that I do not cover is that of small, portable computers. These include the Psion 'Organiser' product and the micro with which Clive Sinclair has recently returned to the computing market: the Z88. This latter machine represents a different conception of how the micro could be a pervasive technology. Unlike the home based infrastructural machines, these are very 'personal' micros that people can carry with them like a notebook. Such a product conception dates back to the visions of researchers in Xerox's Palo Alto Centre, where Alan Kay discussed a similar concept named 'Dynabook'. For a discussion of Sinclair's Z88, see Disney, S.(1987a), *'The Micro Recidivist'*, Computer Trade Weekly, October 5th, p.11 and p.23. On Dynabook, see Johnston, R.(1985), *'Why the World has Taken a Leaf out of the Dynabook'*, Guardian, October 10th, p.13; also, Brand, S.(1972), *op.cit.*, p.36.

(9) Interview with KC.

(10) Interview with OC.

(11) Interview with Sinclair.

(12) For example, David Skinner's research, or that of the Centre for Mass Communications Research.

(13) All the software houses which I interviewed drew some of their sales from exports to the Continent. Regular news and discussions of exporting arrangements and the state of continental markets appear in the trade press.

(14) Ryles, S.(1986), *'Back to the Future'*, Computer Trade Weekly, November 10th, p.18-9; Dinsey, S.(1987b), *'Consoling Thoughts'*, Computer Trade Weekly, June 15th, p.14 and p.18; Kidd, G.(1987), *'The Honorary Consoles'*, Computer Trade Weekly, October 26th, pp.22-23. Although some commentators see this as being one way for games to develop, there are some doubts in the industry about whether such machines will be successful - see Computer Trade Weekly (1987a), *'Can't Sell Consoles'*, June 29th, p.12.

(15) Interview with IS(1), manager of Atari UK.

(16) Scialom, M.(1987), *'Pleasuresoft Looms'*, Computer Trade Weekly, pp.16-18.

(17) These terms refer to the microprocessor chip in the computer. 8-bit, 16-bit and 32-bit represent different generations of chip. All the micros referred to in the period up to 1983 used 8-bit technology, as do the recent Amstrad machines to which I will be referring. Examples of 16-bit technology are Commodore's 'Amiga' series and the 'Atari ST' series of computers.

(18) For example, see Computer Trade Weekly (1987b), *Writing's on the Wall?'*, July 6th. pp.14-5 and p.19; Everiss, B.(1987), *'Crystal Balls'*, Computer Trade Weekly, January 26th, p.12-3.

(19) This was the view of a wide range of magazine editors in Computer Trade Weekly (1987b), *op.cit.*, pp.14-5.

(20) Although budget software is the subject of on-going discussion in the computer trade press, a more extended summary of developments can be found in Disney, S.(1987c), *'Games Without Frontiers'*, Computer Trade Weekly, pp.14-8.

(21) The recent 'Horror' sub-genre might be considered to be another innovation. For example, see Campbell, C.(1987a), *'Chambers of Horror'*, Computer Trade Weekly, October 5th, pp.20-21.

(22) Litwark, M.(1987), *'Reel Power: The Struggle for Influence in the New Hollywood'*, Sedwick and Jackson, London, p.100.

(23) Coucher, M.(1986), *'Software Apocalypse - Now'*, Computer Trade Weekly, December 15th, p.8; Everiss, B.(1987), *op.cit.*, p.12-3.

(24) Interview with BQ.

(25) Yates, T.(1987a), *'The Media is the Massage?'*, Computer Trade Weekly, October 12th, p.10 and p.23.

(26) A retrospective history of the origins of the British Micro federation is given in Yates, T.(1987b), '*Industry Expects...*', Computer Trade Weekly, April 20th, p.13 and p.17.

(27) The links between games and other applications were quite complex. As we saw in the chapter on the origins of games, the former were used as vehicles to teach programming. Later, some software designated as being 'educational' also adopted games features to make them more attractive.

(28) A Gowling survey asked a sample of people who used home micros one question concerning their attitudes to home computers. As opposed to the claims that there was massive disillusionment with the machines, the vast majority of respondents still felt positive towards the micros - and particularly stressed the educational aspects.

TABLE 9.1: ATTITUDES TOWARDS HOME COMPUTERS

Statements	% of respondents agreeing with each statement
I think everyone should learn about computers because it will help future career prospects.	64
I think it is important to have one for the children to help them cope with computers at school.	39
I generally feel dissatisfied with home computers insofar as they are limited in what one can do with them.	1

I regard home computers as sophisticated toys to be used mainly for non-educational purposes	12

(Some respondents answered 'yes' to more than one statement)
Base - 750 households where the main user was the respondent.

Gowling Marketing Services (1985), '*Microcomputer End-User Research*', Liverpool, pp.29-30.

(29) See Statistical Appendix S10.

(30) Commodore's own software sold reasonably well by mail order. Interview with CK.

(31) Both of these views occurred frequently in my interviews with producers, and both are represented in Disney, S.(1987d), '*The Trouble with Edsoft*', Computer Trade Weekly, January 19th, pp.14-15. The corollary of the argument about education and shelf space is that this product should not be sold in a location where it competes against games but instead it should be available in bookshops. This is argued in Kerslake, B.(1987), '*Shunning Education*', Computer Trade Weekly, June 29th, p.11 and p.27.

(32) Interview with CQ and with DK; Disney, S.(1987d), *op.cit.*, pp.14-5.

(33) Again, this was the view of most producers whom I interviewed and is shown in Disney, S.(1987d), *op.cit, p.14-5*; Kerslake, B.(1987), *op.cit.*, p.11 and p.27; and Hughs, J.(1987), *'The Death of Edsoft'*, Computer Trade Weekly, January 19th, p.15 and p.27.

(34) There is another dimension which I already mentioned in the section on education. One sales pitch was that the computer was providing a way to learn how (simplified) business software operated. For example, Commodore offered a program called an 'introduction to word-processing'. With very little memory and no guarantee that a printer would be purchased, such a program could only serve as a learning aid, not a utility in its own right. Tomczyk, M.(1984), *op.cit.*, p.125.

(35) Boyle, G (1986), '*Sinclair's QL Microcomputer*', Design and Innovation, Block 2, Marketing Units 6-8, T362, The Open

University, Technology, 3rd Level Course, Milton Keynes, p.27.

(36) Quoted from a magazine article in 'QL User' in Boyle, G.(1986), *op.cit.*, p.27.

(37) For example, adverts for the Commodore 64 machine depicted such home professionals with the title 'For the Office, or the Home Office'. In this particular case, the marketing and advertising staff had a different understanding of the purpose of the advertisement. For the latter, the aim really was to find small business and home professional users; for the former, the image was intended simply to supply more serious connotations to a home computer which was already designed with excellent games playing facilities. Hence, apart from the notion of business cross-over product, the representation of work can be used simply to connote 'usefulness'. Interviews with KC and with CK.

(38) Commodore's advertising agency eventually started to express this doubt. Interview with CK.

(39) This is not the first time that there have been moves to introduce practices from the workplace into the home. Forty comments on the introduction of domestic appliances in the 1930s: '...the most potent metaphor for efficiency was the factory. Just as the imagery of the factory was employed extensively to suggest efficiency in offices, housewives were encouraged to achieve efficiency in the home by planning their domestic duties as if they were tasks in an industrial routine'. Forty, A.(1986), *op.cit.*, p.216.

(40) Interview with OC.

(41) Interview with QS.

(42) These programs were often business software which had been renamed. For example, 'filing systems' were a new name for the less familiar term 'database'. There were also hybrids, where other leisure software products borrowed elements from business software. Recipes programs, for example, are a type of database program.

(43) For example, QW, one of the school users I interviewed, would spend considerable time trying out programs partly because he was interested to see how they could be useful and how they

worked. I have the impression that a good many sales came from this hobbyist desire to explore, rather than seeking out 'really useful' programs.

(44) Interview with QS.

(45) Interview with QS. This was reflected in the advertising campaign - see Disney, S.(1987e), *'Playing the Sales Generation Game'*, Computer Trade Weekly, February 9th, p.15.

(46) Interview with QS.

(47) In the case of the PCW micro in particular, Amstrad also benefited from some free R&D. The team working on this project had spent several years previously developing just such a machine for another company. These engineers and programmers had worked solely on the on-going project of making incremental improvements to a leading business word-processor. Interview with QS.

(48) Davidson, A.(1985), *'Amstrad Stands Alone on Word-Processor Venture'*, Marketing, August 29th.

(49) Prior to Amstrad's PC machine, there had been IBM clones (ie machines compatible with IBM's 'Personal Computer') but these were aimed at the corporate market, and priced accordingly. After Amstrad's initiative, some clones have been willing to change their target and have benefited from the interest and optimism which Amstrad had aroused. The other dimension to the Amstrad effect has been the stimulation to software houses to write programs, especially business software, for the PC at a lower price than previously. These cheaper packages are know as 'clonesoft'.

(50) The Amstrad PCW operated on somewhat of the same principle in that the micro could run the operating system called 'CP/M'. This used to be an industry standard before the arrival of IBM machines and their operating system, MS-DOS. Hence, older business software could run on the PCW machine.

(51) Tandy's UK manager sees the PC becoming the home machine in Computer Trade Weekly (1987), *'Tandy Comes Home to PCs'*, October, 26th, p.4.

(52) For example, this is argued by OC. Interview with OC.

(53) This is a conclusion drawn by the trade press in its survey of dealers. Computer Trade Weekly, (1987c), *'Clonesoft: Not Yet - Not Ever?'*, October 19th, p.1. More details of retailer views are provided in the same issue in Campbell, C.(1987b), *'The Revolution Goes Soft'*, pp.18-19 and p.27. Certainly with regard to the PCW series, I suspect that such machines have only reached a very particular market of those who write as a major part of their paid work. In the case of the PC, while a breakdown of figures is not available, many articles convey the view that many sales go to the small business market. For example, see Harvey, S., (1987), *'1512 Overture'*, Computer Trade Weekly, February 9th, p.14.

(54) This is the opinion expressed in the interview with LH, for example. IS(1) also felt that British Telecom lacked some commitment to developing the hardware. Telecom's view, as expressed in the interview with CU, was that the company had been held back by technical difficulties, as had been other producers who they had approached to develop cheaper modems.

(55) Bruce, M.(1986), *'British Telecom's Prestel'*, Design and Innovation, Block 2, Marketing Units 6-8, T362, The O.U. Technology 3rd Level Course, Milton Keynes, p.75; Schofield, J.(1984), *'How the Post Office Failed to Deliver'*, Guardian, September 13th, p.17. Margaret Bruce's paper, based on her Phd research, provides a good overview of Prestel's history. Jack Schofield's article represent a particularly critical view, outlining all Prestel's faults.

(56) For example, in the early 1980s Commodore's advertisers conducted some research on people's awareness of telecommunications. The agency recommended dropping some plans for promotions in this field on the grounds that the general public at this stage was not yet familiar enough with this area of application. Interview with KC. Some producers had lobbied the government to subsidise modems in schools as part of the general DoI programme. This idea, to promote familiarity with telecoms, was vetoed. Interview with IS(1).

(57) Club 403 was a Government funded experiment in providing both local information services and home shopping. The scheme was

announced by the DoI in 1982, and went on trial in certain Birmingham suburbs. In 1983, the Home-Banking Service 'Homelink' was launched as a joint venture between Prestel, the Nottingham Building Society and the Bank of Scotland. Unlike the subsidised home shopping project, this service was designed to be commercially viable from the start. Holti, R. and Stern, E.(1984), *'Social Aspects of New Information Technology: A Review of Initiatives in Local Communication; Distance Working; and Eduction and Training'*, Tavistock Institute of Human Relations, London, pp.20-33; Bruce M.(1986), *op.cit.*, pp.77-8.

(58) Examples of such databases include Dialog, Compuserve, and the Source. By 1985, some of these companies were starting to target domestic micro users in addition to their standard institutional customers. Segilman, D.(1985), *'Life will be different when we're all On-line'*, Fortune, February 4th, Vol.111, No.3, pp.48-52.

(59) Commodore offered such a telecom package in the US with the Vic 20 machine. Tomczyk, M.(1984), *op.cit.*, pp.220-5.

(60) The electronic mail service, Telecom Gold, was launched by BT in 1982. It experienced very fast growth among its target audience of business users, and has more recently been aimed at domestic microcomputer users under the name of 'Microlink'. Schofield, J.(1986), *'Dialcom Purchase Adds Lustre to the Telecom Goldmine'*, Guardian, March 20th, p.15; Miles, I.(1987), *'Home Informatics: A Report to the Six Countries Programme on Aspects of Government Policies towards Technical Innovation in Industry'*, Science Policy Research Unit, University of Sussex, Brighton, p.74.

(61) Interview with UD.

(62) Interview with CK.

(63) Hedger, J. et al.(1980), *'Telesoftware: Value Added Teletext'*, IEEE Transactions on Consumer Electronics, Vol.CE 26, August, pp.555-67.

(64) Interview with IS(2).

(65) Leisure Electronics Trader (1983), *'E.T. USA'*, October, p.14 and p.20.

(66) Interview with IS(1)

(67) Micronet currently has 20,000 subscribers, contributing to the total of 74,000 Prestel users. This base has climbed slowly, but continuously, over the years. However, to put these figures in perspective, the Post Office had originally hoped to have 100,000 subscribers by 1980. Disney, S.(1975f), *'Hitting the Net'*, Computer trade Weekly, p.23.

(68) Interview with CU.

(69) For example, the ex-members of WD's club were moving in this direction. Interview with WD.

(70) Schofield, J.(1985), *op.cit.*, pp.153-6.

(71) Interview with CU; Disney, S.(1975f), *op.cit.*, p.23

(72) Knox, B.(1986), *'It Ought to be a MUG's Game'*, Guardian, October 2nd, p.15; Interview with BQ of Level 9.

(73) Horrigan's paper outlines some of these aspirations, also indicating that more than one model of the automated house existed. For example, one version was of the house as a 'machine for living', in which the whole architecture of the home is reconceptualised. As opposed to this, there was the model of the 'house as a wonderland of gadgets'. In the plans for the 'smart home', to which I refer presently, there are also competing views concerning exactly how to realise automation of the home. Horrigan, B.(1986), *'The Home of Tomorrow, 1927-45'*, in Corn, J.(ed.), *'Imagining Tomorrow: History, Technology, and the American Future'*, MIT Press, Cambridge, pp.137-63. To appreciate how major American Corporations, including Texas Instruments, were working on plans for future home as long ago as the 1960s, see Forbes (1967), *'Furniture That Does Everything'*, March 15th, pp.30-9. For more popular, 1980s, scenarios of the future, see Mason, R. and Jennings, L.(1982), *'The Computer Home: Will Tomorrow's Housing Come Alive'*, Futurist, February, Vol.16, No.1, pp.35-43.

(74) Oliver, B.(1983), *'Mattel Joins UK Computer War'*, Marketing, 4th August, p.11.

(75) For example, Clive Sinclair was simply not interested in following up this line of development - and his preferences usually shaped the overall path of the whole firm. Curry, one of Acorn's

founders, had an interest in the area, but the company initially prioritised other developments. More recently, Curry's new company has started marketing control peripherals. Interviews with Sinclair and with CT; Personal Computer World (1986), *'Newsprint'*, November, p.115.

(76) For example, both much of the control equipment which was made available from firms, and the hobbyists' projects, required considerable effort and skill to set up. Interview with LH. In the US, the company BSR, was marketing a much simpler system by 1983. Links from micros could be plugged into the mains sockets, and utilise this electric system to carry control messages to other equipment around the house. In fact, this is a central idea behind many plans for the 'smart home'.However, the British electrical system worked to different standards, and a version was never marketed which was geared to the UK. Shea, T.(1983), *'Grab Bag of Devices Helps Home Control'*, InfoWorld, October 10th, Vol.5, No.44, pp.51-9; interview with SU of Tandy.

(77) Commodore's advertising agency had great doubts about home control on these grounds. The problem of unfamiliarity was also acknowledged at Acorn. Interviews with CK and with UD.

(78) Interview with CD.

(79) For example, the magazine 'Electronics and Computer Monthly'.

(80) An illustration of Japanese interest is provided in Yamamoto, K. and Ayugase, N.(1984), *'A Home Terminal System Using the Home Area Information Network'*, IEEE Transactions on Consumer Electronics, Vol.CE 30, No.4, pp.608-16. An example of American interest is shown in the article: Gutzwiller, F. and Francis, J.(1983), *'Homenet: A Control Network for Consumer Applications'*, IEEE Transactions on Consumer Electronics, Vol.CE 29, No.3, August, pp.297-300.

(81) Miles, I.(1987), *op.cit.*, p.93.

(82) Miles, I.(1987), *op.cit.*, pp.94-5.

(83) Boyle, G.(1986), *op.cit.*, p.18.

(84) Interview with CK and ID. Tomczyk, M.(1984), *op.cit.*, pp.293-99.

(85) For example, apart from the elements which constituted enhancements in the early 1980s home machines, we can now add

'multi-tasking' and WIMPs'. Multi-tasking means that micros can simultaneously run more than one program. Windows/Icons/Mouse Programs refer to a means of inputting commands by pointing to images on a screen instead of by typing instructions on a keyboard.

(86) Keen, B.(1987), *op.cit*, pp.29-32; Miles, I.(1987), *op.cit.*, p.85.

(87) Interview with ID.

(88) Linderholm, O.(1987), *'A Machine For All Times'*, Personal Computer World, January, pp.160-5.

(89) Miles, I.(1987), *op.cit.*, pp.86-9. A further complexity is added by the existence of interactive CD, called 'CD-I', which can read computer data or play audio and basic graphics material.

(90) Treasure, S.(1987), *'Medium Rare'*, Computer Trade Weekly, February 16th, pp.12-3 and p.20; Everiss, B.(1987), *'Come the Revolution'*, Computer Trade Weekly, September 8th, pp.22-3.

(91) Such a route was always attractive to the computer press. It has always held an appeal for the hobbyists who became involved in journalism, besides the fact that sophisticated technological marvels are always newsworthy. For examples of debates over whether the Atari ST or Amiga are better machines, see Yates, T.(1987), *'Head to Head on 68000'* and Jacobson, A.(1987), 'The 68000 Partisans', both in Computer Trade Weekly, August 31st, p.16 and p.18.

(92) Miles, I.(1987), *op.cit.*, p.111.

(93) Interview with KC.

(94) Interview with KC.

(95) Interview with DC.

(96) Miles, I.(1987), *op.cit.*, p.113.

(97) These form of analysis can be found in Pinch, T. and Bijker, W.(1984), *'The Social Construction of Facts and Artefacts'*, Social Studies of Science, Vol.14. This approach is discussed in Keen, B.(1985), *op.cit., pp.22-6.*

(1) Advertising was not the only feature which could be examined in relation to gender - it is simply the one about which more material is available. An example of a different focus would be to examine industrial design. To illustrate the issues which could be investigated here, we can take the case of the Elan micro, which I discussed earlier. The industrial design consultants were specifically trying to depart from the dominant 'black box' style of construction which they felt emphasised the technology. Their 'family' orientated machine was therefore styled with softer curves at certain points. In addition, the consultants originally tried to avoid the colour black on the grounds that it was a very 'macho', 'Darth Vadar' image. Unfortunately, in the designers' eyes', their clients reinstated a black colour scheme once Elan became more conscious of the games market. Interview with IH.

(2) We know that, proportionally, sales of video games consoles were not so large as in the UK. The figures showing correlations between ownership of video games and home computers, however, are open to more than one interpretation. In 1985, the BBC's regular Omnibus survey found that 42% of those families with a home computer had a video games machine. By 1986, this proportion had decreased to 33%. One interpretation of this could be that initially many of the video games console owners were the ones to buy home computers. In later years, the home computer attracted a wider audience of buyers for whom the micro counted as the first games machine. However, another process producing these statistics could simply be that as the years have passed, more and more home computer users disposed of their old video games machines. The question wording asked whether families had these consoles at the time of the survey, whereas my interest would be in the question of whether families with micros had ever possessed video games machines.

(3) To give some examples of the less visible game-playing of adult

women, LK and NM described how they were among a group of secretaries in one company who would regularly gather in one office to play computer games in their breaks. Other evidence comes from several magazine editors and software publishers who mentioned that adventure games seem to have some following among women, judging from the letters they received by way of feedback. TC, of Sinclair User, described how their adventure helpline section had asked for women readers to write in to the column, which was written in 'fake medieval' style. Since that time, about 50% of mail to the column has been from women. Interviews with BQ and with TC.

(4) Interview with Sinclair.

(5) For example, this anticipated audience was reflected in the fact that one of the few items of software which was commissioned for the Jupiter Ace micro was one to demonstrate Hook's law from physics. Interview with WT.

(6) Interview with UD.

(7) Staff at Acorn were fairly explicit in this respect, though this type of sentiment seems to have been a widespread theme in the industry. We have already seen a related theme in the case of the firm Camputers, where the appeal was to businessmen who were wary of being left behind by the technology entering the office.

(8) Morely, D. (1986), *op.cit.*, pp.146-72; Gray, A.(1987), *op.cit.*

(9) Interview with KC.

(10) Interview with CK.

(11) Interview with UD.

(12) This impression is partly based on the fact that it is males who, literally, go into the shop to make the purchase. This is the view conveyed by retailers, and Market Researcher Tittscher argues that 96% of home micros were purchased by men. Obviously, that does not preclude joint discussion of the purchase before these males appear in shops. Tittscher, R.(1984), *op.cit.*, p.76.

(13) Tittscher, R.(1984), *op.cit.*, p.98.

(14) Tittscher, R.(1984), *op.cit.*, p.83; Interview with IS(1).

(15) Tittscher, R.(1984), *op.cit.*, p.87.

(16) Interview with KC.

(17) Interview with DC of Acorn.

(18) Interview with KC.

(19) Tittscher, R.(1984), *op.cit.*, p.89.

(20) This is not to say that micros are actually empowering, as McNeil notes. That issue could only be investigated in terms of relations within the home by more empirical research within the family context. My focus is on the representations of that power. McNeil, M.(1987), '*"It's a Man's World"*', in McNeil, M. (ed.) '*Gender and Expertise*', Free Association Books, London, pp.194-5.

(21) Tittscher, R.(1984), *op.cit.*, p.77.

(22) Interview with KE(2) of Camputers.

(23) Interview with DK.

(24) For example, this research, which was mainly on micros in schools, was reported in Equal Opportunities Commission (1985), *op.cit.*, pp.37-8.

(25) Interviews with DK and with UD.

(26) Interview with QX.

(27) Interview with KC.

(28) Interview with QX.

(29) Interview with KE(1) and with QX

(30) Interview with KC.

(31) Gallagher, M.(1987), '*Redefining the Communications Revolution*', in Baehr, H. and Dyer, G.(eds.) (1987), '*Boxed In: Women and Television*', Pandora Press, London, p.25.

(32) The only example I can find of a more sophisticated analysis, which draws on psychoanalytic debates, is Skirrow, G.(1986), '*Hellivision: An Analysis of Video Games*', in McCabe, C. (ed) '*High Theory/Low Culture: Analysing Popular Television and Film*', Manchester University Press, Manchester, pp.115-42. Apart from this, most of the critiques of games reflect early feminist analysis of the (under-)representation of women and female 'interests' on media such a TV. For a discussion of changes in feminist analysis, see D'Acci, J.(1987), '*The Case of Cagney and Lacey*', in Baehr, H. and Dyer, G.(eds.) (1987), '*Boxed In: Women and Television*', Pandora Press, London, p.205. Apart from the need to

up-date analysis of games in the light of current trends in other feminist research on media, we would have to address some of the specificities of games which make them unlike film and TV. For example, there is the simple point that the player is not just the 'spectator' which is a key theoretical concept in film theory. So, how are we to understand the experience, for example, of a female player controlling a male protagonist?

(33) At the moment, I can only use the word 'genre' very loosely. This is because there has been no sustained effort to think about computer games in terms of this theoretical structure which is derived from literary and film theory. Even in its original disciplinary areas, the notion of genre is problematic, as is clarified in the article by Buscombe, E.(1970), '*The Idea of Genre in the American Cinema*', Screen, Vol.11, No.2, Spring, pp.33-45. For discussions which attempt to think about some of the complexities of the relationship between gender and genre more generally, see Kuhn, A.(1984), '*Women's Genres*', Screen, Vol.25, N.1, January/February, pp.18-28; Brundson, C.(1987), *Men's Genre's for Women*', in Baehr, H. and Dyer, G.(eds.) (1987), '*Boxed In: Women and Television*', Pandora Press, London, especially pp.184-5.

(34) A qualification needs to be added here that, in some games, the user can only discern what is actually happening on screen by being told in the in-lay or shown in the text. This is because the resolution on early home computers was not very high, even compared to the arcades. Hence, the detail on many of the early and even current games is very crude. Often, in real time games, all that can be 'seen' is blobs interacting with other blobs - but we are 'told' that what is represented is space ships shooting each other. Yet, at one level, this can be irrelevant to the game action, which consists of manipulating one blob by some set of rules. Another 'plot' could just as well have been tacked onto the game. This situation is changing now. Improved hardware resolution and programming techniques have combined with ever more attention being paid to such screen detail. Nevertheless, we are still left with the question of what is the relationship between narrative and the visual representation available in this

medium.

(35) For example, the visual style which is used in American science fiction comics, such as Marvel or DC, appears to be one popular style in adverts and in-lay artwork.

(36) Yates, T.(1987), *'Keeping Abreast of the Boy Ploys'*, Computer Trade Weekly, July 13th, p.18; see also the letters pages of Computer Trade Weekly on June 29th and August 3rd.

(37) For example, Commodore's advertisers held this view and so focussed on non-game applications when looking for a way to attract more female users. Interview with KC.

(38) I used a limited number of strategies to familiarise myself with computer games. This involved buying and playing other people's games to try them out, observing reviews and discussion of games in the trade and computer press, and talking about games with producers and users.

(39) Interviews with LE of Sinclair User and with CQ of Mirrorsoft. For a brief discussion of some of the American games which are orientated towards girls, see Schneider, R.(1984), *'Lifestyle Software Emerges'*, Software Merchandising, July, p.37.

(40) Interview with MB.

(41) Interviews with CD of Beyond, and with KE(1) of Acornsoft.

(42) Interview with BQ of Level 9.

(43) The game was '3D Ant Attack'. Interview with HK of Oasis.

(44) Interview with FC of Imagine.

(45) Schofield, J.(1985), *op.cit.*, p.103.

(46) Campbell discusses the recent release of the game based on the soap opera 'Eastenders', and games based on the TV shows 'Blockbusters', 'Bullseye' and 'Treasure Hunt'. Campbell, C.(1986), *'Flogging Soap'*, Computer Trade Weekly, October 13th, p.12.

(47) Interview with FC of Imagine.

(48) Another example of attempts to disrupt traditional gender roles was to have hard, or 'heroic' female characters in the games plot. This can occasionally be seen in the artwork of advertisements, and the women programmers on the design team subcontracted to Beyond adopted this strategy in their products. Interview with CD. While computer magazines balk at any drastic action, such as

refusing to carry sexist advertisements, some magazines do have a conscious, albeit low key, policy on gender. This usually involves commenting on the gender dimension in games reviews and in policies for representing women - for example over-representing women programmers in regular programmer profile slots, and showing female protagonists in their own artwork for listings. Interview with TC and with NU at EMAP.

(49) An example of an attempt to use video games to explicitly 'raise consciousness' was the game on race issues which at one time existed in the GLC's headquarters.

(50) We cannot assume that it is automatically desirable to change the gender identity of the micro, given some of the critiques of questions such as 'access' which were referred to in the introduction. This is a clearly a very complex argument which ultimately I did not think I could tackle within this thesis.

(51) To continue this line of analysis was beyond my scope, both because it would have strained coherence further, and because many of the staff whom I would have needed to contact were not available. However, it seemed worthwhile to compromise and make use of the material which I had assembled in order to point to further possible research and to contextualise my own emphasis on artefact conceptions.

Chapter 11: Conclusion

(1) Although video cameras were also seen as having possible radical applications, the main impetus for the actual hardware development came from the major companies developing this technology and not from more critical users.

(2) Adamson, I. and Kennedy, R.(1986), *op.cit.*, p.96.

(3) In contrast, Ben Keen's study of video is relatively 'upstream', giving more emphasis to initial development, and to technological construction, and less to the detail of video's introduction into different national contexts. Keen, B.(1987), *op.cit.*

(4) Johnson, R.(1986), *op.cit*, p.296.

(5) Johnson, R.(1986), *op.cit*, pp.293-4.

(6) Lorenz, C. (1983), *'A Fear of Feedback?'*, Design, December, No.420, pp.31-41.

(7) Arguably, girls were also rendered invisible by the other processes through which producers interpreted consumption. Besides reading quantitative market research, a number of interviewees commented that they had built up their picture of users from whom they saw at events such as computer shows and in shops.

(8) Some of the processes behind the construction of market research figures are examined in Haddon, L.(1988), *op.cit.*

(9) Interview with NU.

(10) An element of fashion would appear to creep into guidance on how to innovate. In early 1980s discussions of innovation in microcomputers, and in consumer electronics generally, the practices of Sinclair were often reported in the business press as being exemplary. Nowadays it is more likely to be the approach of Amstrad's Alan Sugar which is favoured, while many of the Sinclair's styles of innovation which were once classified desirable are now not so attractive. Yet, what remains is the enthusiastic and optimistic tones in which Sugars success is often discussed: these are reminiscent of the Sinclair days.

(11) Haddon, L.(1984), *op,cit.*

(12) Forty, A.(1986), *op.cit.*

(13) Ben Keen works within broadly the same framework as myself on this issue, using the term 'technoconcept' instead of artefact conception. His term is certainly less cumbersome, but given my concern with representations of 'technology', it seemed more appropriate to avoid having a reference to technology in my analytical terminology.

(14) Morely, D.(1980), *op.cit.*, p.10.

(15) An example of this would be in the work of Hebdige, D.(1979), *op.cit.*, especially p.18.

(16) 'Screen' hs produced a range of articles on this theme over the years. The magazine's approach is discussed in Morely, D.(1980), *op.cit*, pp.159-164.

(17) For example, Belson W.(1978), '*Television, Violence and the Adolescent Boy*', Saxon House, Farborough. This literature is discussed in Murdock, G, and McCron, R.(1979), '*The Television and Delinquency Debate*', Screen Education, Spring, pp51-67.

(18) Morely, D.(1986), *op.cit.. pp.146-50.*

(19) One recent example of this theme occurs in in Golding, P. and Murdock, G.(1983), *op.cit.*, pp.32-6.

(20) Collective Design/Projects (1985), '*Very Nice Work If You Can Get It: The Socially Useful Production Debate*', Spokesman, Nottingham.

(21) Zimmerman, J.(1986), *op.cit.*, p.46.

(22) Many of the arguments concerning gender and access, mentioned in the introduction, would be examples here.

(23) Some feminist accounts looking at these representations also examine particular sites and groups of people. For example, in Game, A. and Pringle, M.(1983), *op.cit.*

METHODOLOGICAL APPENDIX 1: LITERATURE SEARCH PROCEDURES

In his popular book on historiography '*What is History*', Carr provides a succinct statement concerning the nature of historical facts (1). 'The facts are really not like fish on a fishmongers slab. They are like fish swimming about in a vast and sometimes inaccessible ocean; and what the historian catches will depend, partly on chance, but mainly on what part of the ocean he chooses to fish in and what tackle he chooses to use - these two factors being, of course, being determined by the kinds of fish he wants to catch'.

The summary may be a little dated now, as shown by an insensitivity to the gender of the historian. Contemporary work on historiography, or for that matter on the methods and philosophy of other disciplines, could provide more complex accounts of research. However the main point that can be derived from Carr's analogy still stands. This is the principle that it is important to be reflexive about the search procedures structuring the way in which evidence is selected. A number of studies commence by simply pointing out that a literature search was conducted. Instead, this appendix deconstructs the set of decisions involved in that investigative activity.

The first point to make is that my searches for secondary material were intended to be fairly broad. This partly reflected a wish to keep options open under conditions where the objectives and subject matter of the thesis were constantly being re-assessed. In addition, there was the issue of the doctoral thesis in my longer term plans. I hoped broadly to continue researching either computers, information technology or consumer electronics and services after this thesis. Hence, I wanted to build up a wide-ranging bank of resources, even if some of this material was unlikely to be of use in the current project. Thus, a certain amount of the material generated in the research provided further background information, but was not utilised in this final draft: for example, a survey of popular press accounts of

the home micro, and of the literature on 'Hackers'. Such material will not be documented in these appendices.

The literature search entailed looking for several specific categories of account. These included company information and commentaries on the general markets (hard-, software, magazine) with which the project was concerned. The main technical developments considered were those which in any way appeared to substantially further existing technological paths or to open new possibilities for the commodity's development: for example, cassette versus cartridge/disc technologies, or modem developments. Such decisions were informed both by my general understanding of the functioning of home computers, and by the technical discussions in the computer press. However, to some extent I had to rely on the debates and comments of others as a guideline to what might be significant.

Another category of material included discussions of the popularity of micros and games, 'explanations' of the patterns of use and how these might develop, as well as fears and concerns about perceived trends. Any references to survey research or to other literature such as books were also sought. Finally, I built up a file on State initiatives, especially those around education. At a more general level the aim was to construct an overview of the way in which micros, and games, were 'covered' in different texts, for different types of audience: for example, the business and marketing media, computer magazines, daily press, science press, critical journals etc).

Turning from the objectives to the search procedures, one strategy entailed systematically examining the coverage of certain daily newspapers press (for example, the *Guardian*'s Microcomputer section), and periodicals (for example, *Personal Computer World*, the *Listener*, *New Scientist*). I already knew that these had some of the relevant types of material. Simply browsing in computer, marketing and business, social science and design sections of various libraries provided further journals to my list. This process was assisted by another doctoral student, Ben Keen, in his parallel search for material

on videos. We both sought sources which might be relevant for the other's project. *Audiovideo International* was an example of a relevant journal found by Ben. (See Methodological Appendix 2 for further details of the main periodical sources which were checked).

The other main strategy involved checking indices such as the Research Index, Reports Index, British Humanities Index, Sociology Abstracts, Computer Literature Index etc. Once I had become accustomed to the types of material carried and the best search procedures, the next step was a computer search which was shared with Ben Keen. (In fact, searching via categories of interest to Ben produced some material which I would have missed if working on my own). Within the constraints outlined below, this approach picked up a broad range of material. Over a period involving a number of sessions on-line, several tactics were employed to eliminate irrelevant material because of cost considerations. This proved impossible and so the search categories very general ones: for example, locating all references to 'micro'. (See Methodological Appendix 3 for further details of the computer search).

Perhaps the main limitation was that unlike the other indices, the computer search had to be conducted by terms used in the title, rather than by key reference words. Comparison with the articles which had been obtained by systematic examination of journals provided some clues as to the absence of material arising from this limitation. Another factor which influenced the nature of the references generated was the way in which the computer database was itself structured. Again, the limitations were to some extent revealed by comparison with my book search. In particular, these on-line searches are American based (they have only become available in Britain since the 1980s) and so contain predominantly American material.

On the one hand, the computer search clearly revealed a range of journals which would not have been discovered through browsing in libraries. Moreover, this material was very useful for the chapters concerning the roots of micros and games. However, all the sources on

some themes such as video games and the arcades were from the US. To compensate for this, I then manually searched for any writing on these issues in the equivalent British journals. In this particular case, games does not appear to have generated the same degree of interest in the UK as it did in the US.

From the manual search of indices and from the computer search, a further set of periodicals could be identified which, if they were accessible in a main London libraries, were again systematically checked: for example *Marketing* and *IEEE Spectrum*). Where some article references looked potentially relevant to the thesis arguments which I was developing, these too were traced.

From the references which continued to emerge during the course of the thesis, I would speculate that I may have gathered only a proportion of potentially relevant written material. In particular, there may well be more material on the home and arcade video games. Also, precursors such as the calculator were not central at the time of the search, and so further investigation might produce more commentaries on these aspects. However, given the state of my initial research experience and the time limits within which the project was conducted, the procedures adopted still seem the best which could be managed.

Finally, there are the strategies which I used to locate books which were relevant to my thesis. One way of locating such sources involved browsing in the computer and micro-electronics and social science sections of bookshops and libraries. The second approach entailed checking book reviews and tracing references from the articles and from other books which had already been assembled. The third tactic was to approach those who had already conducted some work on social aspects of microcomputers. Lastly, I searched the indices of published books, which again operated by words in the title. These procedures still left some noticeable gaps, particularly as regards American literature. For example, I had heard of the existence of book on the company Atari, but it proved impossible to locate, even after

requesting assistance from the Atari parent company in the US. Judging by the books which I have already acquired, I would have expected to find company histories for firms such as Texas Instruments or Philips, and more literature on the video games industry.

(1) Carr, E.(1964), '*What is History?*', Penguin, Harmondsworth.

METHODOLOGICAL APPENDIX 2: PERIODICALS SYSTEMATICALLY CHECKED

While the references provide some indication of the diverse sources which have ben drawn upon in this thesis, this appendix describes some of the publications which carried a range of relevant articles and so were systematically checked in relation to the dates beneath the journal titles.

KEY SOURCES

Personal Computer World
(Jan '78 - Present day)

PCW was one of the original two microcomputer periodicals and remains the most well known 'general' magazine covering the whole industry. In its early days years it played an important role organising the enthusiasm within the hobbyist movement. Therefore it was an important text and public forum in its own right. The journal carried a good deal of information on developments in the home computing, particularly on the R&D side.

Audiovideo International (US)
(Oct '78 - June '85)

Audiovideo covers developments in a range of US consumer electronics. This source provided material concerning the details of company product in the video games and early home computer fields. Of particular use were the discussions of company plans and expectations about how the products might develop.

Design
(Jan '79 - July'85)

Design had some coverage of 'high-tech' industrial design developments. This was another journal which was more concerned with the marketing side of products. Various articles discussed the role of market research, 'technofear' and the representation of goods as technology.

IEEE Spectrum (US)
(Jan '77 - May '86)

As a journal for electronic engineers, *IEEE Spectrum* carried a number of design case histories: of computers, video game and other consumer electronics. The magazine provided additional material on general developments in those consumer electronics which involved chips, including references to survey reports concerning usage

Fortune (US)
(Jan '79 - June '85)

Fortune is a business magazine which carries news and features concerning developments of different markets in the US (computer hardware, computer magazines, video games) as well as having company profiles. It discussed marketing issues and concerns.

Home Computer and Software Merchandising (US)
(Jan '82 - Dec '84)

This retail and distributor trade magazine was founded once a software had developed in the US. Although I did not use much material directly, the background on the American context helped to clarify the specificities of British machines.

Marketing
(April 80' - Dec'84)

Until 1980 this was the journal of of the institute of marketeers. The magazine was then put on sale to reach a wider audience of marketing staff and its coverage expanded considerably. *'Marketing'* provides news of and backgrounds to company marketing, retailers and distributors as well as carrying features and survey reports in relation to marketing problems and concerns. This fed into my overall chart of the home computer industry and was used to gauge marketers' perceptions of this market.

LET (Leisure Electronics Trader)
(Jan '83 - Dec. '84)

This is one of the three trade magazines - it is no longer operating. Founded in 1983, this periodical itself constituted part of the restructuring of the industry. LET covered mainly home computer and video game software, retail and distribution in Britain. Feature interviews with older firms provided useful information about early history of home micros.

Computer Trade Weekly

CTW is the UK's surviving trade press geared mainly to home computers. It also covers machines for small businesses, but the emphasis is on slightly cheaper, domestic machines and computer games developments. More recently, CTW has started to report market research survey results.

Other, slightly less, significant sources which were systematically checked included:

Electronics (US):	Feb '83 - May '85
Guardian (Computers)	Jan '84 - Jun '86
Listener:	Jan '82 - Dec '85
New Society:	Jan '78 - Dec '85
New Scientist:	Jan '78 - Dec '85

METHODOLOGICAL APPENDIX 3: COMPUTER SEARCH DETAILS

Database

The database used was 'Social Scisearch' from the company 'Dialogue'. This is supposed to include 'every significant item from 1000 major social science journals throughout the world and social science articles selected from 2,200 additional journals in the natural, physical and medical sciences.' (Quote). In practice, the database covers mostly American publications.

Articles derived from this database ranged over the areas of Psychology, Education, Sociology ('Youth Studies'), Therapy, and Law. The sources included not only specialist disciplinary journals but also the computer press, consumer research, and electronics magazines.

Search Procedure

I examined articles between the dates 1973 and 1984 in order to trace some of the early video games material. The search was by keywords in titles. The terms which were eventually sought were: micro, micros, microcomputers, personal computers, home computers, computer games, electronic games, video games. Since this produced 2034 items, which would have been too expensive, over 4 sessions on-line I eliminated many references to work and education, as well as those containing mostly technical detail. This produced 777 references. About a third had some vague relevance to my project, although much of this material was not used.

Absences

The database included articles in some of the more popular journals, small 'alternative' press and trade press. Some examples of titles found by other means indicate the type of reference which this search did not capture:

Revenge of the nerds.
Companies help schools.
More fun for the consumer.
Terminal infidelity.
Reach out and access.
Shakeout comes at last.

Generally, the search picked up articles in disciplines whose convention was to summarise content directly in the titles. For example, this was usually true of psychology. The search did not locate articles referring to 'hardware', 'software', or 'microelectronic'; nor did it highlight pieces containing microcomputer company titles or product names.

METHODOLOGICAL APPENDIX 4: INTERVIEWS WITH PRODUCERS

Key:

(F) = Female interviewee

(1), (2) = Interviewees with the same initials

No.	Date of Interview	Code	Duration	Capacity
(1)	1-8-86	CS	0:45	Hardware - Product Idea
(2)	3-10-86	WT	0:30	Hardware - Production, own company
(3)	9-10-86	OC	1:00	Hardware - P.R.
(4)	7-8-86	CL	1:15	Hardware - Marketing manager
(5)	13-8-86	LC	2:45	Hardware - Ad. agent
(6)	8-7-86	IS(1)	1:15	Hardware - Marketing Manager
(7)	27-10-86	ID	2:15	Hardware - US Software Production & Marketing, Games Programmer, Hobbyist
(8)	24-9-86	QX (F)	0:30	Hardware - Ad.agent
(9)	21-7-86	DC	0:30	Hardware - Marketing
(10)	21-7-86	UD	0:30	Hardware - R&D and Production

(11)	7-10-86	DK	1:15	Hardware - Marketing, BBC advisor, Hobbyist
(12)	21-8-86	KE(1)	0:45	Hardware - Software support Manager
(13)	30-9-86	RS	2:15	Hardware - R&D and Production, ex-Retail, Hobbyist
(14)	7-5-87	TJ	1:00	Hardware - Marketing
(15)	19-5-87	SU	2:00	Hardware - Marketing
(16)	17-10-86	KE(2)	3:00	Hardware - Software support, Hardware repair & attempt at own company, ex-Hobbyist
(17)	6-8-86	FC	1:15	Hardware consultant, ex-retail, Ex-Software Manager.
(18)	13-4-87	IH	1:00	Hardware - Industrial designer
(19)	4-3-86	BQ	2:00	Software - Games designer in family company, ex-Hobbyist
(20)	3-3-86	HK	2:30	Software - Utilities designer in own company, commissioned various software, ex-Hobbyist
(21)	4-10-85	MB (F)	2:00	Software - Marketing
(22)	8-10-85	XE	3:00	Software - Product idea and Marketing
(23)	3-10-85	CD	1:30	Software - Product idea and Marketing

(24)	3-10-85	CQ (F)	1:00	Software - Marketing
(25)	14-10-86	IS(2)	0:30	Magazine - Ex-computer journalist, Magazine and trade press founder, consultant to BT projects.
(26)	3-5-85	TC	1:30	Magazine - Editor
(27)	26-6-86	FD (F)	0:30	Magazine - Staff writer
(28)	16-7-86	LE	0:45	Magazine - Editor
(29)	28-3-85	NU	1:15	Magazine - Editor
(30)	15-3-85	NM (F) & CT	1:30	Magazine - Booked advertising
(31)	24-5-85	FH	1:00	Magazine - Editor, ex-Hobbyist
(32)	27-8-86	LH	2:00	Magazine - One of oldest 'figures' in the industry, ex-editor, Hobbyist
(33)	18-7-86	JH	1:00	Magazine - Editor
(34)	16-9-86	CU	0:30	Telecommunications - Head of Prestel and related systems (Micronet)

METHODOLOGICAL APPENDIX 5: HARDWARE COMPANY INTERVIEWS

(by function within the firm)

KEY

Of those firms I made some effort to locate:

Not available = Firm exists, but the specific personnel have left

Not tracable = Firm no longer exists and staff cannot be found

Failed Interview = Tape recorder failed and only a few points can be remembered.

( ) = Interview code number

	Marketing/ Product Idea	R&D/ Production	Advertising/ PR
		Major Companies	
Sinclair	(1) CS	(2) WT	(3) OC
Commodore	(4) CL	R&D conducted in the US	(5) LC
Atari	(6) IS(1)	(7) ID	(8) QX
Acorn	(9) DC (11) DK	(10) UD (12) KE(1)	Not Available

Amstrad	Refusal	(13) RS	
Texas Instruments	(14) TJ	R&D conducted in the US	
Tandy	(15) SU	R&D conducted in the US	
Philips (MSX)	Refusal	R&D conducted in Japan	
(Mattel)		R&D conducted in the US	

Minor Companies

Camputers	Not Tracable	(16) KE(2)	Not Tracable
Jupiter Cantab	(2) WT	(2) WT	
Oric	(17) FC	Failed Interview	Not Tracable
Enterprise	Not Tracable	(18) IH	Not Tracable

Lowe	Not Available	Not Available
Grundy	Not Tracable	
Dragon	Not Tracable	

Hobby machines

Nascom	Not Tracable	Not Tracable
Tangerine	Failed Interview	Failed Interview

METHODOLOGICAL APPENDIX 6: SOFTWARE COMPANY INTERVIEWS

Small Companies	Larger Companies
Early Companies	
(19) BQ Level Nine	(17) FC Imagine
Part-time, adventure games Considered hardware	Full-time, games software First games software firm to advertise nationally
(20) HK Oasis	
Part-time, utilities, games designer aid, board and card games, home finance software	
(21) MB Bubble Bus	
Full-time, games software Ex-small business software company	

Later Companies

(22) XE
Domark

Publishing house founded by ex-marketeers. Games software

(23) CD
Beyond

Off-shoot of the publishing group EMAP. Publishing house for games software.

(24) CQ
Mirrorsoft

Off-shoot of the Mirror publishing group. Games, utility and educational software.

The software arms of hardware firms are listed in the interviews with hardware firms. The very first 'commercial' home/hobby computer software arose with hobby machines like the Nascom, but I have not found any reference to actual software companies before 1981/2. Some of the firms which I interviewed started up shortly after this period.

Even when located, access to small firms was not always easy. Sometimes I relied on very personal factors to get interviews - (eg I had gone to the same college as one programmer). I tried, unsuccessfully, to obtain interviews with 3 other older firms.

Apart from the interviews listed above, I also tried to contact some more larger firms. The staff of these companies were either too busy, or the 'right' person was simply never there (after 10+ phone calls). There were certain firms where it would have been useful it have interviewed staff. For example, *'Good Housekeeping'* had at one stage produced educational software pitched at mothers for their children. However, all the staff concerned had left and those remaining could not help me to locate these particular personnel.

METHODOLOGICAL APPENDIX 7: MAGAZINE STAFF INTERVIEWS AND REMAINING PRODUCERS

MAGAZINES

Founder of Magazines

(25) IS(2)

Consumer Magazine Staff	Editor	Other
Machine specific magazine (*Sinclair User*)	(26) TC (28) LE	(27) FD (Staff reporter)
Games magazine (Advertising) (*Computer & Video Games*)	(29) NU	(30) NM & CT
Hobby magazine (*Electronic & Computers Monthly*)	(31) FH	

Trade Press

Oldest trade magazine (*Microscope*)	(32) LH	
Current trade magazine	(33) JH	

(*Computer Trade Weekly*)

RETAIL

(17) FC

(13) RS

TELECOMUNICATIONS

British Telecom

(34) CU

I also tried, unsuccessfully, to locate and interview some of the other magazine founders.

METHODOLOGICAL APPENDIX 8: COMPUTER CLUB STUDY

Type of Club:

The club had been founded in the early 1980s, and shortly afterwards reached its peak of attendance (records of which are no longer available). The club used to be very active, with speakers and lecture courses. The founder and other key figures had left just before I started to attend. By the following term, the club had ceased to exist once the resident technician, who helped to run the meetings, left for another job. While I was attending, the club met once a week, on Mondays, between 6:30 and 9 pm. It was based in a polytechnic.

Frequency of Visits:

I attended for two terms between 30th September 1985 and 17th March 1986 - there was no summer term. 12 sessions were attended. Only in the first 10 were field noted taken - there was nothing really new to add at the last two. (These 10 were the 7th, 10th and 21st of October; 4th, 11th and 25th November, 2nd of December 1985; 13th, 20th and 27th of January 1986). During this early period, I had to miss 3 meetings for various reasons.

Attendance:

There were really two clubs,the 'Sinclair User' one and the 'Hardware' one. However, we were all in the same area and numbers were so small that in effect only one group existed. The core attending was 6, with other people appearing at odd times. These included a few 'old hands' from the club's earlier days, and people who only turned up once or

twice. However, numbers never rose above 9 and in bad weather dropped to 4 or 5. There was one woman in the group.

Preparation and Field Notes

I would usually prepare some questions concerning my own projects with the home computer and general thesis-related issues. This included finding out about the club's earlier activities and policies; the types of projects which were conducted; the nature of the club atmosphere; who attended in the club's heyday; and explanations for the club's decline.

The process of building up a picture of club interests and those of its current members was on-going. Participation proved to be much easier than interviewing, in that I was able to return to points which had been raised in previous sessions.

Field notes were written up directly after the meetings. On two occasions the conversation in the club was taped, with the permission of all concerned. Field notes covered such matters as answers to some of my questions, the topics of conversation, and 'events' that evening. In particular, I was interested in the nature of 'talking about technology'. I was able to discover the place of games, and games copying, in the club. However, my observations of the social interaction give little clue about what the club was like when in its heyday. The impressions conveyed in accounts which members gave indicated that the atmosphere was very different in earlier years.

METHODOLOGICAL APPENDIX 9: SCHOOL CLUB STUDY

Type of Club

The club met in the all-boys school on Wednesdays from 4-6 pm. From about 4:30 onwards the member of the computing staff who organised the club would be present. One sixth-former, QW, was usually there and in charge when the teacher was not around. He also tackled many of the problems which the other boys had with their programs. Some boys came to experiment with the software or write programs from interest. Others, especially as exams approached, used the club as an extra session to complete their O-level and CSE projects. Towards the end of the period of visits, two other boys were invited across from the neighbouring school.

Frequency of Visits

I attended between 20 November 1985 and 21 May 1986. 14 sessions were attended; only 9 were written up as field notes. On 3 visits this was because much of the time was taken up interviewing one of the group. On one occasion, I decided that so little new had happened that it was not worthwhile writing anything. (The 9 documented were the 20th and 27th of November; 5th and 12th of December 1985; 15th and 22nd January 1986; 5th and 12th February; 27th April - the gap was where a number of interviews took place). During this period I had to miss 3 meetings.

Attendance

This varied between 5 and 14, often being about 10 boys. This was probably influenced by the fact that the room was fairly small and so could contain only 8 machines. There was a core of about 6 boys who turned up most weeks.

Preparation and Field Notes

Apart from interviewing, I had prepared a list of questions which were asked during sessions. From these, I built up some initial idea of the boys' involvement with computing. An additional aim was to construct some picture of the activities in the club and the nature of interaction there.

Field notes were written up directly after sessions. Interviews were usually conducted in an empty neighbouring classroom. When this was not possible, the interview had to be held fairly quietly in the corner of the room. Unfortunately, this arrangement proved to be a little distracting.

METHODOLOGICAL APPENDIX 10: INTERVIEWS WITH YOUTH

INTERVIEWS WITH MALE YOUTH

Code	Date	Initials	Age	Duration (Hours)	Means of Contact
(MY1)	27-1-86	QW 1	17	1:30	Asked at School Club
(MY2)	17-2-86	QW2		1:00	
(MY3)	10-3-86	QW3		1:30	
(MY4)	8-4-86	QW4		0:45	
(MY5)	12-3-86	ID	14	0:30	Asked at School Club
(MY6)	4-12-86	NH	13	0:30	Asked at School Club
(MY7)	21-5-86	BB	15	0:30	Asked at School Club
(MY8)	23-4-86	NN	17	0:30	Asked at School Club
(MY9)	7-5-86	TT	17	0:45	Via QW
(MY10& MY11	14-5-86	KL &MM	14	0:45	Asked at School Club
(MY12)	25-4-85	NB	18	0:45	Pilot - Asked at College of F.E.

(MY13)	30-4-85	DM	12	0:30	Pilot - via his mother, who was also interviewed
(MY14)	23-11-84	JJ &KK	12&14 (brothers)	0:45	Pilot - interview and played games in their room

INTERVIEWS WITH FEMALE YOUTH

(FY1& FY2	27-3-87	CS & ST	15 15	0:30	At Girls School - via teachers
(FY3& FY4	27-3-87	OT & XD	15 15	0:45	At Girls School - via teachers
(FY5& FY6& FY7	27-3-87	ZN & ML & BA	15 15 15	0:30	At Girls School - via teachers

METHODOLOGICAL APPENDIX 11: ADULT USER INTERVIEWS

Code	Date	Initials	Duration (Hours)	Means of Contact
ADULT FEMALE INTERVIEWS				
(F1)	30-3-86	FT	0:45	Party
(F2)	5-9-85	DN	0:45	Party
(F3)	27-5-87	LK	2:00	Friends
(F4)		OO	Over a period	Club
(F5)	20-6-87	NM	1:00	Friends
(F6)	14-6-87	DC	0:30	Presentation
ADULT MALE INTERVIEWS				
(MA1)	3-4-85	NL		My Computer Club
(MA2)	21-1-87	MG		Other Club
(MA3)	15-2-87	WD		Other Club
(MA4)	5-6-87	TG		Other Club

STATISTICAL APPENDIX S1: SALES OF HOME COMPUTERS

The following table shows various estimates of the size of the home computer market. These figures are based on sales data - ('consumer off-take').

TABLE S1.1: ESTIMATES OF MARKET SIZE FOR HOME COMPUTERS

Market size by volume - '000 units

	Mintel	Marketing Assessment	Brema	Euromonitor
1980	50	100		
1981	100	200		
1982	750	500	600	700
1983	1700	1500	1500	1700
1984	2000	1600	1350	
1985		1100	1100	
1986			600	

In evaluating these data, we need to bear in mind two processes which structure these statistics: (a) factors which produce differences

between estimates, and (b) those which bring about a degree of consensus between various researchers.

One cause of differences relates to the period when research for a market report was conducted. For example, if analysis takes place at the beginning of the year, the sales data from retailers concerning the important Christmas period are not likely to have been fully correlated, and so there is an element of guessing as regards the end-of-year figures.

Second, production statistics from manufacturers may have entered into the calculations of some estimates. However, many firms do not make their production figures available, or if they do, there are various possible motives for misrepresenting their position in the market. Brema, the brown goods trade association, receives production data from its members. In addition, Brema members collectively have to guess the production for non-members (one important non-member in later years being Amstrad - which eventually held two thirds of home computer market). Thus, differences between reports can reflect the varied, and contesting, guesses of producers concerning the success of rivals.

Third, in the particular case of home computers, there has always been the issue of where to have a cut-off point between consumer electronics and office micros, since sales data alone could not easily distinguish between the destination of goods which were sold. In the early 1980s, this issue did not cause much divergence between reports in that, by convention, a cut-off point of £500 was taken to mark the upper limits of home computers.

Market research reports acknowledge that this standard broke down by the mid-80s, when Amstrad's PCW and PC computers were aimed partly at business audiences but sold for less than £500. Some more expensive machines were also finding a place in the home. As a result, different market researchers adopted different definitions of 'home' computer from that time. Some picked new, but varied, cut-off price

points, while others identified certain machine brands as 'home' computers, and others as 'office' ones.

Working against the factors which produce differences between reports are the processes by which estimates circulate in the industry. Apart from the fact that some market researchers adopt and adapt figures from others, the trade press also picks up and gives publicity to certain figures rather than others. These statistics can then be further re-reported by hardware and other producers to the very market researchers who interviewed them. In addition, market researchers are sometimes concerned about moving to far away from the commonly 'floated' figure, for fear of losing credibility. Thus, there are various interrelated forces which help to create a degree of consensus.

In the case of other brown goods, the Brema figures often appear to play key role in setting a baseline for the consensus. However, home computers are considered peripheral to the main interests of Brema members. As a result, the estimates for home micros are calculated separately from those for the other consumer electronics which they cover, and only appear in some of Brema reports.

This has given rise to one interesting feature of the figures in table S1.1. In a variety of the producer interviews which were conducted for the thesis, manufacturers and journalists explained that despite the clamour about the burst bubble of the home computer in 1984, sales continued to increase that year, but not so quickly as before. In fact, the Brema figures are the only ones which portray a different picture from this consensus, in that they show a decline in sales in 1984.

STATISTICAL APPENDIX S2: OWNERSHIP OF HOME COMPUTERS

There are two methodological approaches by which researchers can derive data concerning how many households possess home computers: from sales estimates and from sample responses. Although some sales figures for 1980 and 1981 were given in Table S1.1, most market research firms do not attempt to produce sales estimates until markets are thought to have reached a certain size. This is because the initial sales and production figures in new markets are often considered to be somewhat suspect. As regards sample data, firms such as Gowling have tried to build up a picture of earlier household penetration retrospectively, by asking interviewees when they bought their machines. On the whole, sample based statistics are not available for home computers until 1983, when the market was regarded as being a more established one.

TABLE S1.2: HOUSEHOLD PENETRATION FIGURES FOR HOME COMPUTERS

Percentage of Households with Home Computers

Source	Year				
	1982	1983	1984	1985	1986
Sales Based					
Mintel	5	13	23		
Keynote		7.5	10	14	18
M.R.G.B	4	12	18	24	
W.M.	5	11	18	24	

Source	Year				
	1982	1983	1984	1985	1986
Sample Based					
Barb			8	12	15
GHS			9	13	
FES			13	15	
Gowling	5	11	19		

The sales based estimates of household penetration are based on cumulative sales for previous years, making some allowance for the purchase of second or replacement computers. In Statistical Appendix S1, we have already seen that how the process of producing the original sales figures involves the social construction of statistics. In addition, the market research reports admit to guessing the proportion of sales which are up-grades and replacements. In fact, these particular estimates fluctuate more than in the case of many other consumer electronics.

In the light of the above points, it might seem that relying on sample based data is a more appropriate strategy. Some of these shown here are derived from very large surveys (10,000 and 20,000) and so there are mathematical reasons why we should have confidence that the figures generalise to a wider population. Yet, a consistent difference between sales and sample data for consumer electronics in general has been apparent for some time, with sample data usually indicating lower penetration. This consistent discrepancy needs some explanation.

One key factor is the time period to which the various statistics refer. Even though there are problems in formulating trade estimates, all sales figures are at least intended to refer to calculations for the end of the year. Thus, if we wanted to find a strictly comparable sample to check against the 'sales estimates for 1985' we would look for a survey which was conducted at the end of December 1985, or at the start of January 1986. In fact, the Gowling figures for each year meet this requirement, in that the fieldwork behind the figure for, say 1984, was carried out at the beginning of 1985.

The other surveys which are cited above take place at different times of the year. The earliest survey each year is the Barb's 'Establishment Survey', the data for which are normally collected in March. Hence, when a figure from Barb is quoted as the 'household penetration for 1985', that statistic is really nearer to the equivalent 1984 trade figure (plus an allowance for the first quarter of 1985). Hence, we would expect Barb results to be smaller than trade estimates, lagging almost a year behind. To a large extent, this is the case.

Meanwhile, the GHS and FES data are collected throughout the year, the final statistics representing an annual average. If we were to assume that people buy products evenly over the year, these official statistics would really be the equivalent of a mid-year survey. However, one major consideration affecting purchase of all consumer electronics is the increased sales during the Christmas period. This implies that, other things being equal, official statistics might often be the equivalent of a survey taken after the middle of the year. The general corollary is that we would expect Government figures to be higher than the Barb results, but lower than the sales based estimates for that year. This process also appears to be happening in the figures cited.

These factors account for some, but not all, of the fluctuation between statistics. Approaching individuals rather than families may produce further differences between surveys, although it is not clear why this should happen. For example, the BBC's own internal figures

from its Omnibus survey - based on individual respondents - are consistently higher than its own 'official' Barb ones for home computers - which are family based. The FES and GHS data are also derived from questions asked of families - whereas Gowling data come from individual respondents. We could investigate differences in procedure further, but the effort is not warranted in this thesis. Table S1.2, together with the considerations noted above, allow us to build up an approximate picture of broad trend concerning the adoption of home computer products.

STATISTICAL APPENDIX S3: GENDER AND USE OF HOME COMPUTERS

Tables S3.1 and S3.2 are derived from the regular surveys of adult consumer activities produced by Mintel and by the Henley Centre.

TABLE S3.1: RECENT USE OF HOME COMPUTERS BY GENDER: LAST WEEK

Question: Whether respondents had used a home computer in the last week for an hour or more

Percentage Who had Used a Home Computer

Date of fieldwork	Feb. 1984	May/June 1985	Nov/Dec 1985	May 1986
Men	4	6	8	8
Women	3	2	3	3

Source: Min (d,e,f and g)

TABLE S3.2: RECENT USE OF HOME COMPUTERS BY GENDER: LAST 3 MONTHS

Question: Whether respondents had used a home computer in the last 3 months

Percentage Who had Used a Home Computer

Date of fieldwork	3rd qtr. 1985	1st qtr 1986	1st qtr. 1986	3rd qtr 1986
Men	15	15	13	15
Women	5	9	8	9

Source: HC (a,b,c and d)

Although some of these figures are low, the pattern of gender differences which they show appears to be broadly consistent. Evidence in the later statistical appendices confirms and shows in more detail this greater male usage of home computers.

STATISTICAL APPENDIX S4: SOCIAL CLASS AND POSSESSION OF HOME COMPUTERS

Tables S4.1 shows survey derived data on social class and possession of home computers. Although class is not the central focus of the thesis, it seemed important to ascertain whether the gender differences which are of interest relate to only particular social classes. I have divided the table into two parts, since Mintel and Gowling (GMS) have slightly different class categories - Gowling collapsing D and E. The General Household Survey figures are provided simply to check the market research statistics against those derived from a larger official statistics sample. Mintel's 1985 figures appear to be very similar to these. In addition, other research which I have seen, such as the Target Group Index market research for 1983, conform broadly to the trends shown by Mintel.

TABLE S4.1: POSSESSION OF HOME COMPUTERS BY SOCIAL CLASS

Source	Min(a)	Min(b)	Min(c)	GHS
Fieldwork	Oct 1982	Feb 1984	March 1985	1985
Class		% owning		
AB	7	19	24	26
C1	3	12	19	17
C2	3	10	15	18
D	2	5	10	9
E	1	3	7	9

Source	GMS(a)	GMS(b)	GMS(c)
Fieldwork	Feb 1983	Jan 1984	Jan 1985
Class	% owning		
AB	12	19	24
C1	7	25	26
C2	4	11	20
DE	2	5	10

We saw in the introduction that some commentators had been concerned about the growth of a class based information gap, with only the higher socio-economic classes gaining familiarity with computers. The above data show that class clearly has a bearing on possession of micros. Apart from the somewhat exceptional Gowling figures for C1's in 1984 and to some extent in 1985, computer ownership corollates with social class.

It would appear to be more accurate to view these new products as diffusing through social classes, in much the same way as many other consumer electronics. First we see a concentration in the AB category. This is followed by increasing sales to C1, then C2 then D and E. I would argue that this reflects the broad based, cross-class interest in interactive games.

STATISTICAL APPENDIX S5: YOUTH, GENDER AND USE OF VIDEO GAMES MACHINES

Statistical Appendix S5 draws entirely on the various surveys of children and teenagers conducted by Carrick James Market Research. This group is of particular interest because of their role in my argument concerning continuities between video games and home computers. Statistical Appendix S7 shows how this younger age group constituted the major users of home computers. These youth were also the main player of video games.

In these surveys, data concerning both video games and home computers appear in a range of different contexts: in questions about TV usage, about sport and leisure, and about toys. As a result, different question wording about games machines, as well as the way within which questions are framed by the other parts of the interview schedule, mean that results are often not comparable. Two other factors add to this incommensurability. First, the age-range of the samples varies. Second, as with many other market research firms, there is a greater stress on providing the latest information rather than keeping the form of the questions and the surveys fixed to facilitate analysis of trends. Thus, even within similar types of survey, there are changes over time both in terms of the question wording and the way in which categories are organised, .

In particular, early questions refer to 'TV games', while later ones refer to 'TV/Video games'. In fact, these categories are meant to cover both programmable consoles using cartridges and those video games machines which have several games installed but which are non-programmables. Carrick James initially also asked questions about 'electronic games', the units which only contained a single game. However, since the data from these resemble those for video games, they have not been reported here.

There are occasions when data from different surveys are comparable, enabling us to glimpse the pattern of growth and decline in the use of video games machines, as well as the changing patterns of playing between boys and girls. However, charting the change over time is not the main emphasis in this appendix. The principal aim is to form a picture of differential interest in video games machines between boys and girls. Thus, even incommensurable surveys have been reported in order to underline the existence of these differences.

OWNERSHIP OF VIDEO GAMES MACHINES

A general problem with responses concerning the ownership of items is whether individuals of families/households are the appropriate unit of analysis. For some 'personal' products there may be a clearer-cut sense of possession by individuals. Perhaps, personal stereos would be an example of this. On the other hand, other goods may have been bought communally: that is to say, 'for the family' or 'for the children'. An example here might be the video cassette recorder.

Video games, and home computers, are ambiguous in this respect, in that these products may be seen as being either individual or familial goods. The range of problems concerning such possession data in relation to gender are postponed until the discussion of home computers (Statistical Appendix S8), since I can refer to interview material in order to illustrate a number of points. As a consequence, data which solely concerns ownership are not utilised in this appendix.

However, one exception concerns questions which have conflated ownership and use. In Statistical Appendix S8, I suggest that these particular questions may well measure mainly usage. Therefore, it seems worthwhile to make some allowances for this question wording, given that this was the phrasing which was employed in some of the earliest pieces of market research both on video games machines and

on home micros. The details of data concerning video games are given below:

TABLE S5.1: GENDER, OWNERSHIP AND USE OF VIDEO GAMES

Q: Do you own and use a TV game?

(in the context of discussing toys in the home)

Source Code	Date of Survey	Age range	Percentages of Male:Female
CJ (a)	Dec. '79	7-17	28:15
CJ (b)	Dec '80	7-17	32:18
CJ (c)	Dec. '81	7-17	36:21

Although this early question is rather vague as to whether it refers to recent use, or it is asking respondents if they have ever played games, the data nevertheless provide a first indicator of greater male interest. In the early years of video games machine sales, male interest appears to be stronger, in a ratio of about 2:1. By 1981, the girls appear to have caught up a little, narrowing the ratio down to 3:2.

USE OF VIDEO GAMES MACHINES: 'EVER'

There are a number of different possible questions specifically about usage. As we might expect, the one which produces the largest number of affirmative replies is the question of whether respondents 'ever' use home video games machines. These responses show the extent of a minimum contact with the machines and so provide a first layer in our picture of usage patterns. Of course, respondents might still reply negatively if they have only used the video games machine once or a few times in the past - that is to say, they might interpret 'ever' as meaning 'occasionally'. With this proviso in mind, the statistics enable some comparison of the broadest base of interest among girls and boys. While video games machines may well be more fashionable among boys and associated with them, I doubt whether this question would evoke intentionally false answers on a large scale.

There are some variants among these questions about use. The two which I cite are not commensurate with each other. The first asks about video games machines in the context of discussing the usage of TV sets in the home: for example, for making video recordings, for displaying Teletext etc. The question itself is framed in relation to others which make it clear that respondents are to reply about their own experience, not that of other family's members. The second variant, again addressing individuals, appears in the context of a range of questions about sport and leisure activities. Hence this question also records cases of usage outside of the home.

TABLE S5.2: GENDER AND USAGE OF VIDEO GAMES: 'EVER'

Source Code	Date of survey	Age range	Percentages of Male:Female
Q: Do you ever play TV/video games?			
	(In the context of asking how TV sets are used)		
CJ (f)	Nov. '82	11-24	47:37
CJ (h)	Feb. '83	7-14	59:46
CJ (j)	June '83	7-19	44:36
CJ (m)	Dec. '83	7-19	38:29
	(In the context of asking about Sport and Leisure)		
CJ (i)	Feb/Mar. '83	7-24 (boys)& 7-14 (girls)	42:26
CJ (k)	Aug. '83	5-17	33:19

Table S5.2 again suggests that the remains a consistent difference between use by boys and girls, varying around the 4:3 ratio. The gap remains even when there is a decline in overall affirmative answers - a change which is presumably due to the rising popularity of competing home computer products. It is not clear why the figures

generated by the sport and leisure survey should indicate less overall usage and a wider gender gap.

Some questions asked whether respondents had ever used certain brands of computer (CJ (h) and CJ (l)). In line with the findings above, it is still clear that boys used more video games machines. (This table has not been shown since it really adds nothing more to what we might gather from the figures above). The only extra observation from the statistics on specific types of video games machines is that more girls used a machine, but did not know its brand. This fits in with a point which will be discussed in Statistical Appendix S6, that boys seem to have more knowledges concerning such products.

RECENT USE OF VIDEO GAMES MACHINE

The other common data refer to recent usage of the micro. This measure does not strictly reflect 'regular usage'. Recent users would include, for example, those who have only recently acquired a video games machine and who might have a different profile from that of earlier buyers. On the other hand, regular users might be expected to be well represented among recent users. Therefore, in lieu of better measures, we might treat recent use as being some guide to those with a stronger interest in the games-playing. I see no reason to believe that there should be strong gender differences caused by giving intentionally false answers or problems of remembering the events of the recent past. In addition to questions framed in terms of TV sets and leisure activities, I also use figures from a survey concerning games and puzzles in the following table.

TABLE S5.3: GENDER AND USAGE OF VIDEO GAMES: 'RECENT'

Source Code	Date of survey	Age range	Percentages of Male:Female
Q: Have you played TV/Video games in the last 7 days? (In the context of asking about Games and Puzzles played or used in the home)			
CJ (d)	Apr. '82	7-14	13:8
(In the context of asking how TV sets are used)			
CJ (j)	June '83	7-19	15:7
CJ (m)	Dec. '83	7-19	17:8
(In the context of asking about Sport and Leisure)			
CJ (i)	Feb/Mar. '83	7-24 (boys)& 7-14 (girls)	17:10
CJ (k)	Aug. '83	5-17	16:8

Once again, the usage figures show that there is more male games playing. In fact, the ratio is higher on average - 2:1 - than in the questions asking whether respondents ever played on video games

machines. If this were true of the wider population beyond these samples, then we might take the statistics to indicate the existence of a larger core of regular players among boys than among girls.

AMOUNT OF USE

Apart from having to make the assumption that recent use might indicate regular use, we should be able to judge the latter from figures concerning how often young people play on video games machines. Unfortunately, the problem with this more direct measure of stronger interest is that when investigating this degree of detail, the number of cases becomes so small that we must be less confident that the results generalise to a wider population.

In the following table, the figures represent the actual number of people who say they use video games machines for different amounts of time. This is in line with the practice adopted in Statistical Appendix S8. There is no separate figure for those who have a video games machine but who do not use it. Such cases were conflated with the figures for those with no video games machines, and with the 'don't knows'.

TABLE S5.4: GENDER AND USAGE OF VIDEO GAMES: 'FREQUENCY-DAYS PER WEEK'

Source code	CJ (e)			CJ (j)	
Date of survey	Oct/Nov '82			June '83	
Age Range	7-19 yr			7-19 yr	
	Male	Female		Male	Female
Total Sample Size	708	715		638	621
Total of Replies	280	225		278	220
Days per Week					
5 or more	17	5		20	10
3-4 days	22	8		24	9
1-2 days	70	45	2 days&	34	14
			1 day	46	32
Once a Month	84	71		74	60
Less Often	87	96		80	95

The statistics in Table S5.4 would clearly support the case for saying a higher proportion of boys were more regular players in both 1982 and 1983.

Another measure of intensity of interest is given by the statistics concerning the number of hours spent on the video games machine per week. The problem here, even more so than in the above table, is that people's ability to judge average time spent on an activity is not reliable. Furthermore, and this to some extent would be true of table S5.4, there may be reason to anticipate that boys overestimate this time. The issue is discussed in Statistical Appendix S8 in relation to home computers. Nevertheless, even allowing for some exaggeration, I suggest in that to some extent such figures indicate real differences between the male and female players.

TABLE S5.5: GENDER AND USAGE OF VIDEO GAMES: FREQUENCY-HOURS PER WEEK'

Source code	CJ (e)		CJ (m)	
Date of survey	Oct/Nov '82		Dec '83	
Age Range	7-19 yr		7-15 yr	
	Male	Female	Male	Female
Total Sample Size	708	715	3123	2962
Total of Definite Replies	268	213	586	345
Hours per Week				
1 or less	154	152	229	157
up to 2	51	27	110	89
up to 3	16	15	23	31
up to 4	13	3	28	18
up to 5	7	5	94	
up to 6	8	4	47	15
up to 7	5	5		
up to 14	10	2	39	0
up to 21	4	0	0	0
up to 28			8	0
up to 35	0	1	8	0
D.K.	21	18	459	429

From this table we can see that in 1982 there were as many young male occasional players (one hour or less), as young female ones, and that these constituted the majority of games machine users. However, there was a larger number of more frequent players among the boys. This pattern is even more apparent in 1983. In addition to the

greater number of more occasional male players than female ones, the very heavy users are predominantly boys.

We can highlight the effect of this distribution by calculating a rough average of the number of hours spent playing. (This is calculated by adding 229x½ to 110x1½ etc, divided by the total number of definite replies).

TABLE S5.6: AVERAGE HOURS OF USE FOR VIDEO GAMES MACHINE USERS

Source Code	Date	Age Range	Average hours use for those who use a computer Male:Female
Q: How many hours do you spend using a TV/video games per week? (In the context of asking about the usage of TV sets - options of different hours were given)			
CJ (e)	Oct/Nov '82	7-19	1.8 : 1.2
(In the context of questions about TV games and home computer use - options of different hours were given)			
CJ (m)	Dec '83	7-15	2.9 : 1.8

In sum, the tables suggest a number of points about 'interest'. First, a slightly more widespread interest in video games machines appears

to exist amongst boys (if we assume that usage reflects interest). When we turn to the various tables on recent usage, there are more boys who would appear to be regular, rather than infrequent, players. Third, amongst male users there is a larger core of more 'dedicated' users - for whom that interest appears to be intense. However, as I elaborate in the chapter to which this appendix refers, while trying to stress gender differences, we still need to be aware that girls also play video games and that there are both regular and enthusiastic female players.

STATISTICAL APPENDIX S6: YOUTH, GENDER AND INTEREST IN VIDEO GAMES

DESIRE FOR A VIDEO GAMES MACHINE

There were questions in the Carrick James surveys which related only indirectly to interest. For example, some questions asked whether children expected to receive video games (CJ (h,l)) or had received them as presents (CJ (h)). Such questions were usually asked in the periods before and after Christmas. However, these statistics are partly constructed by parental decisions concerning the preferences of and what is appropriate for their children. Instead of using such figures, I preferred to drew on the very straightforward question concerning the presents which children themselves wanted. This seems to be a more direct measure of interest.

TABLE S6.1: GENDER AND PREFERENCE FOR VIDEO GAMES MACHINES

Q: Would like to get a TV game(s machine)?
(in the context of asking about preferred Christmas presents)

Source Code	Date of survey	Age group	Percentages of Males:Females
CJ (a)	Dec. '79	7-17	19:15
CJ (b)	Dec. '80	7-17	18:19
CJ (c)	Dec. '81	7-17	17:10
CJ (g)	Dec. '82	7-17 (boys)& 7-14 (girls)	18: 9

In contrast to the data on usage, general interest in video games machine seems to have been roughly equal in 1979 and 1980. However, a gap develops thereafter, caused by a decline in the preferences which were expressed by girls.

KNOWLEDGE OF VIDEO GAMES

As part of their role supporting marketing departments, Carrick James also asked questions about different types of micros to test 'brand awareness'. Although there are some problems as regards interpreting the responses, I would argue that we can tentatively treat such statistics as reflecting a degree of knowledge about developments in the video games market.

TABLE S6.2: GENDER AND BRAND KNOWLEDGE: VIDEO GAMES MACHINES

Q: Have you heard of these brands of video games (machine)?
(List read out)

Source code	CJ (h)	CJ (l)
Date of survey	Feb. '83	Sept.'83
Age Range	7-14 yr	7-19 yr
	Male:Female	Male:Female
Make of video games machine	%	%
Atari	95:68	86:75
Binatone	33: 7	36:29
Coleco/CBS	6: 0	20: 7
Grandstand	81:44	71:57
Mattel Intellivision	42: 7	34:13

Parker	55:16	-
Philips	78:37	51:49
Thorn EMI	24: 2	-
Vectrex	-	16: 9

A problem in interpreting these statistics stems from the fact that respondents who have not previously encountered these brands may nevertheless claim to have heard of them, or even convince themselves that this is the case. This issue is discussed later in Statistical Appendix S9, where I can make use of relevant interview material on home computers. In that appendix, I argue that the figures may indeed be influenced by exaggerated claims from boys, but this itself reflects the fact that boys valued having such knowledges more positively. On the other hand, there is still reason to believe that the data in part indicate differential knowledges among male and female youth. On both counts, we could take the statistics to suggest that there is greater interest among young males.

STATISTICAL APPENDIX S7: AGE, GENDER AND USE OF HOME COMPUTERS

AGE: THE IMPORTANCE OF YOUNG USERS

The table which was cited in the main chapter draws on a sample of individuals, as does other data from Carrick James Market Research; thus, it is unlikely that respondents belong to the same family. A different approach was adopted by the market research firm Gowling. The latter examined patterns of use within households (which, in effect, means couples with and without children). This strategy provides further evidence about the significance of age, even though it can have its pitfalls.

In a survey whose fieldwork was conducted at the start of 1983, Gowling presented the following table showing the main users of the micro in those sample families who possessed a home computer (GMS (a) p.12).

TABLE S7.1: MAIN USERS IN HOUSEHOLDS WITH MICROCOMPUTERS

Family Position	Percentage of main users amongst families with micros
Husband/Father	36
Wife/Mother	3
Son	48
Daughter	8
Other/Don't know	5

(GMS (a))

These figures arose from a question which asked the 'male head of household' to specify the main user. Obviously, this question wording forces a choice of one person, and does not show the pattern of use by other family members. As a result of this process, fathers and sons stand out to such an extent that it is easy to conclude that gender is the overriding factor structuring interest. Certainly, this type of evidence might have reinforced that perception among producers.

However, it is important to introduce a few words of caution about these particular statistics. As regards the question wording, 'main' may be taken by respondents to include other criteria besides the sheer amount of time spent on the micro. For example, answers may reflect evaluations concerning who is involved in more 'serious' computing. More importantly, perhaps, the question requires one family member to know about the time spent on the machine by everybody else. These considerations, taken in conjunction with the slightly later Carrick James data cited in Chapter 8, suggest that the stress on fathers and underemphasis on daughters that these data indicate may be a little exaggerated even at this point in time.

The proportion of adult male usage seems to have declined in the period after this early survey. While micros were still acquired by 'single' people and 'couples without children', the mass Communications Research shows that the biggest growth occurred amongst families with children (MC (a) p.60 and MC (b)p.13; GMS (b) p.18) Gowling suggested that only 10% of micros were in 'adult only' households by 1985 (GMS (c) p.18), while the Mass Communication sample revealed an equivalent figure of 13% (MC(b) p.13).

In 1985, Gowling again looked at the pattern of usage within families (GMS (c) p.28). However, in the case of this sub-sample of 750 families with micros, interviews were conducted with children together with one or more parent. Gowling also posed questions concerning levels of usage in terms of hours, subsequently converting

respondents' answers into the categories of use shown below in Table S7.2.

TABLE S7.2: LEVEL OF COMPUTER USAGE BY FAMILY MEMBERS

Family member		% Distribution Heavy User	Medium User	Light User	Non-User
Husband/Father	(n=643)	9	21	40	30
Wife/Mother	(n=612)	2	6	30	62
Eldest Boy	(n=612)	48	35	13	4
Second Eldest Boy	(n=269)	43	35	18	4
Third Eldest Boy	(n= 49)	26	37	34	3
Eldest Girl	(n=381)	12	26	41	21
Second Eldest Girl	(n= 95)	17	24	39	20
Third Eldest Girl	(n= 15)	32	20	43	5

(GMS (b)).

Other studies had suggested that micros were most likely to be taken up by households with a boy or boys. For instance, Cunnington's 1984 survey (CA (a) p.13), found that 56% of boys and 32% of girls aged 12-15 had access to computers in their home. Table S7.2 would seem to reflect this trend in the larger number of boys this sub-sample identified.

While usage by boys clearly stand out, I would want to draw attention to the figures for fathers. By this stage, there are very few heavy adult male users, fewer than any category of girls. Also more husbands/fathers were non-users than in the case of any category of

children. Even if Gowling had employed their previous classification of main users, it seems likely that fathers would have played a far lesser role by the time of this later survey.

STATISTICAL APPENDIX S8: YOUTH, GENDER AND USE OF HOME COMPUTERS

This appendix again draws on the various surveys of children and teenagers which were conducted by Carrick James Market Research. In many surveys, the proportion of micro users in the sample was very small, especially in the early 1980s. Therefore, there is always the doubt in any particular survey that the scale of apparent gender differences could result from statistical chance. While being aware that there is change over time, as noted in Statistical Appendix S5 and S6, the principal aim is to show the nature of differential interest in micros across all of those surveys. Through this approach, we can have some confidence that the general ratios of male to female usage and the other patterns of interest revealed in the figures generalise to a wider population than the samples.

OWNERSHIP OF MICROS

One type of statistic which is frequently found in market research is that derived from questions asking whether respondents 'own' or 'have' micros. This approach seems most appropriate when researchers are interested in the 'family' or 'household' as the unit of consumption. For example, we can ask how many households in general own micros. Or we might be interested in how micros are distributed according to household social class. However, to ask about 'ownership' is less appropriate once we assume that an individual is the unit of consumption, as in the statistics comparing male and female ownership of home computers.

In a great many cases, there probably is some clear-cut sense of possession by individuals. Some of my interviewees bought machines for themselves or, in the case of teenagers, received micros as gifts. In these cases, there is no problem with the interviewing approach

which assumes individual ownership. Yet, it was clear from other interviews that micros were not always regarded as being individual possessions. Home computers were often bought 'for the children' or 'for the family'.

Alternatively, some home computers had originally been bought by and for one person, such as the father or a particular child, but since other household members used the machine, these micros were later perceived as being communal artefacts. In both of the above situations, if a girl or a boy were to say that she or he owned a home computer, what in practice is regarded as being a shared object may appear in the statistics as a gender-specific possession. These constitute one set of circumstances where statistical profiles which assume individual owners can be misleading.

Conversely, even if one person is recognised as being the 'owner' of the micro, an interview question about ownership may nonetheless be interpreted in familial terms. For example, if a father had bought the micro mainly for himself, other family members might well interpret the question 'Do <u>you</u> own a home computer?' as meaning 'Is there a home computer in your family?' That possibility is even clearer in the question of 'Do you <u>have</u> a home computer?' (as asked in the market research CJ (f)). Or, to rephrase the point, the respondent may interpret 'you' as being plural. In such cases, the researchers may be interested in possession, but the respondent refers to availability. In this instance, ownership which should be registered in one set of statistics - for example, the father's - appears in someone else's. Again, the profile figures can be misleading

In practice, most figures concerning ownership suggest that a higher percentage of boys possess micros. It is easy to suggest reasons for these results, if we assume that there is more male interest. For example, more households with only boys, or a single boy, may have micros than households with only girls, or a single girl. On the other hand, boys may be keener to 'claim' the micro as their own. Ultimately, the thesis is concerned with the question of who takes an

interest in the machine. At best, ownership may indirectly reflect this. I prefer a more 'direct' indicators of interest, such as patterns of usage. Hence, ownership statistics are not cited in the appendices concerning gender.

A further complication arises where some market research questions conflates ownership and usage. The first variant of this question asks: 'Do you own or use a home computer'. Here, all the additional, and potentially misleading, answers evoked by the term 'own' seem still to apply, and hence I avoid utilising these data. The other variant, 'Do you own and use a home computer?', may well attract an affirmative answer where the micro is a 'family' possession, but the respondent occasionally uses the machine. In other words, the question may be interpreted as referring simply to 'use'. I noted in the Statistical Appendix S5 that it may be worthwhile to make some allowances for this particular question wording since this phrasing was employed in one of the earliest pieces of market research concerning micros and video games machines. Details of the home computer statistics are given below:

TABLE S8.1: GENDER, OWNERSHIP AND USE OF HOME COMPUTERS

Q: Do you own and use a microcomputer?
(in the context of discussing toys in the home)

Source Code	Date of Survey	Age range	Percentages of Male:Female
CJ (c)	Dec. '81	7-17	3:2
CJ (g)	Dec. '82	7-17 (boys) 7-14 (girls)	4:2

Certainly, the 1982 percentages are not very different from those in the other surveys of 'use' which will be discussed presently. The only point of detail is that the figure for girls might have been slightly depressed if the 15-17 year old girls omitted here were more likely to be computer users than the younger girls. However, the other data quoted in the chapter do not suggest that this is particularly the case.

USE OF MICROS: 'EVER'

The first variant of the question asking whether respondents ever use micros is framed within the context of examining the use of of TV sets. Such a question omits the use of micros which included their own monitor. However, the thesis covers the period before the arrival of those 'CPC' Amstrad machines which included monitors in the sales package. Hence, the vast majority of early 1980s home computers plugged into the TV. The second variant, asking questions about sport and leisure activities, includes usage in other locations, such as the homes of friends, although it excludes the use of micros in work and in education.

TABLE S8.2: GENDER AND USAGE OF HOME COMPUTERS: 'EVER'

Source Code	Date of survey	Age range	Percentages of Male:Female
Q: Do you ever use a micro computer?			
	(In the context of asking how TV sets are used)		
CJ (f)	Nov. '82	11-24	17:9
CJ (j)	June '83	7-19	10:6
CJ (m)	Dec. '83	7-19	18:9
	(In the context of asking about Sport and Leisure)		
CJ (i)	Feb/Mar. '83	7-24 (boys)& 7-14 (girls)	17:8
CJ (k)	Aug. '83	5-17	17:5

The main point to which I would draw attention is the fairly consistent ratio between male and female use. This is approximately 2:1, which is greater than for the equivalent figure for video games. The only exception which shows a higher ratio is CJ (k). This may reflect a relatively broader experience of the machine among 5-7 year old boys than girls. The only strictly comparable figures are CJ (j) and CJ (m), where we see a sharp increase in the percentages during the year when home computers were starting to become very popular. Questions asking whether respondents had ever used certain brands of computer, as noted in Statistical Appendix S5, produced statistics which were broadly in line with those above.

RECENT USE OF MICRO

As in Statistical Appendix S5, statistics showing the recent usage of home computers can be viewed as being a rough indicator of more regular usage and thus of stronger interest in micros. The details for home computers are provided in the following table:

TABLE S8.3: GENDER AND USAGE OF HOME COMPUTERS: 'RECENT'

Source Code	Date of survey	Age range	Percentages of Male:Female
Q: Have you used a microcomputer in the last 7 days? (In the context of asking about Games and Puzzles played or used in the home)			
CJ (d)	Apr. '82	7-14	4:1
(In the context of asking how TV sets are used)			
CJ (j)	June '83	7-19	4:1
CJ (m)	Dec. '83	7-19	12:4
(In the context of asking about Sport and Leisure)			
CJ (i)	Feb/Mar. '83	7-24 (boys)& 7-14 (girls)	10:6
CJ (k)	Aug. '83	5-17	10:4

The only strictly comparable figures are CJ (j) and CJ (m) - which again register the increase in computer usage during the 'boom' year of 1983. Once again, there is more male usage - in fact, the gender gap is larger than in the case of video games. As with video games, the ratio is higher on average than in the statistics referring to whether respondents ever used their machines. The existence of a larger core of regular users among boys than among girls would certainly fit in both with the experience of some of my interviewees and the next statistics which we shall be examining.

AMOUNT OF USE

In the case of the statistics concerning how often young people use micros, the figures generated in surveys are even smaller than for video games. Strictly speaking, convention dictates that the numbers involved fall below the point where we can have much confidence in the generalisability of these figures. Nevertheless, we can at least note that the pattern which appears to emerge would conform with conclusions drawn in relation to previous tables and to qualitative interview material: that a higher proportion of boys were more regular users.

TABLE S8.4: GENDER AND USAGE OF HOME COMPUTERS: 'FREQUENCY-DAYS PER WEEK'

Source code	CJ (e)			CJ (j)	
Date of survey	Oct/Nov '82			June '83	
Age Range	7-19 yr			7-19 yr	
	Male	Female		Male	Female
Total sample Size	708	715		638	621
Total of replies	29	12		64	41
Days per week					
5 or more	7	1		16	3
3-4 days	6	0		11	2
1-2 days	12	6	2 days&	3	7
			1 day	14	10
Once a month	2	0		8	14
Less Often	2	5		12	5

If we add the figures for 3-4 and 5 days, in both surveys, these categories together account for 40% of boys but only just over 10% of girls. By the end of 1983, the core of heavier computer users is catching up with that of video game players, although the latter is still larger. At this stage, home computers had not yet attracted the vast number of occasional users as was the case with video games machines.

Of course, it can be argued that male respondents may exaggerate claims concerning frequency of use. In support of this view, it is worth noting that some of my male interviewees were quite proud of the number of hours which they had spent on the computer. This was in the wider context where magazines portrayed serious users as being addicted and working late into the night as programming Hackers had

once done. On the other hand, boy and girl interviewees consistently indicated that the boys in the family spent longer hours using the micro. Thus, even with some exaggeration, I would suggest that the above and following figures to some extent reflect real differences between the male and female usage.

TABLE S8.5: GENDER AND USAGE OF HOME COMPUTERS: FREQUENCY-HOURS PER WEEK'

Source code	CJ (e)		CJ (j)	
Date of survey	Oct/Nov '82		June '83	
Age Range	7-19 yr		7-19 yr	
	Male	Female	Male	Female
Total Sample Size	708	715	638	621
Total of definite replies	27	11	54	34
Hours per week				
1 or less	1	4	12	21
up to 2	2	2	15	5
up to 3	9	4	0	2
up to 4			5	2
up to 5	2	0		
up to 6	4	0	9	2
up to 7	3	0	5	0
up to 14	2	0	5	2
up to 21	4	0	1	0
up to 28			2	0
up to 35	0	1		
D.K.	4	5	8	4

Generally, the distribution of girls is skewed more towards lighter users while the heavier users are predominantly boys, with one exception in 1982. The same differences between computer and video games usage emerge as in the previous table. As shown below, one corollary of there being proportionally fewer infrequent users is that the average number of hours spent on home computers is greater than in the case of video games.

TABLE S8.6: GENDER AND AVERAGE HOURS OF USE FOR MICRO USERS

Source Code	Date	Age range	Average hours use for those who use a computer Male:Female
Q: How many hours do you spend using a microcomputer per week? (In the context of asking about the usage of TV sets - options of different hours were given)			
CJ (e)	Oct/Nov. '82	7-19	6.2 : 4.3
CJ (j)	June '83	7-19	4.5 : 1.8
(In the context of questions about TV games and home micro use - options of different hours were given)			
CJ (m)	Dec. '83	7-15	5.5 : 2.3

In sum, we have the same general picture as for video games, except that the gender differences tend to be greater. There is a more widespread interest in micros amongst boys than girls. As with video games, more boys than girls would appear to be regular, rather than infrequent, users. Third, amongst male users there is a larger core of those more 'dedicated' users for whom that interest appears to be intense. However, while trying to stress gender differences, it is nevertheless clear that girls also use home computers and that there are both regular and enthusiastic female users.

STATISTICAL APPENDIX S9: YOUTH, GENDER AND INTEREST IN HOME COMPUTERS

DESIRE FOR A MICRO

The question asking which Christmas presents children themselves wanted constitutes one of the more direct measures of interest.

TABLE S9.1: GENDER AND PREFERENCE FOR HOME COMPUTERS

Q: Would like to get a home computer?
(in the context of asking about preferred Christmas presents)

Source Code	Date of survey	Age group	Percentages of Males:Females
CJ (a)	Dec. '81	7-17	8: 3
CJ (e)	Dec. '82	7-17 (boys)& 7-14 (girls)	19:10

As in the other statistics concerning home computers, we find more interest among boys, in an approximate ratio of 2:1. This ratio resembles the equivalent measure of preferences for video games. If we refer back to the table of 'ownership and use' in Statistical Appendix S8, the percentages involved were still quite low at that time. Hence, it is tempting to suggest that these differences shown by particular 'usage' figures may have been caused by statistical chance. However, the greater percentages generated by the above question on 'desire' from those same surveys lend credibility to the

view that the ratios shown in the 'ownership and use' tables reflected actual gender differences.

KNOWLEDGE OF MICROS

As in Statistical Appendix S6, the data from questions concerning 'brand awareness' were used to assess the degree of knowledge which young people possessed concerning home computers products.

TABLE S9.2: GENDER AND BRAND KNOWLEDGE: HOME COMPUTERS

Q: Have you heard of these brands of microcomputer?
(List read out)

Source code	CJ (f)		CJ (j)
Date of survey	Feb. '83		Sept.'83
Age Range	7-14 yr		7-19 yr
	Male:Female		Male:Female
Make of micro	%		%
Acorn	15: 7		24:12
Atari 400/800			54:43
BBC Micro	28:15		43:29
Colour Genie			56:19
Commodore Vic	29:13		40:18
Dragon	25: 8		43:21
Sinclair	33:16	(ZX81)	48:28
		(Spectrum)	51:31
Tandy	23:16		
Texas	33:18		31:17
Commodore 64			46:29
Jupiter Ace			15: 5

Lynx	14: 6
Mattel	15: 4
Oric	24: 9

As mentioned previously, it is difficult to assess these data because respondents who had not previously encountered these brands may nevertheless have claimed to have heard of them, or even have convinced themselves that the brands were familiar. Did boys do this more than girls? To an extent, this may have be the case where boys wanted to present themselves as being up-to-date with computing developments. A number of interviewees conveyed this impression. Yet, to the extent that the figures do not simply measure knowledges, they may nevertheless reflect a different process which is relevant to the thesis analysis: that boys valued having such knowledges more positively.

On the other hand, the interviews with both boys and girls, (talking about brothers, for instance), suggested that more boys kept up-to-date with home computer developments. In this respect, another relevant survey question asked: 'Which of the following products would you most like to get?'. Such a question partly measures knowledges of, as well as desire for, micros. Especially in the earliest version of this question in 1982 (CJ (d)), far more boys than girls chose the lesser known machines from firms other than Sinclair and Commodore. Presumably, in making such choices, these boy respondents must know something about the more obscure machines. Thus, at least to some extent, the statistics on brand awareness appear to reflect differential knowledges among male and female youth.

The question remains of how such knowledges relate to interest. It could be argued (a) that such brand awareness is a function of access to information about machines and (b) that boys are in a better position to pick up such knowledges incidentally. As we have noted, boys are the predominate readers of the specialist magazines which are

the main carriers of both advertisements and other forms of product information.

However, two points need to be made. First, conveying product information is one of the main roles of these magazines, as is clear from most of the articles. The fact that more boys read the magazines therefore can be taken to indicate that they have a positive interest in obtaining these knowledges, rather than obtaining them incidentally. Secondly, hardware advertisements were less concentrated in magazines than were the adverts for software. The larger companies, such as Tandy and Atari, as well as Sinclair and Acorn, advertised in the national press and even on TV. Their adverts were more generally accessible, and not confined to the computer press. Yet, if we look at the figures for the brand awareness of those particular companies, there is still a gap between boys and girls. Therefore, as with video games, the figures can be taken to suggest that boys take more of an interest in home computer products.

STATISTICAL APPENDIX S10: THE USES OF THE HOME COMPUTER

THE IMPORTANCE OF GAMES: SOFT- AND HARDWARE

It is generally understood within the computer industry that games-playing has been the predominant use of computers for some time. Sales figures would tend to support that assumption. In 1984, the market research firm Gowling reported that 70% of all software packages sold to the home market were games. (GMS (b), p.22). For some time, the best selling peripherals have been the joysticks which are used for playing games (e.g. GMS (c), p. 26).

Turning to survey data, Gowling differentiated between owners and currently active users in Table S10.1 below:

TABLE S10.1: TYPES OF SOFTWARE OWNED BY MICRO USERS

Type of Software	% of micro owners with at least one	Av. No. of packages owned by all micro owners	Av. No. of packages owned by 'users' only
Games (any type)	77	3.7	4.8
Educational Packages	44	1.2	2.6
Personal Finances/ Home Economics	12	0.2	1.4
Small Business/ Accountancy	16	0.2	1.4

A survey by the market research firm Cunnington asked how much time home computer users spent on different applications, and also asked about the type of software packages which respondents wanted in the future. In these questions, games were excluded: as the most popular application by far, games software was the subject of separate questions.

TABLE S10.2: USE OF AND DESIRE FOR VARIOUS HOME COMPUTER APPLICATIONS

Applications	% of all Hours Spent on the Micro	% of Users Wanting
Education	32	22
Graphics	12	8
Hobbies	10	2
Home Finance	8	5
Word Processing/ Database	8	12
Business	21	11
Other	9	23

Obviously, one limitation of these indicators is that the activity of programming with the micro does not necessarily require any software to be bought at all.

THE IMPORTANCE OF GAMES: USAGE

The Mass Communications longitudinal research shown in Table S10.3 underlines how games playing is the most regular usage, with programming and education following (M.C. (b)):

TABLE S10.3: WEEKLY USE OF HOME COMPUTER APPLICATIONS

Application	% using once week
Games	48
Learning/Education	21
Program writing	20
'Doing calculations'	14
Storing info for personal use	8
Keeping business records or accounts	5
Word-processing	5
Home Finances	3

A survey by the BBC addressed a sample of individuals of all ages who had access to micros. One question looked at 'main uses'. The categories which were offered to the respondents differed from those in the Mass Communications' study, but it might be reasonable to assume that the BBC's 'family use/games' category in Table S10.4 predominantly picks up games-playing, while 'Pleasure/Hobby' responses chiefly measure the amount of programming. This survey also provides a breakdown by gender, showing that games playing is the

most popular use for both males and females.

TABLE S10.4: GENDER AND MAIN APPLICATIONS OF HOME COMPUTERS

Q: What do you mainly use your home computer for?

Use	Male %	Female %
Family use/Games	55	64
Pleasure/Hobby	33	17
Education	4	9
Business/Work	5	5
Personal Affairs/Information	3	3
Other	1	1

However, it should be noted that 'main use' has one of the problems akin to 'main user', discussed in Statistical Appendix S7: the question does not show the pattern of other uses besides the most popular one.

Table S10.5 from Gowling provides a breakdown by both age and gender (GMS (c) p.29). The question asks about main usage by different family members, and is related to Table S7.2 which was cited in Statistical Appendix S7.

TABLE S10.5: MAIN USES OF HOME COMPUTER BY FAMILY MEMBERS

Family Member	Main Activities: % distribution					
	Playing Games	Educational	Listing Programs	Work Related	Program Writing	Other
Husband/Father	56	8	11	9	15	1
Wife/Mother	76	10	5	5	4	1
Eldest Boy 1		80	9	5	1	13
2nd Eldest Boy	89	6	2	-	6	-
3rd Eldest Boy	90	4	3	-	4	-
Eldest Girl 1		84	10	4	1	4
2nd Eldest Girl	86	10	7	-	2	-
3rd Eldest Girl	64	21	19	-	-	-

(where the total exceeds 100 it reflects equal usage amongst two or more main activities)

Here, we see again that games are clearly the main use for all categories of user. The fact that games-playing is the major use for girls would conflict with any notion that girls use micros chiefly for other things in preference to games. (The figures for the third eldest girl are derived from a small sample, so I have been wary about making any particular comment on these data).

STATISTICAL APPENDIX S:11 SOURCES AND DETAILS OF MARKET AND OTHER QUANTITATIVE RESEARCH CITED IN APPENDICES

SAMPLE BASED RESEARCH

Code Source

CJ = Carrick James Market Research
GMS = Gowling Marketing Services
MC = Centre for Mass Communications Research
CA = Cunnington and Associates
(cited in Financial Times Business Information (1985) *'UK Market for Home Computers'*, London)
BBC = BBC Broadcasting Research
Min = Mintel publications
HC = Henley Centre for Forecasting
Gov = Office of Population Censuses and Surveys

Code:	Date	Title and Sample size
CJ (a):	Dec.79	'National Survey Among 7-17 Year Olds', Base 1026.
CJ (b):	Dec.80	'National Survey Among 5-17 Year Olds', Base 1060.
CJ (c):	Dec.81	'National Survey Among 5-24 Year Olds and Mothers of 2-12 Year Olds ', Base 1591.
CJ (d):	Apr.82	'National Survey Among 7-24 Year Olds and Mothers of 7-14 Year olds', Base 1354.
CJ (e):	Oct/Nov.82	'National Survey Among 7-19 Year Olds and Mothers of 3-6 Year Olds', Base 1426.
CJ (f):	Nov.82	'National Survey Among 11-24 Year Olds', Base

1030.

CJ (g): Dec.82	'National Survey Among 7-17 Year Olds', Base 535 7-17 year old boys and 381 7-14 year old girls.
CJ (h): Feb.83	'National Survey Among 7-14 Year Olds', Base 812.
CJ (i): Feb/Mar.83	'National Survey', Base 897 7-14 year old males and 398 7-14 year old females.
CJ (j): Jun.83	'National Survey Among 7-19 Year Olds', Base 1261.
CJ (k): Aug.83	'National Survey Among 5-17 Year Olds', Base 1253.
CJ (l): Sept.83	'National Survey Among 7-19 Year Olds', Base 1241.
CJ (m): Dec.83	'National Survey Among 7-44 Year Olds', Base 2428.
Min(a): 1983	'Home Computers', Base 1,043.
Min(b): 1984	'Home Computers', Base 1,558.
Min(c): Aug-Oct.84	'Leisure Intelligence, Issue 8', Base 1,043.
Min(d): Feb.84	'Leisure Intelligence, Issue 6', Base 1,474.
Min(e): Aug/Oct.85	'Leisure Intelligence, Issue 12', Base 1,511.
Min(f): May-Jun 86	'Leisure Intelligence, Issue 14', Base 1,399.
Min(g): Nov-Jan 86	'Leisure Intelligence, Issue 16', Base 1,496.
GMS (a):1983	'The UK Home Computer Market', Base 1994
GMS (b):1984	'Microcomputer End-User Research', Base 2000.
GMS (c):1985	'Microcomputer End-User Research', Base 2000.
HC (a): Winter 85	'Leisure Futures', Base: Not available.
HC (b): Summer 86	'Leisure Futures', Base: Not available.
HC (c): Autumn 86	'Leisure Futures', Base: Not available.
HC (d): Winter 86	'Leisure Futures', Base: Not available.
MC (a): 1983	'Interim Report'
MC (b): 1985	'Interim Report'
CA (a): 1984	1200 households with a home computer
BBC : 1986	'Microlive', Base: 390.

FES :	1986	Family Expenditure Survey, Base: 11,000
FES :	1985	Family Expenditure Survey, Base: 11,000
GHS :	1985	General Household Survey 1985, Base: 12,500
GHS :	1984	General Household Survey 1985, Base: 12,500

SALES BASED RESEARCH

Code	Source
Key Note	- Key Note Publications, (1987), *'Household Appliances (Brown Goods)'*, London.
M.A.	- Marketing Assessment (1986), *'Home Computing'*, London.
M.R.G.B.	- Euromonitor (1985), *'Market Research Great Britain'*, October, London.
Mintel	- Mintel Publications (1984), *'Home Computers'*, London.
W.M.	- Wood McKenzie (1985), *'Home Computers'*, London.
Brema	- Brema (1986), *'Annual Report'*, London.
Euromonitor	- Euromonitor (1984), *'The Personal Computer Report'*, London.

BIBLIOGRAPGHY

This bibliography provides details of the more cetral rferences cited and excludes much of the press reporting.

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

Arnold, E. and Burr, L.(1985), 'Housework and the Appliance of Science', in Faulkner, W. and Arnold, A.(eds.), *Smothered by Invention*, Pluto Press, London.

Aronson, S.(1977), 'Bell's Electrical Toy: What's the Use? The Sociology of Early Telephone Usage', de Sola Pool, I.(ed.), *The Social Impact of the Telephone*, MIT Press, Cambridge, pp.15-39.

Athanasiou, T.(1985) 'High-tech alternativism: the case of the Community Memory Project', in Radical Science Collective, (eds.), *Making Waves: the Politics of Communication*, Free Association Books, London, pp.37-52.

Atherton, R.(1981), 'Britain's School Teach the Wrong Computer Habits', *New Scientist*, 28th May, pp.568-70.

Atkinson, J.(1984), 'Manpower Strategies for Flexible Organisations', *Personnel Management*, Vol.18, No.2, pp.28-31.

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

Baer, R.(1977), 'Television Games: Their Past, Present, and Future', *IEEE Transactions on Consumer Electronics*, Vol. CE-23, No.4, November, pp.496-509.

Barker, M.(1984a), *A Haunt of Fears: the Strange History of the British Horror Comics Campaign*, Pluto Press, London.

Barker, M.(ed.) (1984b), *The Video Nasties: Freedom and Censorship in the Media*, Pluto Press, London.

Bell, C. and Roberts, H.(eds.)(1984), *Social Researching: Politics, Problems, Practice*, Routledge and Kegan Paul, London.

Bell, D.(1973), *The Coming of Post-Industrial Society*, Basic Books, New York.

Belson W.(1978), *Television, Violence and the Adolescent Boy*, Saxon House, Farborough.

Bernstein, P.(1981), 'Atari and the Video Games Explosion', *Fortune*, July, Vol.104, No.2, pp.40-6./

Bereano, P. et al.(1985), 'Kitchen Technology and the Liberation of Women From Housework', in Faulkner, W. and Arnold, A.(eds.), *Smothered by Invention*, Pluto Press, London, pp.162-81.

Bing, J.(1982), 'The Electronic Games Gambit', *Impact of Science on Society*, Oct/Dec, Vol.37, No.4, pp.425-31.

Bishop, J. and Hoggart, P.(1986), *Organising around Enthusiasms*, Comedia, London.

Briggs, A.(1977), 'The Pleasure Telephone: A Chapter in the Prehistory of the Media', de Sola Pool, I.(ed.), *The Social Impact of the Telephone*, MIT Press, Cambridge, pp.40-65.

Brand, S.(1972), 'Spacewar: Fanatic Life and Symbolic Death Among the Computer Bums', *Rolling Stone*, 7th December, pp.33-8.

Bruce, M.(1986), 'British Telecom's Prestel', *Design and Innovation*, Block 2, Marketing Units 6-8, T362, The O.U. Technology 3rd Level Course, Milton Keynes, pp.64-91.

Brunsdon, C. and Morely, D.(1978), *Everyday Television: "Nationwide"*, BFI, London.

Brundson, C.(1987), 'Men's Genre's for Women', in Baehr, H. and Dyer, G.(eds.) (1987), *Boxed In: Women and Television*, Pandora Press, London, pp.184-202.

Buscombe, E.(1970), 'The Idea of Genre in the American Cinema', *Screen*, Vol.11, No.2, Spring, pp.33-45.

Carlton, D.(1985), *Software People: An Insider's Look at the Personal Computer Software Industry*, Simon and Schuster, New York.

Chanan, M.(1985), 'The Reuters Factor. Myths and realities of Communicology: A Scenario', in Radical Science Collective (eds.) *Making Waves: the Politics of Communications*, Free Association Books, London, pp.109-34.

Chapman, J.(1981-2), *Consider and Examine the Importance and Effect of the Hobbyist in Computer Education: Explore and Investigate Clubs and User Groups*, unpublished dissertation, Dip. Comp. Ed., Westhill College of Education, Birmingham.

Cicourel, A.(1964), *Method and Measurement in Sociology*, Collier McMillan Canada, Don Mills.

Ciotti, P.(1982), 'Revenge of the Nerds', *California (Magazine)*, July, pp.73-7 & 126-34.

Clarke, G.(1982), *Defending Ski-Jumpers: A Critique of Theories of Youth Sub-Culture*, stencilled paper, No. 71, Centre for Contemporary Cultural Studies, Birmingham.

Clarke, J. and Critcher, C.(1985), *The Devil Makes Work: Leisure in Capitalist Britain*, MacMillan, London.

Cockburn, C.(1985), *Machinery of Dominance: Women, Men and Technical Know-How*, Pluto Press, London.

Cohen, S.(1973), *Folk Devils and Moral Panics*, Paladin, London.

Collective Design/Projects (1985), *Very Nice Work If You Can Get It: The Socially Useful Production Debate*, Spokesman, Nottingham.

Condry, J. and Keith, D.(1983), 'Educational and Recreational Uses of Computer Technology: Computer Instruction and Video Games', *Youth and Society*, September, Vol.15, No.1, pp.87-111.

Corrigan, P. and Willis, P.(1980), 'Cultural Forms and Class Mediations', *Media, Culture and Society*, No.2., pp.299-312.

Critcher C. et al.(1980) *Fads and Fashions*, Centre for Contemporary Cultural Studies stencilled paper, No. 63.

D'Acci, J.(1987), 'The Case of Cagney and Lacey', in Baehr, H. and Dyer, G.(eds.) (1987), *Boxed In: Women and Television*, Pandora Press, London, pp.203-26.

Dale, R.(1985), *The Sinclair Story*, Duckworth, London.

Danko, W. and MacLachlan, J.(1983), 'Research to Accelerate the Diffusion of a New Invention: The Case of Personal Computers', *Journal of Advertising Research*, Vol.23, No.3, June/July, pp.39-43.

De Sola Pool, I. et.al.(1977), 'Foresight and Hindsight: The Case of the Telephone', de Sola Pool, I.(ed.), *The Social Impact of the Telephone*, MIT Press, Cambridge, p.127-57.

Deem, R.(1986), *All Work and No Play: The Sociology of Women and Leisure*, Open University Press, Milton Keynes.

Deem, R.(1987). 'The Politics of Women's Leisure', in Horne, J. et al.(eds.), *Sport, Leisure and Social Relations*, Routledge and Kegan Paul, London, pp.208-28.

Douglas, S.(1986), 'Amateur Operators and American Broadcasting: Shaping the Future of Radio', in Corn, J.(ed.), *Imagining Tomorrow: History, Technology, and the American Future*, MIT Press, Cambridge, Mass., pp.34-57.

Dosi, G.(1984), *Technical Change and Industrial Transformation: The Theory and An Application to the Semiconductor Industry*, Macmillan, London.

Dosi, G.(1982), 'Technological Paradigms and Technological Trajectories', *Research Policy*, No. 11, No.3, pp.147-62.

Dutton, W. et al.(1987), 'Diffusion and Social Impact of Home Computers', *Communications Research*, Vol.14, No.2, April. pp.219-250.

Earnshaw, S.(1984), 'Advertising and the Media: The Case of Women's Magazines', *Media, Culture and Society*, No.6, pp.410-421.

Egli, E. and Meyers, L.(1984), 'The Role of Video Game Playing in Adolescent Life: Is there Reason to be Concerned?', *Bulletin of the Psychonomic Society*, Vol.22, No.4, pp.309-12.

Ellis, D.(1984), 'Video Arcades, Youth and Trouble', *Youth and Society*, September, Vol.16, No.1, pp.47-65.

Equal Opportunities Commission (1985), *Infotech and Gender: An Overview*, Manchester.

Evans, C.(1979), *The Mighty Micro: The Impact of the Microchip Revolution*, Coronet Books, Sevenoaks.

Ewen, S.(1976), *Captains of Consciousness*, McGraw Hill, Berkeley.

Fedida, S. and Malik, R.(1979), *The Viewdata Revolution*, Associated Business Press, London.

Fishman, K.(1981), *The Computer Establishment*, Harper and Row, New York.

Forbes (1967), 'Furniture That Does Everything', March 15th, pp.30-9.

Forty, A.(1986), *Objects of Desire: Design and Society 1750-1980*, Thames and Hudson, London.

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

Frith, S.(1978), *The Sociology of Rock*, Constable, London.

Frude, N.(1983), *The Intimate Machine: Close Encounters with New Computers*, Century, London.

Fry, T.(1982), 'Unpacking the Typewriter', *Block*, No.7, Polytechnic of

Central London, London, pp.36-47.

Gallagher, M.(1987), 'Redefining the Communications Revolution', in Baehr, H. and Dyer, G.(eds.) (1987), *Boxed In: Women and Television*, Pandora Press, London, pp.19-37.

Game, A. and Pringle, R.(1983), *Gender at Work*, Pluto Press, London.

Gold, R.(1977), 'Roles in Sociological Field Definitions', in Denzin, N.(ed.), *Sociological Methods*, Aldine, McGraw Hill, New York, pp.370-80.

Golding, P. and Murdock, G.(1983), 'Privatising Pleasure', *Marxism Today*, October, pp.32-6.

Goodall, P.(1983), 'Design and Gender', *Block*, No.9, Polytechnic of Central London, London, pp.50-61.

Gray, A.(1987), 'Behind Closed Doors: Video Recorders in the Home', in Baehr, H. and Dyer, G.(eds.), *Boxed In: Women and Television, Pandora*, London, pp.38-54.

Gribbin, M.(1984), 'Boys Muscle in on the Keyboard', *New Scientist*, 30th August, pp.16-17.

Griffin, C.(1982), *Cultures of Femininity: Romance Revisited*, stencilled paper No.69, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham.

Griffin, C.(1985), *Typical Girls: Young Women from School to the Job Market*, Routledge and Kegan Paul, London.

Griffin, C. et al.(1982), 'Women and Leisure', in Hargeaves, J.(ed.) *Sport, Culture and Ideology*, Routledge and Kegan Paul, London, pp.88-116.

Haddon, L. (1984) *Forming the World of the Hobbyist': A Case Study of a Home Computer Magazine*, unpublished paper, Centre for Contemporary Cultural Studies, Birmingham.

Haddon, L. (1987) *The Masculine Micro?* paper given at the conference of the British Sociological Association, Leeds, April.

Haddon, L.(1988a), 'Electronic and Computer Games: The History of an Interactive Medium', *Screen*, Vol.29, No.2, Spring, pp.52-73.

Haddon, L.(1988b) *The Use of Domestic and Communications Technologies: A Guide to Statistical Sources*, unpublished paper, Science Policy Research Unit, University of Sussex.

Hall, S.(1969), 'The Hippies: An American Movement', in Nagel, J.(ed.), *Student Power*, Merlin Press, London.

Hall, S. and Jefferson, T.(eds.) (1976) , *Resistance Through Rituals: Youth Subcultures in Post-War Britain*, Hutchinson, London.

Hall, S. et al.(1978), *Policing the Crisis: Mugging, the State and Law and Order*, Macmillan, London.

Hanson, D.(1982), *The New Alchemists: Silicon Valley and the Microelectronics Revolution*, Little, Brown and Co, Boston.Braun, E. and McDonald, S.(1978), *Revolution in Miniature*, Cambridge University Press, Cambridge.

Haraway, D.(1985), 'A Manifesto for Cyborgs: Science, Technology and Socialist Feminism in the 1980s', *Socialist Review 1985*, No.80, p.72-4.

Hargeaves, D.(1967), *Social Relations in a Secondary School*, Routledge and Kegan Paul, London.

Hartley, J. et al.(1985), *Public Acceptance of New Technologies: New Communications Technology and the Consumer*, Prest, Manchester University, September.

Hebdige, D.(1979), *Subculture: The Meaning of Style*, Methuen, New York.

Hebdige, D.(1982), 'Towards a Cartography of Taste: 1935-1962', in Waites, B. et al (eds.), *Popular Culture: Past and Present*, Croom Helm, Beckenham, pp.194-218.

Helmers, C.(1978), 'Apple Bytes Man', *Wharton Magazine*, Vol.3, No.3, pp.40-1.

Henriques, N.(1984), 'Women in Computing; Escape from the Female Ghetto', *New Scientist*, 9th August, pp.17-9.

Hobson, D.(1979), 'Housewives: Isolation as Oppression', in CCCS Women's Group (eds.), *Women Take Issue*, Hutchinson, London, pp.79-95.

Holmen, M.(1980), 'Who is Using Personal Computers', *IEEE Transactions on Systems, Man and Cybernetics*, Vol.SMC-10, N.8, August, pp.480-4.

Holti, R. and Stern, E.(1984), *Social Aspects of New Information Technology: A Review of Initiatives in Local Communication; Distance Working; and Eduction and Training*, Tavistock Institute of Human Relations, London.

Horrigan, B.(1986), 'The Home of Tomorrow, 1927-45', in Corn, J.(ed.), *Imagining Tomorrow: History, Technology, and the American Future*,

MIT Press, Cambridge, pp.137-63.

Hughs, M. et al.(1985), 'Are Computers only for Boys', *New Society*, 11th October, pp.75-76.

Huws, U.(1985), 'Terminal Isolation', in Radical Science Collective (eds.), *Making Waves: The Politics of Communication*, Free Association Books, London, pp.9-26.

Illich, I.(1973), *Deschooling Society*, Penguin, Harmondsworth.

Illich, I.(1973), *Tools for Conviviality*, Calder and Boyers, London.

Industry Report (1981) 'Winning with Video Games', *Institutional Investor*, Vol.15, No.9, 279-81.

Isaacson, P.(1979), '1979-The Year of the Home Computer', *Datamation*, Vol.25, No.1, January, pp.217-8.

Jenkins, R.(1984), 'Bringing it all back Home: An Anthropologist in Belfast', in Bell, C. and Roberts, H.(eds.) (1984), *Social Researching: Politics, Problems, Practice*, Routledge and Kegan Paul, London, pp.147-64.

Johnson, L.(1983), 'Images of Radio: The Construction of the Radio Audience by Popular Radio Magazines', in Teese, P. and Wickham, G.(eds.) *Melbourne Working Paper 4*, Dept. of Education, University of Melbourne, pp.35-54.

Johnson, R.(1983), *What is Cultural Studies Anyway?*, stencilled paper No.74, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham.

Johnson, R.(1986), 'The Story so Far: And Further Transformations?, in Punter, D.(ed.), *Introduction to Contemporary Cultural Studies*, Longman, Harlow, pp.227-313.

Jones, M.(1984), 'Video Games as Psychological Tests', *Simulations and Games*, Vol.15, No.2, June.

Jones, T.(1983), 'The Grand Old Man', *Psychology Today*, 21 (3).

Jordan, K. and Leigh, J.(1984), 'Race and Sex Differences of Children in Satisfaction and Other Factors Associated with Video Games', *Advances in Consumer Research*, Vol.11, pp.94-9.

Kaplan A. (1977), 'Home Computers versus Hobby Computers', *Datamation*, 23 (7), pp.72-5.

Kaplan, S.(1982), *The Image of Amusement Arcades and the Differences in Male and Female Video Game Playing*, Paper presented at the

North Central Sociological Association annual meeting, Detroit, Michigan, May.

Kay, A.(1977), 'Microelectronics and the Personal Computer', *Scientific America*, September, pp.231-44.

Keen, B.(1985) *Theories of Technology: Some Critical Thoughts*, unpublished working paper, Imperial College, London.

Keen, B.(1987), 'Play It Again Sony: The Origins and Double Life of Home Video Technology', *Science as Culture*, No.1, pp.7-42.

Kennedy, M.(1987), 'Labouring to Learn: Women in Adult Education', in McNeil, M.(ed.) *Gender and Expertise*, Free Association Books, London, pp.103-24.

Kidder, T.(1981), *Soul of a New Machine*, Penguin, Harmondsworth.

Kiesler, S. et al.(1983), 'Second-Class Citizens?', *Psychology Today*, March, pp.40-8.

Kreinberg N. and Stage, E.(1983), 'EQUALS in Computer Technology', in Zimmerman, J. (ed.), *The Technological Woman: Interfacing with Tomorrow*, Praeger, New York, pp.251-9.

Kubey, C.(1982), '*The Winners Book of Video Games*, W.H.Allen, London.

Kuhn, A.(1984), 'Women's Genres', *Screen*, Vol.25, N.1, January/February, pp.18-28;

Kunkin Heller, D.(1982), 'Computer Games for Women Stress Cooperation, Humor and Whimsy', *Infoworld*, April 12th, pp.17-18.

Labov, W.(1973), 'The Logic of Nonstandard English', in N. Keddie (ed.), *Tinker, Tailor...The Myth of Cultural Deprivation*, Penguin, Harmondsworth, pp.21-66.

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

Levy, S. (1984), *Hackers: Heros of the Revolution*, Doubleday, Garden City.

Linn, P.(1985), 'Microcomputers in Education: Living and Dead Labour', in Solomonides, T. and Levidow, L.(eds.), *Compulsive Technology: Computers as Culture*, Free Association Books, London, pp.58-101.

Linn, P.(1987), 'Gender Stereotypes, Technology Stereotypes', in McNeil, M.(ed.), *Gender and Expertise*, Free Association Books, London, pp.127-51.

Litwark, M.(1987), *Reel Power: The Struggle for Influence in the*

New Hollywood, Sedwick and Jackson, London.

Loftus, G. and Loftus, E.(1983), *Mind at Play: The Psychology of Video Games*, Basic Books, New York.

London Borough of Croydon (1983), *Information Technology in Schools*, Equal Opportunities Commission, Manchester.

London Industrial Strategy (1985), *The Cultural Industries*, Greater London Council, London.

Long, S. and Long, W.(1984), 'Rethinking Video Games: A New Challenge', *Futurist*, December, Vol.18, No.6, pp.35-7.

Maclaurin, W.(1949), *Invention and Innovation in the Radio Industry*, MacMillan, London.

Maddison, J.(1983), *Education in the Microelectronics Era*, Open University Press, Milton Keynes.

Markoff, J.(1983), 'Who's In Front', *InfoWorld*, Vol,5, No.44, 31st October, pp.32-6.

Marles, V. and Radcliffe, J.(1982), 'The Role of Research in the Production Process: "The Computer Programme"', in *Annual Review of BBC Broadcasting Research Findings 1981/2*, BBC, London, No.8, pp.40-54.

Marsh, P.(1981), *The Silicon Chip Book*, Abacus, London.

Mason, R. and Jennings, L.(1982), 'The Computer Home: Will Tomorrow's Housing Come Alive', *Futurist*, February, Vol.16, No.1, pp.35-43.

Martin, J. and Norman, A.(1973), *The Computerised Society: An Appraisal of the Impact of Computers on Society over the Next 15 years*, Pelican, Harmondsworth.

McGlynn, D.(1982), *Personal Computing*, John Wiley and Sons, New York.

McNeil, M.(1987), 'It's a Man's World,' in McNeil, M.(ed.), *Gender and Expertise*, Free Association Books, London, pp.187-97.

McRobbie, A.(1978), *Jackie: An ideology of Femininity*, stencilled paper No.53, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham

McRobbie, A.(1980), 'Settling Accounts with Subcultures: a Feminist Critique', *Screen Education*, No.34., pp.37-49

McRobbie, A.(1981), 'Working Class Girls and Femininity', in CCCS Women's Studies Group (eds.) *Women Take Issue*, Hutchinson, London, pp.96-108.

Miège, B.(1979), 'The Cultural Commodity', *Media, Culture and Society*, No.1, pp.297-311.

Miles, I.(1987), *Home Informatics: A Report to the Six Countries Programme on Aspects of Government Policies towards Technical Innovation in Industry*, Science Policy Research Unit, University of Sussex, Brighton.

Moorehouse, H.(1984), *Organising Enthusiasm: Specialist Magazines and Sub-cultures*, Paper given at the 'Leisure: Politics, planning and People Conference, University of Sussex, July.

Morely, D.(1980), '*The Nationwide Audience*', BFI, London.

Morely, D.(1986), *Family Television: Cultural Power and Domestic Leisure*, Comedia, London.

Moritz, M.(1984), *The Little Kingdom: The Private Story of the Apple Computer*, William Morrow and Company Inc., New York.

Murdock, G. and Golding, P.(1974), 'For a Political Economy of Mass Communications', in Miliband R. and Saville, J. (eds.) *The Socialist Register 1973*, Merlin Press, London, pp.205-34.

Murdock, G, and McCron, R.(1979), 'The Television and Delinquency Debate', *Screen Education*, Spring, pp.51-67.

Murdock, G. et al. (forthcoming), 'Home Computers: The Social Construction of a Complex Commodity', *International Review of Sociology*.

Naisbitt, J.(1982), *Megatrends*, Warner Books, New York.

Needham, N. (1983), 'Thirty Billion Quarters Can't Be Wrong: Or Can They? A Look at the Impact of Video Games on American Youth', *Today's Education 1982-3 Annual*, pp.52-5.

Nye, D.(1985), *Image Worlds: Corporate Identities at General Electric 1890-1930*, MIT Press, Cambridge, Mass..

Osborne, A.(1979), *Running Wild: The Next Industrial Revolution*, Osborne/McGraw-Hill,Berkeley.

Panelas, T.(1983), 'Adolescents and Video Games: Consumption of Leisure and the Social Construction of the Peer Group', *Youth and Society*, September, Vol.15, No.1, pp.51-65.

Patrick, H.(1973), *Glasgow Gang Observed*, Eyre Methuen, London.

Pawling, A.(1984), *Invisible Girls: Girls and Sport at a Technical College*, unpublished M.A. dissertation, Centre for Contemporary

Cultural Studies, Birmingham.

Perry, T. et al.(1982), 'Video Games: the Electronic Big Bang', *IEEE Spectrum, December*, Vol.19, No.12, pp.20-32.

Phillips, A. and Taylor, B.(1980), 'Sex and Skill: Notes Towards a Feminist Economics', *Feminist Review*, No.6, pp.79-88.

Pinch, T. and Bijker, W.(1984), 'The Social Construction of Facts and Artefacts', *Social Studies of Science*, Vol.14, No.3, August, pp.399-441.

Price, J.(1985), 'Social Science Research on Video Games', *Journal of Popular Culture*, Spring, Vol.18, No.4, pp.111-25.

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

Roszak, T.(1986), *The Cult of Information: The Folklore of Computers and the True Art of Thinking*, Lutterworth Press, Cambridge.

Schwartz Cowan, R.(1983), *More Work for Mothers: Ironies of Household Technology from the Open Hearth to the Microwave*, Basic Books, New York.

Screen Digest (1977), *Video games*, July, pp.127-9.

Seldon, A. and Pappworth, J.(1983), *By Word of Mouth: Élite Oral History*, Methuen, London.

Shotten, M.(1986), *Computer Dependency: A Survey*, paper given at the Ergonomics Society, University of Durham, 8th-11th April.

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

Siegel, L.(1986), 'Microcomputers: From Movement to Industry', *Monthly Review*, July-August, pp.110-17.

Skirrow, G.(1986), 'Hellivision: An Analysis of Video Games', in McCabe, C. (ed) *High Theory/Low Culture: Analysing Popular Television and Film*, Manchester University Press, Manchester, pp.115-42.

Smith, J.(1987), 'Men and Women at Play: Gender, Life Cycle and Leisure', in Horne, J. et al.(eds.), *Sport, Leisure and Social Relations*,Routledge and Kegan Paul, London, pp.51-87.

Smith, S.(1983), '"Coin Detected in Pocket": Videogames as Icons', in Geist, C. and Nachbar, S. (eds.) *The Popular Culture Reader*, Bowling Green University Popular Press, Bowling Green, pp.145-51.

Sobel, R.(1986), *IBM vs. Japan: The Struggle for the Future*, Stein and

Day, New York.

Solomonides, T. and Levidow, L.(eds.) (1985), *Compulsive Technology: Computers as Culture*, Free Association Books, London.

Sudnow, D.(1978), *Pilgrim in a Microworld: Eye, Mind and the Essence of Video Skill*, Heinemann, London.

Tittscher, R. and Tittscher, I.(1984), *The UK Microcomputer Market: Major Companies and Trends*, Sector Investments Limited, London.

Toffler, A.(1980), *The Third Wave*, Morrow, New York.

Toles, T.(1985), 'Video games and American Military Ideology', in Mosco, V. and Wasko, J. *The Critical Communications Review, Vol.III: Popular Culture and Media Events*, Ablex, Norwood, pp.206-23.

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

Trapanski, E.(1979), *Special when Lit: A Visual History of the Pinball*, Dolphin Books, New York.

Trinkaus, J.(1983), 'Arcade Video Games: An Informal Look', *Psychological Reports*, No.52, p.586.

Tunstall, J.(1964), *The Advertising Man*, Chapman and Hall, London.

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

Weizenbaum, J.(1976), *Computing Power and Human Reason: From Judgement to Calculation*, W.H.Freeman, San Francisco.

White, C.(1977), *Royal Commission on the Press: The Women's Press in Contemporary Britain 1946-76*, HMSO, London.

Whyte, W.(1943), *Street Corner Society*, University of Chicago Press, Chicago

Williamson, J.(1984), *A Review of the Developments by the Birmingham ILEA of the Use of Computers in Secondary Education*, Cert.Ed dissertation, Westhill College, Birmingham.

Willis, P.(1975), *The Main Reality*, stencilled paper, No.38, Centre for Contemporary Cultural Studies, Birmingham.

Willis, P.(1978), *Profane Culture*, Routledge and Kegan Paul, London.

Willis, P.(1980), *Learning to Labour*, Gower, Farnborough.

Willis, P.(1983), *Thinking the Unthinkable*, Report on Unemployed Youth to Northampton Council.

Wilson, E.(1985), *Adorned in Dreams: Fashion and Modernity*, Virago,

London.

Winship, J.(1981), *Woman becomes an "Individual": Femininity and Consumption 1954-1969*, stencilled paper No.65, Centre for Contemporary Cultural Studies, University of Birmingham, Birmingham.

Winship, J.(1983) '"Options: For the Way you want to live now", or a Magazine for Superwoman', *Theory, Culture and Society*, Vol.1, No.3, pp.44-65.

Zimmerman, J.(1986), *Once Upon a Time: A Woman's Guide to Tomorrow's Technology*, Pandora, New York.

ACKNOWLEDGEMENTS

I would first like to thank my two supervisors - initially Gary Wersky and later Karen Legge - for their advice, encouragement and efforts, especially when in some respects the approach and subject matter of the thesis constituted somewhat unfamiliar territory. I appreciated the balance which they struck between allowing me to take a good deal of initiative, while always monitoring progress and being willing to provide assistance.

Also, I really appreciated the very close collaboration with Ben Keen over the first part of the Phd programme as well as our continued contact and discussion ever since. We formulated many aspects of the framework together, and Ben has provided much useful feedback in the latter stages of the thesis.

Over the last two years, regular meetings with David Skinner were much appreciated in that they helped to maintain that sense of being involved in a collaborative effort, as well as providing comments on my work together with very useful material from David's own research.

In this latter respect, I would also wish to thank Margaret Shotton and Paul Hartmann at Centre for Mass Communications Research both for the material which they made avialable and for discussing their work in this area. In the same vein, the statistical data supplied by Carrick James was much appeciated.

Especially in the early stages of the research, I valued the discussions of my potential project which took place with a variety of researchers within sociology and cultural studies. In particular, Dave Albury, Maureen McNeil and Richard Johnson provided valuable commentary and support on several occasions.

Lastly, I would thank my parents and Sue Chipp, now my wife, for their moral support throughout, not to mention the hidden domestic labour

and practical assistance which, behind the scenes, facilitated my finding the space to research and write this thesis.