

# Our Computer heritage.

**– a project to produce an informed audit of computer archival collections.**

## 1. Executive Summary.

This proposal, originating from the Computer Conservation Society, is for a three-year project to identify, document and explain historical material relevant to the development of early British computers. The emphasis is on approximately 80 computers that were designed and built in the UK between 1945 and 1970, and on the 2,000 resulting installations.

Historical artefacts from these pioneering installations, such as original documents, hardware and software, exist in a variety of places such as museums, universities, companies, and with private individuals. The present access to, and description of, these collections leaves much to be desired. There is an urgent need to catalogue and interpret the artefacts whilst the people who worked on the computers are still alive.

The Computer Conservation Society (CCS) opened discussions with a number of museums in the spring of 2002, as a result of which the project entitled *Our Computer Heritage* is now proposed. The following partners have expressed a firm interest in participating: the British Computer Society (BCS), the National Archive for the History of Computing, the Public Record Office, the National Museum of Science and Industry, the Museum of Science and Industry in Manchester, and the National Museums of Scotland. In December 2002 the CCS began discussions with the BCS, to examine appropriate ways of implementing the project. In the spring of 2003, exploratory talks on funding were opened with the Heritage Lottery Fund. Meanwhile, a Pilot Study has been initiated using CCS volunteer effort, the purpose of which is to compile information on a sub-set of early computers and use this to refine ideas about the database structure.

The objective of the *Our Computer Heritage* project is to produce an easy-to-use, web-accessible multimedia database which will provide three related categories of information:

- (a) descriptions and photos of each type of early British computer, together with the dates, destinations, applications and anecdotes of all end-user installations;
- (b) the technical specifications of early hardware and software;
- (c) a catalogue of all surviving artefacts, their location, facilities for public access, and (where appropriate) sample audio/visual images.

This paper sets out the motivation for the project, its organisation and budget, and the details of a proposed bid to the Heritage Lottery Fund for its implementation.

The vision for this project came from CCS's Preservation Policy Working Group, namely: Chris Burton, Simon Lavington, Brian Oakley and Tony Sale. This document represents the state of play as at July 2003.

## 2. Background.

### 2.1. Motivation.

The Computer Conservation Society (CCS) is a co-operative venture between the British Computer Society, the Science Museum (officially known as the National Museum of Science and Industry, in London), and the Museum of Science and Industry in Manchester. Since 1989 the CCS has been actively involved in the conservation, restoration and study of historic computers. Recent concerns that have led the CCS to propose the *Our Computer Heritage* project include the following:

- (a) There are many UK locations (museums, libraries, universities, special archives, companies, government establishments, web sites, private houses, etc.) where computer artefacts have been deposited. The cataloguing of, and access to, historical items varies from location to location. Cross-referencing between locations is in general poor, especially since the contents of particular sites is liable to change. Researchers have difficulty in finding items. Museum curators have difficulty in interpreting their artefacts.
- (b) Public interest in computer history and in the pioneering role played by Britain in the Information revolution, is growing. However, the resources devoted to computer artefacts at existing repositories is liable to change as budgets come under pressure. For example the world-class work of CCS members in restoring/reconstructing historic computer hardware has met with mixed reactions by host organisations.
- (c) There has been little attempt at national level to identify gaps in the country's accessible collections, and to formulate a policy about what to preserve, and where to preserve it.
- (d) Many companies and private individuals possess historical computer artefacts that they now wish to dispose of. These organisations/individuals experience difficulty in identifying suitable national repositories for their artefacts. The advice of the CCS is frequently sought. The CCS itself has no facilities for storage, so it routinely directs enquirers to museums or to the National Archive for the History of Computing (NAHC). Curators are today under severe financial constraints, though the NAHC has said that it would be happy to have first refusal on any documents turned up by *Our Computer Heritage*.

Arising from the above concerns, the CCS believes that it has identified a need to examine all relevant collections and carry out an audit of what exists where, in what condition, with what access, and how catalogued. This audit would be augmented with links to a database of technical information on the historic computers themselves, and to details of installations and applications. The entire exercise is seen as a vital step towards promoting informed debate about how to address all of the issues (a) to (d) listed above. Since talking to the Heritage Lottery Fund, outreach to a wider audience has also become an aim of the project.

In putting together the present auditing and interpreting project, the CCS has sought the advice of other interested parties. A half-day Workshop was held in Manchester on 6<sup>th</sup> March 2002, to discuss an earlier draft of this proposal. The Workshop was attended by 12 people, representing the following organisations: CCS, BCS, IEE, National Archive for the History of Computing, the Museum of Science and Industry in Manchester, the National Museums of Scotland, ICL, the University of Warwick and the Public Record Office. Apologies were received from individuals representing the MOD, the Foreign & Commonwealth Office, and the Science Museum. The Workshop was chaired by Brian

Oakley, CBE. Suggestions from the Workshop, and subsequent contacts, have been incorporated into this document.

## **2.2. Scope.**

The prime focus of *Our Computer Heritage* is taken to be general-purpose stored-program digital computers designed and built in the UK in the period 1945 – 1970. There are clearly a few examples of special-purpose digital equipment or hybrid (mixed analogue/digital) equipment that is of historical importance. Whilst not strictly within scope, such artefacts might be included as special cases. It is expected that particular effort will be directed towards stored-program computers that first came into operation in the period 1948 to 1968.

The history of British computing, and the on-going interests of the CCS, are certainly not limited to the period 1945 – 1970. We choose to focus this particular auditing project on the time-frame 1945-70 because:

- (a) it is judged to be a priority area in respect of access to surviving pioneers and their fast-disappearing memorabilia;
- (b) it is perhaps the major era of all-British mainframe design, manufacture and deployment, spanning the period from the earliest, world-renowned, prototypes to the age of company mergers and the start of international standardisation;
- (c) British computers designed within this time-frame constitute a closed corpus. It is not too difficult to list all the machines in the corpus, together with an information base giving their hardware and software technical details, customers/applications, relative innovative importance, surviving pioneers, etc.

Appendix 1 contains a listing of the principal British-designed computers to have come into operation in the period under review. Depending upon definitions, it can be seen that the corpus consists of approximately 80 distinct computer systems, installed at some 2,000 sites throughout the UK. Included in the list of sites will be details of software houses which produced applications programs running on the named computer systems.

## **2.3. Definition of archival material.**

Archival material within the scope of *Our Computer Heritage* includes:

- (a) Hardware artefacts, ranging from components and sub-assemblies to complete computer systems;
- (b) Software-related artefacts (eg program listings; digital media (paper tape, cards, magnetic tape, floppy discs, etc.) containing original code and/or data; original or modern digital media containing simulators/emulators of historic hardware, or software for media conversion of legacy digital data;
- (c) Written and audio-visual artefacts related to (a) and (b) - (eg technical reports, applications reports, letters, brochures, reprints, notebooks, manuals, photos, videotapes, audio recordings of interviews with pioneers, etc);

There is clearly much overlap between these categories of artefact. It is believed that category (c), the written and audio-visual artefacts, presents the greatest auditing problem. To this category might be added a (restricted-circulation) list of contact addresses of members of the Computer Conservation Society, and others, who have technical expertise

on one or more of the early British computers within the scope of the *Our Computer Heritage* project.

Notice that category (b) is not primarily concerned with what is sometimes known as *digital content* – that is to say, the stored data which relates to the real world outside a specific computer system. Nevertheless, information in categories (b) and (c) could well be relevant to those whose task it is to recover and preserve digital material which was originally generated by a historic computer whose technical details are within the scope of the CCS's project.

In Appendix 2 we describe the principal existing UK collections of historic computer artefacts, and recent partial auditing initiatives by our partners - upon which the *Our Computer Heritage* project will build. We now give the proposed organisation of a project which will implement the CCS's vision. What follows is provisional. We have not yet finalised arrangements for a host organisation (though we are in discussions with the BCS). Also, we have not yet formally applied for a grant, though there is good reason to hope that we can attract support from a source such as the Heritage Lottery Fund,

### **3. Project management, implementation, funding requirements and deliverables.**

#### **3.1. Partners and management strategy.**

It is planned that a grant for the three-year project will be sought from the Heritage Lottery Fund (HLF). The bid depends upon the CCS being able to identify a host organisation with the necessary stature and permanence to head up the project. The proposed roles of the partners are as follows:

<i>name of partner</i>	<i>provides</i>
A Host organisation (such as the BCS)	the project office; the Infrastructure Manager; database/web maintenance; the on-going web server facilities.
Computer Conservation Society (CCS)	technical expertise; volunteer effort; quality control.
National Archive for the History of Computing (NAHC)	Advice, training, access
Public Record Office (PRO)	ditto
National Museum of Science & Industry, London (NMSI)	ditto
National Museums of Scotland (NMS)	ditto
Museum of Science and Industry in Manchester (MSIM)	ditto

During the three-year *Our Computer Heritage* project, information about historic British computers and surviving artefacts will be gathered by CCS and BCS volunteers operating from three regional bases. The suggested regions, detailed below, have been chosen both for their density of known archival material and their local museum support. After

suitable training by our museum partners, the volunteers will work in teams. The total number of CCS members as at November 2002 is 756. Most of these are retired, many having spent at least part of their working lives in contact with some of the historic computers targeted by the project. Recent polls suggest that between 10% and 30% of the CCS membership might volunteer to help with the *Our Computer Heritage* project. The BCS Branch structure, with its well-established local committees, could also be invaluable in recruiting and supporting volunteers. As at July 2003, the Pilot Study already has about 30 CCS volunteers poised to start work.

Bearing in mind the known geographic concentrations of historic computer artefacts, the proposed regional centres are:

- a) Southern England, based in London, with advice and training provided by the Science Museum and by the Public Record Office;
- b) The Midlands, Wales and the North West, based in Manchester, with advice and training provided by the Museum of Science and Industry in Manchester and by the National Archive for the History of Computing (based at the University of Manchester);
- c) Scotland, Northern Ireland and the North East, based in Edinburgh, with advice and training provided by the National Museums of Scotland.

### 3.2. Budget.

If external support is to be supplied by the Heritage Lottery Fund, then the HLF expects at least 10% of the project's expenditure to come from the applicants. The HLF permits volunteer labour to be charged at one of three standard rates. The appropriate rate for the *Our Computer Heritage* project is £150 per volunteer-day. Below we give broad expenditure headings and some budget estimates, assuming the support of the HLF:

<i>Host item</i>	<i>total notional cost</i>	<i>from host's sources</i>	<i>from HLF</i>
Salary (incl. overheads) of one Infrastructure Manager for three years:	£90K	nil	£90K
IT & office consumables for three years; photo royalty fees, insurance, etc.	£15K	£10K	£ 5K
IT facilities to support & manage the project's database & Web site for 3 years:	£ 9K	£ 3K	£ 6K
Notional contribution to server support for the project's web site for at least 17 years after the project's formal end, at £200 per annum:	£3.4K	£3.4K	nil
<b>Host totals</b>	<b>£117.4K</b>	<b>£16.4K</b>	<b>£101K</b>

<i>CCS item</i>	<i>total notional cost</i>	<i>from CCS sources</i>	<i>from HLF</i>
Information-gathering: volunteer labour at £150 per day:	£150K	£150K equiv.	nil
Experts & volunteers & partner-reps: travel & subsistence:	£10K	nil	£10K

<b>Other partners items</b>	<b>total notional cost</b>	<b>from partners</b>	<b>from HLF</b>
Hire of training facilities	£ 3K	nil	£ 3K
Expenses (attending meetings, etc.)	£ 2K	nil	£ 2K

**Summary:**

The total notional cost of project is £282.4K, of which £116K would be requested from the HLF.

**3.3. Project deliverable: the database.**

The main publicly-visible outcome from the *Our Computer Heritage* project will be a web-browsable multimedia database. The database covers all stored-program digital computers designed, built and delivered in Britain during the period 1945 – 1970 – (see listing in Appendix 1). Although the contents of the database is necessarily compiled by computer specialists, the result must be usable by, and interesting to, non-specialists – ie by the general public. The proposed structure of the database is shown in Figure 1. Further details concerning access and implementation are given in Appendix 3.

It is intended that the web-site and database will be maintained by technical staff at the host organisation after the conclusion of the three-year project. It is anticipated that follow-on CCS projects will periodically move the historical time-frame of *Our Computer Heritage* forwards from 1970.

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# Appendix 1.

## Checklist of pre-1970 British-designed computers.

The list is sorted by name of originating organisation - (usually being the affiliation of the main hardware implementers for that computer). Bearing in mind the many mergers and name-changes in the UK computer industry during the 1960s, it is not possible to avoid minor ambiguities.

In the case of a range (or series) of computers, an entry is given for the first model. Again, this leads to minor ambiguities for cases where there were major design-changes as the series developed. In the case of the Elliott ARCH range of process control computers, there was much overlap with the company's 800 series machines.

The emphasis is on general-purpose stored-program digital computers that first became operational between 1945 and 1970. However, a few special-purpose digital computers have been included where these have had some historical impact.

The date towards the right in each row indicates the point at which a computer became fully operational. Again, there are certain ambiguities that depend upon the definition of 'fully operational'. The final column contains an estimate of the number of computers of a certain type to have been built, up to 1970. This figure includes a few machines that were owned by the company concerned and used for revenue-earning bureau work, as well as machines that were delivered to external customers.

It is estimated that the total number of UK-designed computers in operation in Britain rose approximately as follows:

1950 =	4
1955 =	60
1960 =	400
1965 =	950
1970 =	2100

Of course, to obtain the total installed base of computers in the UK, one should add imported machines to the above figures. The first non-British computer to reach these shores, an IBM 650, was installed in Oct. 1956.

The list in this Appendix is a re-formatted and slightly-revised version of the list compiled by Simon Lavington which was published in the Computer Conservation Society's journal *Resurrection*, issue 22, Summer 1999.

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**ACE – (see under NPL).****AEI**

Metrovic MV950  
 AEI 1010

<i>date first working.</i>	<i>no. built to 1970.</i>
1956	6
1960	10 (?)

**ARCH – (see under Elliott)****Atlas – (see under Ferranti)****Atomic Energy Research Establishment (AERE), Harwell**

Cadet

1955	1
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**Birkbeck College, University of London**

ARC  
 SEC  
 APE(X)C

1949	1
1950?	1
1952	1

**BTM – (see under ICT)****Cambridge University**

EDSAC  
 EDSAC II  
 Titan

1949	1
1957	1
1963?	1

**CDL – (see under GEC)****Computer Technology Ltd.**

Computer Technology Modular One

1968	30 (?)
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**Digico**

Digico Digiac  
 Digico Micro 16

1966	20 (?)
1968	50 (?)

**EDSAC – (see under Cambridge)****Elliott Automation – (see under Elliott Brothers)****Elliott Brothers (London) Ltd., Borehamwood.**

Elliott 152  
 Elliott Nicholas  
 Elliott 401  
 Elliott 153  
 Elliott 311 (part of the Elliott/Ferranti/GCHQ OEDIPUS)  
 Elliott 402  
 Elliott 403 (WREDAC)  
 Elliott 405  
 Elliott 802  
 Elliott 803  
 Elliott 900 series

1950	1
1952	1
1953	1
1954	1
1954	1
1955	9
1956	1
1956	30
1958	7
1959	211
1963	240 (?)

Elliott 503	1963	32
Elliott ARCH 1000, etc. (usu. embedded versions of std. machines)	1962	?
Elliott 502	1964	3
Elliott 4100 series	1966	170 (?)

### **EMI**

EMI EBM	1957?	1 (?)
EMI CP407	1958	1 (?)
Emidec 1100	1959	20 (?)
Emidec 2400	1961	20 (?)

### **English Electric**

Deuce series	1955	31 (?)
KDN2	1962	20 (?)
KDP10	1962	5 (?)
KDF6	1963	15 (?)
KDF9	1963	29 (?)
KDF8	1964	5 (?)
KDF7	1965	15 (?)
English Electric System 4 (RCA Spectra; IBM/360 compat.)	1968?	?

### **Ferranti Ltd.**

Ferranti Mark 1	1951	2
Ferranti Mark 1 star	1953	7
Ferranti Pegasus	1956	40
Ferranti Mercury	1957	19
Ferranti Perseus	1959	2
Ferranti Sirius	1961	16
Ferranti Apollo	1961	?
Ferranti Atlas	1962	4
Ferranti Poseidon	1962?	5 (?)
Ferranti Argus series	1963?	150 (?)
Ferranti Hermes	????	?
Ferranti Orion	1963	13

### **GEC**

CDL 1301 (jointly with BTM)	1961	?
GEC 90xx series	1964?	?
GEC S7	1966?	?

### **ICL – (see under ICT)**

### **ICT**

BTM HEC	1953	8 (?)
BTM 1200 series	1954?	80 (?)
ICT 1300 series (see also under GEC)	1961	125 (?)
ICT 558 FCC	1962	(?)
ICT 1500 (RCA 301)	1963?	70 (?)
ICT 1600 (RCA 3301)	1965?	(?)

ICT 1900 series	1964	284 to 15/2/67
<b>Imperial College, University of London</b>		
ICCE	1952?	1
<b>Leo Computers Ltd.</b>		
Leo	1951	1
Leo II	1957	11
Leo III	1963	94
<b>Lyons – (see under Leo Computers Ltd.)</b>		
<b>Manchester University</b>		
Manchester SSEM ('the Baby')	1948	1
Manchester Mark I	1949	1
Manchester experimental transistor computer	1953	1
Manchester Meg (Mark II)	1954	1
Manchester MUSE, later ATLAS – (see under Ferranti)		
<b>Marconi</b>		
TAC	1959	5 (?)
Myriad	1963	50 (?)
<b>Mark I – (see under Manchester University and under Ferranti).</b>		
<b>Metropolitan-Vickers – (see under AEI).</b>		
<b>Ministry of Supply – (see under Post Office Research Labs.)</b>		
<b>NPL: National Physical Laboratory</b>		
Pilot Ace	1950	1
Ace	1957	1
<b>Post Office Research Labs., Dollis Hill, London.</b>		
MOSAIC	1953	1
<b>Royal Aircraft Establishment (RAE), Farnborough.</b>		
RASCAL (believed never to have been fully operational)	(1953)	1
<b>Royal Radar Establishment – (see under TRE).</b>		
<b>Smiths Aircraft Industries Ltd., Cheltenham.</b>		
SECA (believed never to have been fully operational)	(1955)	1
<b>STC</b>		
Stantec Zebra	1958	45 (?)

<b>TRE: Telecomms Research Est. (later Royal Radar Est.).</b>		
TREAC	1953	1
RREAC	1961?	1

## Appendix 2.

### Summary of the main existing collections, and recent auditing initiatives.

#### A2.1. Museums.

Amongst the major UK museums and museum-like sites holding significant historic computer artefacts (as defined in section 2) are the following:

- Birmingham Museums and Art Galleries
- Computer Conservation Society (items at present stored at Bletchley Park and elsewhere)
- Museum of Science and Industry in Manchester
- National Museums and Galleries of Wales
- National Museum and Galleries on Merseyside
- National Museums of Scotland
- The Science Museum (London).

These organisations collaborated three years ago in a national listings project, co-ordinated by Jenny Wetton of the Museum of Science and Industry in Manchester. The result, the National Computing Collections Listing Project (NCCLP), has produced a potentially useful (but incomplete) web-searchable database of holdings:

<http://www.sciencemuseum.org.uk/ncclp/welcome.htm>

In a recent comment, Jenny Wetton has said, "Curators have been enthusiastic but not forthcoming with data, partly due to a lack of time and partly because they do not feel confident in identifying material in their collections". Certainly, the indexing/searching facilities of the NCCLP database are in need of some polishing. For example, there is no way of discovering that the Birmingham Museum actually has, in storage, significant parts of a Ferranti Orion computer and a complete ICT HEC computer. It would seem that many museums could benefit from help from computer experts on such things as provenance of manufacture and use of artefacts, in order to interpret their collections to visitors in a meaningful way. This is an example of the point at which links to a new web-browsable multimedia database could play their part.

#### A2.2. National Archive.

The National Archive for the History of Computing (NAHC) was set up in 1987 with a three-year grant from the Leverhulme Foundation. The NAHC is currently hosted by the Centre for the History of Science, Technology and Medicine of the University of Manchester; documents are held in the John Rylands University Library at Manchester.

The National Archive at Manchester is potentially both a repository, cataloguer, and cross-referencing source for large quantities of written and audio-visual artefacts. See the on-line catalogue at: [http://www.man.ac.uk/Science\\_Engineering/CHSTM/contents.htm](http://www.man.ac.uk/Science_Engineering/CHSTM/contents.htm)

However, funding, staffing levels and storage space at the NAHC are not lavish. Due to a recent staff departure and freeze on posts, the position of Archivist is at present vacant. Recently (November 2002) the NAHC applied to the Arts and Humanities Research Board for a grant to improve its cataloguing, establish a better photo collection, and investigate computer applications post-1970. The NAHC has said that it is pleased to be associated with the *Our Computer Heritage* project, which it sees as complementary to its own future plans.

### **A2.3. Universities.**

University Libraries and Departments hold many important documents linked to individual computer pioneers. Examples are the Bodleian Library, Oxford (papers of Christopher Strachey) and Kings College, Cambridge (papers of Alan Turing). The Centre for the History of Technology, Science and Society at the University of Bath has become responsible for the Contemporary Scientific Archives Centre, previously maintained in Oxford. See their introductory web page at:

<http://www.bath.ac.uk/Departments/SocPol/Centres/histech.htm>

Despite being in operation (at Oxford and then at Bath) since about 1973, only four individuals are currently listed under 'Computer Science' (K F Bowden, Gill, Renwick, Strachey).

Departments of Computer Science, particularly at the Universities of Cambridge and Manchester, often hold valuable artefacts relating to the research carried out at their institutions.

### **A2.4. Government establishments.**

Many computer-related documents are held in government-funded establishments. Locations include the Public Record Office and the defence-related research establishments. Access to historical computer information at these sites is, for understandable reasons, not always straightforward.

For the early years within our period of 1945 – 1970, it has on occasions been possible for the authorities to release certain computer pioneers from their obligations under the Official Secrets Act, thus enabling them to provide historians with technical details of UK-designed computer hardware and software which was originally used for classified applications. A recent example occurred in the autumn of 2001, in respect of an Elliott computer project for GCHQ. Such aspects of archive-auditing are an on-going story, requiring specialist knowledge.

### **A2.5. Companies.**

Computer companies have, in the past and to various degrees of thoroughness, kept archival copies of internal reports, etc. Bearing in mind the plethora of take-overs and mergers that boiled the major UK computer manufacturers down to one entity, namely the late-lamented ICL, it is not surprising that the state of company archives is very mixed. An audit of relevant company archives was carried out in 1985 by the Institution of Electrical Engineers, with funding from ICL –(see: Serena Kelly (ed.), "Report of a Survey of the Archives of the British Commercial Computer Manufacturers 1950-1970", Institution

of Electrical Engineers, 1985, pp.272). During this six-month audit, 20 companies, ten libraries and Museums, and nearly 200 individuals were contacted. To quote from the Report's summary: "It highlighted above all a widespread disregard for the value of archives. Of the 12 companies still in operation, only one (STC) has employed a qualified archivist and only four others make any effort at all to retain significant documents". The study is now acknowledged by the IEE to be quite out of date and there is plenty of evidence that the industrial archival situation has deteriorated since 1985.

Not surprisingly, new company information occasionally comes to light. In the case of one computer company there have been two recent developments which illustrate the dynamic nature of archival auditing:

- (a) An archival collection of about 1,000 Internal Technical Reports from the 1950s and 1960s, some of them formerly classified 'Secret', has recently come to light in a successor-company's strong-room. Negotiations were undertaken, the result of which is that this important, but hitherto 'lost', collection is now in a museum's store, awaiting cataloguing. Approximately 170 of these technical reports are directly relevant to digital computers.
- (b) A former employee of the same company, whilst still in service, supervised and catalogued a large collection of other historic documents, many pre-war. It now seems that the successor company can no longer house the collection and wishes to sell the documents to raise cash (possibly thereby splitting the archive).

Related to industrial archives are the public sources of information such as the Public Record Office, patent libraries and Companies House. Searching these sources is a specialist occupation.

## **A2.6. Private individuals.**

Individuals who designed hardware or software within UK companies, government establishments or universities during the period 1945 – 70, are now either dead, retired, or approaching the end of their professional employment. These individuals, or their relatives, often have historic computer artefacts at home. In the late summer of 1999 the CCS launched an appeal for information about privately-owned computer artefacts and memorabilia, an appeal publicised by the BCS and the IEE. 89 individuals responded in the period 13/8/99 to 30/4/2000. Of these responders, approximately 35 percent owned material that was of clear historical importance within the scope defined in section 2 above.

Here is one example from the CCS appeal, to illustrate the usefulness to historians of privately-owned artefacts. The Borehamwood Laboratories of Elliott Brothers (London) Ltd. produced a so-called FACTS booklet for each type of commercially-available computer built by the company. Each FACTS booklet contained from 15 to 45 pages, depending upon the machine. Each booklet included information on the instruction set and instruction timings, the register-level programming model, the assembly language, the configuration options available, and the physical size and power consumption requirements of each sub-unit in a system. The complete set of about a dozen booklets covered the various models of computer in the Elliott 5xx, 8xx, 9xx and 41xx ranges. However, according to the NCCLP database (see section 3.1 above) only two booklets have survived in publicly-available collections. As a result of the CCS appeal, the full set of FACTS booklets has now been collected by a member of the CCS.

In contacting private individuals, all auditing exercises must of course adhere to proper procedures in relation to the Data Protection Act.

## Appendix 3.

### **Preliminary notes on the access-requirements for, and the implementation of, the web-accessible multimedia database.**

*These notes should be read in conjunction with the main project specification and, in particular, with the database diagram given in Figure 3.*

#### **A3.1. Access requirements.**

The database links together three classes of information for each computer:

- (a) descriptions and photos of each type of early British computer, together with the dates, destinations, applications and anecdotes of all end-user installations;
- (b) the technical specifications of early hardware and software;
- (c) a catalogue of all surviving artefacts, their location, facilities for public access, and (where appropriate) sample audio/visual images.

Although the contents of the database is necessarily compiled by computer specialists, the result must be usable by non-specialists. In short, the database must be readily available, and searchable (or browsable) according to a variety of starting-points. Here are some illustrative examples of starting-points.

a socio-economic researcher, knowing that a certain company operated a certain computer system on a certain date, needs to know the cost and capabilities of this computer relative to other British-designed and machines available at the same time.

A school-child is doing a project on the Information Revolution in Britain. She wants dates and photographs of the 'first office computer' and 'the first factory computer'. Since her school is in Liverpool, she would also like to know about the first computer installation in the Liverpool area.

an archivist has been given a magnetic tape, generated by an early computer. The tape contains important legacy data on former employees. Can the contents of the tape be read, converted to a modern format, and printed out?

a patent lawyer is investigating early forms of instruction caches and believes that a certain early computer contained relevant hardware. Technical details are now required, including references to published material.

A museum curator has been given a hardware sub-assembly purporting to come from a certain computer. More details of the computer are required, in order to catalogue and display this artefact and place it in context.

An industrial historian is researching company take-overs and wishes to locate photographs which illustrate the R&D and production facilities of certain early computer manufacturers.

A book is being prepared on the history of steel production. When were computers first used for process-control, and/or for administrative data processing, by steel manufacturers?

### **A3.2. Implementation guidelines.**

The database must deal with both fixed-format and free-format entries. Updating, especially of the *artefacts* sections, must be catered for. The implementation should, as far as possible, be future-proof in the sense that the database must survive updates to client or server hardware or software.

The database should conform to the documentation and taxonomic standards currently in use by museums and other archival repositories. The CIMI version of Dublin Core is the standard for prime consideration – see: [www.cimi.org/publications](http://www.cimi.org/publications) for the Guide to Best Practice.

The database should obviously be web-accessible. Remote access via the Internet will be the normal route for all users. Information retrieval should be possible by a combination of informal web-page browsing and specific search-engine querying.

Further discussion is necessary concerning detailed implementation strategies. HTML is a likely candidate for the presentation of information, due to its wide usage at present. Should HTML views be generated dynamically? Should there be a relational database behind the scenes? All these are matters currently under review. As at July 2003, a Computer Science student is examining the issues as part of an M.Sc. project.